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This publication implements Air Force Policy Directive (AFPD) 32-70, *Environmental Considerations in Air Force Programs and Activities*, and supports Air Force Instruction (AFI) 32-7001, *Environmental Management*. It provides guidance and procedures for cultural resource and natural resource programs at Air Force installations. This publication applies in its entirety to all civilian employees and uniformed members of the Regular Air Force, Air Force Reserve, Air National Guard, and individuals with contractual obligations to comply with Air Force publications located at installations in the U.S. and its territories. For personnel located at installations outside of the U.S. and its territories, this AFMAN is applicable if it directs action that is not specified by applicable host nation Final Governing Standards, AFI 32-7001, Environmental Management, or AFI 32-7091, *Environmental Management Outside the United States*, and that action does not conflict with an of these publications. The authorities to waive wing/unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, or T-3") number following the compliance statement. See AFI 33-360, *Publications and Forms Management*, for a description of the authorities associated with the Tier numbers. Submit waiver requests through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the requester's commander for non-tiered compliance items. Ensure all records created as a result of processes prescribed in this publication are maintained in accordance with AFMAN 33-363, *Management of Records*, and disposed of in accordance with the Air Force Records Disposition Schedule located in the Air Force Records Information Management System. This publication may be supplemented at any level, but all supplements must be routed to the Office of Primary Responsibility (OPR) of this publication for coordination prior to certification

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Chapter 1

ROLES AND RESPONSIBILITIES

1.1. Secretary of the Air Force (SecAF).

1.1.1. Establishes a historic preservation program for the identification, evaluation, and nomination to the National Register of Historic Places (National Register), and protection, of historic properties in accordance with the National Historic Preservation Act (NHPA), at 54 USC § 306102(a).

1.1.2. In accordance with 36 CFR § 800.7(c)(4), documents decisions to proceed with undertakings that adversely affect historic properties when the Air Force has been unable to reach agreement with the Advisory Council on Historic Preservation, the State Historic Preservation Officer (SHPO), or an affiliated federally-recognized tribal government.

1.1.3. Has the authority, under Section 110 of the NHPA (54 USC § 306112), to waive all or part of the Air Force's NHPA Section 110 preservation responsibilities (54 USC §§ 306101-306107 and 306109-306114) in the event of a major natural disaster or an imminent threat to national security. **Note:** Section 110 of the NHPA (54 USC § 306112) does not allow the SecAF to waive Section 106 (54 USC § 306108) and 36 CFR Part 800 consultation responsibilities. 36 CFR § 800.12 provides guidance for emergency situations.

1.2. Assistant Secretary of the Air Force for Installations, Environment and Energy (SAF/IE).

1.2.1. Serves as the principal advisor to the SecAF and Chief of Staff of the Air Force on all matters related to conservation management. SAF/IE delegates responsibilities for the management of Air Force cultural and natural resources to the Deputy Assistant Secretary of the Air Force for Installations, Environment, and Energy (SAF/IEE).

1.2.2. Designates a senior policy official from the Headquarters-level, as the single point of contact, responsible for policy in accordance with Headquarters Air Force Mission Directive (HAF MD) 1-18, *Assistant Secretary of the Air Force (Installations, Environment and Energy)*, paragraph A1.32.3.2.

1.2.3. Designates the Air Force Federal Preservation Officer in accordance with HAF MD 1-18, paragraph A1.32.3.2.

1.3. Deputy Assistant Secretary of the Air Force for Installations, Environment, and Energy (SAF/IEE).

1.3.1. Interacts with the Office of the Secretary of Defense (OSD), major commands, other Federal agencies, Congress, and external non-governmental environmental organizations as the Air Force’s principal representative and advocate for conservation compliance and policy.

1.3.2. Establishes and maintains cooperative working relationships with Air Force and federal-level environmental regulators, OSD, the Air Force Civil Engineer Center (AFCEC), and other stakeholders.

1.3.3. Promulgates and oversees policy for integrated cultural resources management as part of the Air Force Environmental Management System in accordance with AFI 32-7001, *Environmental Management*.

1.3.4. Approves and provides guidance, direction, and oversight for all matters pertaining to the formulation, review, and execution of plans, policies, and programs.

1.3.5. Coordinates Air Force conservation compliance and policy with the other Department of Defense (DoD) services to explore common areas of interest and prevent duplication of effort.

1.3.6. Reviews and forwards coordinated installation packages to the Department of the Interior to nominate Air Force historic properties for listing on the National Register.

1.3.7. Collects and reports Air Force-wide conservation performance metrics for the OSD Environmental Management Review.

1.3.8. Approves cultural resources agreements with other land-managing federal agencies, branches of government, and other parties as appropriate.

1.3.9. Approves and signs NHPA Program Alternatives pursuant to Section 106 (54 USC § 306108) and 36 CFR § 800.14.

1.3.10. Oversees the Air Force natural resources program as the Air Force Natural Resources Trustee as per 42 USC § 9607(f)(2)(A) (known as the Comprehensive Environmental Response, Compensation, and Liability Act)).

1.3.11. Develops policy providing functional oversight for the Air Force wildland fire program. Appoints Air Force representatives to the Fire and Emergency Services Working Group per DoDI 6055.06, *Fire and Emergency Services Program*.

1.3.12. Designates one primary voting member and up to three alternates to the DoD Conservation Committee.

1.3.13. Approves establishment of conservation banks, wetland banks, or other property easements in support of military readiness requirements, and as mitigation for military activities that may affect natural resources.

1.4. The General Counsel of the Air Force (SAF/GC) through the Deputy General Counsel, Installations, Energy and Environment (SAF/GCN).

1.4.1. Provides legal support to the SecAF and Headquarters, and Air Force organizations on policy development and legislation related to environmental conservation.

1.4.2. Consults with Air Force Legal Operations Agency, Civil Law and Litigation Directorate, Environmental Law and Litigation Division (AFLOA/JACE) on significant or non-routine matters related to environmental conservation.

1.4.3. Nothing in paragraph 1.4 or its subparagraphs is inconsistent with Headquarters Air Force Mission Directive (HAFMD) 1-14, *General Counsel and The Judge Advocate General*.

1.5. Headquarters, United States Air Force, The Judge Advocate General (AF/JA) through the Air Force Legal Operations Agency, Civil Law and Litigation Directorate, Environmental Law and Litigation Division (AFLOA/JACE). AFLOA/JACE shall:

1.5.1. Provides legal expertise to the SecAF and Headquarters, Air Force organizations, installations and the Air Force Civil Engineer Center on all applicable laws, regulations, and Executive Order (EO) requirements concerning the implementation of the Air Force conservation programs.

1.5.2. Consult with SAF/GCN on significant or non-routine matters related to environmental conservation.

1.5.3. Review Integrated Cultural Resources Management Plans (ICRMPs) where complex tribal, stakeholder, or controversial issues are present, or where the ICRMP addresses resources shared with another federal agency.

1.5.4. Coordinate on drafts of 36 CFR § 800.6(c) Memoranda of Agreement (MOA), 36 CFR § 800.14(a) alternate procedures, and 36 CFR § 800.14(b) Programmatic Agreements (PAs) involving multiple installations or controversial undertakings.

1.5.5. Depending on the complexity, scope, precedent, or other factors, send select drafts to SAF/GCN for review and comment.

1.5.6. Nothing in paragraph 1.5. or its subparagraphs is inconsistent with HAFMD 1-14.

1.6. Director, Air Force History and Museums Policies and Programs (AF/HO).

1.6.1. Establishes policy concerning historical data and documentation; historical reporting; historical publications; and organizational lineage, honors, and emblems. Reviews the history and management of field history and field museum programs of major commands, direct reporting units, and field operating agencies.

1.6.2. Provides management oversight to its subordinate division, the Air Force Historical Support Division, and its field operating agency, the Air Force Historical Research Agency.

1.6.3. Provides strategic vision, policy, and overall guidance for the Air Force Heritage Program.

1.6.4. Maintains operational records and other data that might be useful to cultural resources personnel during NHPA consultations and Section 110 (54 USC § 306102) data collection and evaluation.

1.7. Deputy Chief of Staff for Logistics, Installations, & Force Protection, Directorate of Civil Engineers (AF/A4C). AF/A4C shall:

1.7.1. Prepare draft conservation policy for SecAF review and approval.

1.7.2. Identify applicable legal and other requirements.

1.7.3. Establish, track, and report Air Force-wide conservation performance metrics.

1.7.4. Respond to congressional inquiries in coordination with SAF Legislative Liaison (SAF/LL).

1.7.5. Review proposed legislation in coordination with SAF/IEE, SAF/LL, SAF/GCN, and AFLOA/JACE.

1.7.6. Serve as process-owner for overall Environmental Quality and media-specific requirements development for Air Force-owned Information Technology systems.

1.7.7. Coordinate and analyze environmental performance reporting, compliance tracking, and resource needs.

1.7.8. Execute policy, advocate for resources, and oversee execution of Air Force conservation programs.

1.7.9. Determine the need for an installation Integrated Natural Resources Management Plan (INRMP) (see **paragraph 3.4**). **(T-0)**.

1.8. Air Force Installation and Mission Support Center. Air Force Installation and Mission Support Center shall: **(T-1)**.

1.8.1. Provide resource advocacy, and plan, program, and budget for AF environmental Operations and Maintenance programs.

1.8.2. Assist Air Force installations in delivering the capabilities to implement facility environmental strategic policy, guidance, and environmental reporting.

1.9. Air Force Civil Engineer Center Environmental Directorate (AFCEC/CZ). AFCEC/CZ shall serve as OPR and implement this AFMAN, allocate resources, and oversee execution of conservation programs throughout the Regular Air Force. **(T-1)**. **This will include the following:**

1.9.1. Plan, organize, direct, and control installation conservation programs on behalf of AF/A4C. **(T-1)**. Provide technical expertise at national, regional, and local echelons to develop and execute cultural and natural resources programs in coordination with installations. **(T-1)**.

1.9.2. Staffs the following subject matter experts: **(T-2)**.

1.9.2.1. Cultural Resources Expert. Serves as program manager and provides technical assistance and guidance to the Air Force on issues related to cultural resource programs. **(T-2)**.

1.9.2.2. Natural Resources Expert. Serves as Serves as program manager and provides technical assistance and guidance to the Air Force on issues related to natural resource programs. **(T-2)**.

1.9.3. Develop guidelines and other documents to assist execution of the conservation programs. **(T-2)**.

1.9.4. Represent the Air Force on DoD-sponsored teams and conservation working groups. **(T-2)**.

1.9.5. Collect, analyze, and report Air Force-wide performance information to AF/A4C and SAF/IE in support of the Air Force Environmental Management System and Environmental Management Review by the OSD. **(T-2)**.

1.9.6. Reconcile heritage asset and historic property reported data and advise AF/A4C of any discrepancies to maintain Real Property Inventory accuracy, in accordance with AFI 32-9005, *Real Property Accountability*, paragraph 3.2.3.1. **(T-2)**.

1.9.7. Review and coordinate with SAF/IEE on any undertakings which require NHPA Section 106 (54 USC § 306108) consultation and could have Air Force-wide policy implications. **(T-2)**.

1.9.8. Manage Air Force conservation information clearinghouses available to Air Force personnel and others through the internet. **(T-2)**.

1.9.9. Oversee the maintenance and release of cultural resources information beyond the custody of AFCEC and installation cultural resources personnel. **(T-2)**.

1.9.10. Monitor and coordinate with SAF/IEE NHPA activities pursuant to Section 106 (54 USC § 306108) when NHPA activities involve multiple installations, other DoD components, or other federal agencies. **(T-1)**.

1.9.11. Author, staff, and maintain the Air Force conservation Playbooks and eDASH conservation webpages. **(T-2)**.

1.9.12. Validate program goals and objectives and provide Program Objective Memoranda (POM) and Integrated Priority List (IPL) guidance, approval, validation, advocacy, and oversight. **(T-1)**.

1.9.13. Ensure active duty installation funding requirements are correctly identified, programmed, supported, executed, and tracked. Identify, program, and validate conservation requirements to build the Air Force POM and IPL. **(T-1)**.

1.9.14. Provide and manage contracts, interagency agreements, and cooperative agreements on behalf of, and for use by, Air Force organizations for conservation management assistance and implementation of conservation projects. **(T-1)**.

1.9.15. Provide conservation training for base personnel, facility managers, residents, contractors, tenants, and others, as appropriate. **(T-2)**.

1.9.16. Provide technical support and advice to MAJCOMs and installations on conservation programs and compliance with these programs. **(T-2)**.

1.9.17. Review proposed actions for cultural resources impacts and engage in integrated planning with proponents. Develop and implement a process to fully integrate cultural resources planning with broader planning activities in accordance with DoDI 4715.16, *Cultural Resources Management*. Provide support and expert advice for Environmental Impact Analysis Process reviews. **(T-1)**. Integrate the ICRMP with the installation Activity Management Plan process and the Program Objective Memoranda. **(T-2)**.

1.9.18. Consult with the SHPO and affiliated tribal stakeholders to determine if a given installation requires the development and maintenance of an ICRMP. If negative, will advise the installation on procedures to waive the ICRMP requirement. **(T-2)**.

1.9.19. Provide DoD and Air Force required data in response to case-specific or recurring reporting requirements. **(T-2)**.

1.9.20. Respond to Freedom of Information Act requests, requests from media and public affairs, and higher echelon data calls and congressional inquiries. **(T-0)**.

1.9.21. Provide cultural resources expertise to support environmental baseline surveys (EBS) for real property, forward basing, and other Combatant Command decision-making. Follow

the EBS procedures and documentation per AFI 32-7066, *Environmental Baseline Surveys on Real Property Transactions,* and do not substitute for consultation and compliance with applicable cultural resources regulations (e.g., NHPA, Archaeological Resources Protection Act [ARPA], etc.). **(T-0)**.

1.9.22. Develop lessons learned and best practices; communicate and share with installations and AFCEC. **(T-2)**.

1.9.23. Develop, review, or comment on draft installation cultural resources MOA, PAs, comprehensive agreements, curation agreements, and ARPA permits. **(T-2)**. Initiate such documents only after coordination with legal counsel and the installation Cultural Resources Manager. **(T-2)**.

1.9.24. Develop, review, or comment on draft National Register nominations. **(T-2)**. Prepare nomination packages for coordination with the installation and through AF/A4C and SAF/IEE to the Keeper of the National Register. **(T- 2)**.

1.9.25. Provide information on cultural resources training, and professional development for Cultural Resources Managers. **(T-2)**.

1.9.26. Monitor historic preservation outreach and awareness programs. **(T-2)**.

1.9.27. Notify Headquarters AF/A4C of unanticipated discoveries of archaeological resources or emergency situations affecting historic properties. **(T-0)**.

1.9.28. Advocate for resources required to implement approved installation INRMPs and ICRMPs through the PPBE process. **(T-2)**.

1.9.29. Provide and manage contracts, interagency agreements, and cooperative agreements on behalf of, and for use by, Air Force organizations for natural resources program management assistance and implementation of natural resources management projects, with the exception of the installation Bird/Wildlife Aircraft Strike Hazard (BASH) program, which is managed by the Wing Flight Safety Office. AFCEC/CZ Director is delegated authority to sign cooperative agreements and interagency agreements entered into pursuant to Section 103a of the Sikes Act, 16 USC § 670c-1. **(T-1)**.

1.9.30. Administer the Air Force reimbursable forestry, agricultural and grazing, fish and wildlife, dispersed outdoor recreation, and Forest Reserve Account programs, to include the distribution of funds for approved projects. **(T-2)**.

1.9.31. Provide oversight, technical direction, and guidance for wildland fire management planning and implementation for the Air Force. Advocate for resources required to implement the Air Force wildland fire program. **(T-1)**.

1.9.32. Administer training and certification records for Air Force conservation law enforcement officers. **(T-2)**.

1.9.33. Annually review the Development Plan, INRMP, ICRMP, and Range Comprehensive Plan of each Installation. **(T-0)**. Identifies and reports problems in these plans to the respective Installation. Shall update, analyze trends, and recommend corrective actions for these plans. **(T-2)**.

1.10. Air Force Civil Engineer Center Fire Emergency Services Division (AFCEC/CXF). Manages Air Force Fire and Emergency Services (FES) program in accordance with AFI 32-2001, *Fire and Emergency Services (FES) Program*.

1.11. Air Force Civil Engineer Center Environmental Directorate, Wildland Fire Branch (AFCEC/CZOF). AFCEC/CZOF shall:

1.11.1. Provide oversight, technical direction, and guidance for wildland fire management planning and implementation for the Air Force. Advocate for resources required to implement the Air Force wildland fire program. **(T-1).**

1.11.2. Develop plans and programs to facilitate Air Force wildland fire policy execution. **(T-1)**.

1.11.3. Determine the need for an installation Wildland Fire Management Plan (WFMP) as a component plan of the INRMP, provide guidance for WFMP content, and develop WFMP in coordination with the installation. **(T-1)**.

1.11.4. Establish, with AFCEC/CXF inputs, Regional Fire Management Officer (RFMO) positions to implement installation WFMPs and support wildland fire operations in their respective regions. **(T-2)**.

1.11.5. Establish strategically located Wildland Support Modules (WSMs) at installations and ranges with the highest wildfire risk and most frequent wildfire activity. WSMs shall operate under the installation commander's control. The RFMO and WSM are to support wildland fire operations in their respective regions. **(T-3)**.

1.11.6. Manage a system for tracking and reporting of wildfires, prescribed fire, and mechanical/chemical fuel reduction activities that occur on lands under Air Force jurisdiction. **(T-1)**.

1.11.7. Administer wildland fire education and training by issuing, certifying, maintaining and tracking NWCG certification and qualifications for all Air Force personnel, including military, contractors, cooperators and volunteers. **(T-2)**.

1.11.8. Serve as the Air Force agency representative on the interagency Incident Qualification and Certification System (IQCS) Change Management Board. **(T-2)**.

1.11.9. Manage AFCEC/CZOF wildland fire vehicle and equipment assets. Review and advocate for installation-level requirements for wildland vehicles and equipment. **(T-3)**.

1.11.10. Provide and manage contracts, interagency agreements, and cooperative agreements with AFCEC/CXF for wildland fire program assistance on behalf of, and for use by, Air Force installations. **(T-2)**.

1.12. Air National Guard, Logistics and Installations Directorate (NGB/A4). NGB/A4 shall:

1.12.1. Develop additional guidance, as needed, to meet unique operational and mission needs, and ensure adequate oversight of cultural resources programs. **(T-0)**.

1.12.2. Plan, program, budget, allocate, and oversee the execution of the conservation programs throughout their organization. Identify, program, and validate conservation requirements to build the Air Force Program Objective Memoranda and Integrated Project List.

Develop additional guidance, as needed, to meet unique operational and mission needs, and ensure adequate oversight of conservation programs. **(T-0)**.

1.12.3. Coordinate cultural resource tasks with Wing commanders, base civil engineers, and environmental managers to ensure compliance with all historic preservation laws and regulations. **(T-0)**.

1.12.4. Advocate for resources required to implement approved installation ICRMPs and INRMPs. **(T-2)**.

1.12.5. Annually review the Development Plan, INRMP, ICRMP, and Range Comprehensive Plan of each AFRC Installation. **(T-0)**. Identifies and reports problems in these plans to the respective AFRC Installation. Shall update, analyzes trends, and recommend corrective actions for these plans. **(T-2)**.

1.13. Air Force Reserve Command Logistics, Engineering and Force Protection Directorate (AFRC/A4). AFRC/A4 shall:

1.13.1. Develop additional guidance, as needed, to meet unique operational and mission needs, and ensure adequate oversight of cultural resources programs. **(T-0)**.

1.13.2. Ensure AFRC installation funding requirements are correctly identified, programmed, supported, executed, and tracked. **(T-0)**. Identify, program, and validate cultural natural and resources requirements to build the Air Force Program Objective Memoranda and Integrated Project List. Plan, program, budget for and execute the resources required to implement the conservation requirements for AFRC installations. **(T-0)**.

1.13.3. Coordinate cultural resource tasks with wing commanders, base civil engineers, and environmental managers to ensure compliance with all historic preservation laws and regulations. **(T-0)**.

1.13.4. Advocate for resources required to implement approved installation ICRMPs and INRMPs. **(T-2)**.

1.14. Installation or Wing Commander. The Installation or Wing Commander shall:

1.14.1. Establish and maintain government-to-government relationships with Indian tribes. **(T-0)**.

1.14.2. Approve and sign, after coordinating with installation legal office and AFCEC, Memoranda of Understanding (MOU) or protocol agreements, with Tribal governments in regard to consultation procedures, or MOA and PAs with SHPOs and other stakeholders as appropriate. **(T-0)**

1.14.3. Provide written authorization for the Base Civil Engineer to issue ARPA permits to qualified applicants and provide a copy of the signed permit to AFCEC. **(T-3)**.

1.14.4. Designate, in writing, the Base Civil Engineer as the federal agency official with responsibility for installation compliance with 43 CFR Part 10, Native American Graves Protection and Repatriation Act. **(T-1)**.

1.14.5. Designate, in writing, the Base Civil Engineer as the federal agency official with management and curation agreement signature authority over archaeological artifact

collections and associated records, per 36 CFR Part 79, *Curation of Federally-Owned and Administered Archeological Collections*. **(T-1)**.

1.14.6. Maximize reuse of historic buildings and structures, where justified by an objective economic analysis of life-cycle benefits and costs, before disposal, new construction, or leasing in accordance with NHPA Section 110 (54 USC § 306101(2)), EO 13693, *Planning for Federal Sustainability in the Next Decade*, DoD Directive 4165.06, DoDI 4165.70, *Real Property Management*, and DoDI 4715.16, *Cultural Resources Management*. **(T-0)**.

1.14.7. Designate, in writing, an installation Cultural Resource Manager. **(T-3)**.

1.14.8. Approve the INRMP prepared pursuant to the Sikes Act, Section 101(a)(2). The installation commander may re-delegate signature authority to a lower level provided that the signatory has control over all aspects and management objectives addressed within the subject INRMP, but no lower than the Support Group commander. **(T-1)**.

1.14.9. Provide for appropriate staffing of professionally trained natural resources management personnel to ensure implementation of the INRMP, pursuant to 16 USC § 670e-2. **(T-0)**.

1.14.10. Sign cooperative agreements and interagency agreements entered into, pursuant to 16 USC § 670c-1. **(T-1)**.

1.14.11. Approve and sign the installation Wildland Fire Management Plan. **(T-2)**. May re-delegate signature authority to a lower level, but no lower than the Civil Engineer Squadron commander.

1.14.12. Designate the Installation Wildland Fire Program Coordinator (WFPC) in coordination with the installation Fire Chief. **(T-2)**.

1.15. Installation Cultural Resources Manager. The Installation Cultural Resources Manager shall:

1.15.1. Ensure compliance with all historic preservation laws and regulations. Coordinate with AFCEC, the SHPO, affiliated tribal stakeholders, the Advisory Council on Historic Preservation, and others as appropriate to identify significant cultural resources; assess potential impacts; and reduce, avoid, or mitigate adverse effects. **(T-0)**. Prepare, coordinate, and implement MOU, MOA, and PAs, as appropriate, with the technical assistance of AFCEC. **(T-0)**.

1.15.2. Participate in civil engineer planning meetings and identify actions that have the potential to affect historic properties and determine when NHPA Section 106 (54 USC § 306108) consultation is needed for those undertakings. **(T-0)**.

1.15.3. In coordination with AFCEC, assist the Installations Tribal Liaison Officer (ITLO) with the identification of affiliated tribes, tribal consultation, and other interactions. Maintain records of tribal contacts showing compliance with EO 13175; Section 106 (54 USC § 306108); 42 USC § 4321 (referred to as the National Environmental Policy Act (NEPA)); and the 25 USC § 3001-3013, *Native American Graves Protection and Repatriation Act (NAGPRA)*. **(T-0)**.

1.15.4. Develop NAGPRA Comprehensive Agreements to define and facilitate pre-arranged methods for dealing with future inadvertent discoveries of NAGPRA remains and cultural items, in accordance with NAGPRA Section 3(c), and 43 CFR § 10.4. **(T-0)**.

1.15.5. Monitor activities of tenant organizations and contractors, which could adversely affect cultural resources on the installation, on lands controlled by the installation, or on non-Air Force lands impacted by installation-facilitated activities. **(T-1)**.

1.15.6. In coordination with AFCEC, AFRC, or ANG, implement and sustain an installation ICRMP following the AFCEC or ANG ICRMP template. No less than annually, review the Installation Development, INRMP, ICRMP, and Range Comprehensive Plan. **(T-0)**. Identify problems and program alternatives to correct problems. Shall adjust actions to reach ICRMP goals. **(T-0)**.

1.15.7. In coordination with AFCEC, develop and maintain installation cultural resources data tables. **(T-1)**. Ensure real property, geospatial, and business data (supporting, descriptive, reference, interpretive, and other related information) for installation cultural resources are properly entered, shared, protected, and maintained. **(T-2)**.

1.15.8. Maintain accuracy of the Real Property Asset (RPA) Historic Status Codes used in the installation Accountable Property System of Record (e.g., NexGen IT), and ensure the System includes the installation's updated historic property data. **(T-1)**.

1.15.9. Assist the Real Property Officer with physical inventories of installation historic property and heritage assets at least every 3 years. **(T-2)**. Monitor and assess condition of historic properties annually, or as required by circumstances. **(T-2)**.

1.15.10. Provide DoD and Air Force-required data via AFCEC in response to case-specific or recurring reporting requirements. **(T-2)**.

1.15.11. Identify items of potential significance to Air Force history to the National Museum of the U.S. Air Force (NMUSAF) per AFI 84-103, *United States Air Force Heritage Program*. **(T-2)**.

1.15.12. Properly curate recovered archaeological collections and associated records. Periodically assess curation repositories per 36 CFR Part 79 and curation agreement schedules. **(T-0)**. Verify curation facilities meet requirements and standards of 36 CFR Part 79. **(T-0)**.

1.15.13. Conduct public awareness and education programs, and incorporate basic cultural resources information into installation newcomer orientation briefings. Periodically brief ICRMP highlights at commanders' calls and other installation forums. **(T-3)**. Inform personnel occupying historic buildings about the significance of these buildings and explain any special management considerations. **(T- 3)**.

1.15.14. Assist proponents of actions undergoing an environmental impact analysis to:

1.15.14.1. Fully consider the effects of any proposed action on cultural resources and document all considerations during the planning process. **(T-0)**.

1.15.14.2. Fund mitigation measures for adverse effects to historic properties, including, but not limited to, data recovery and building documentation. **(T-1)**.

1.15.14.3. Avoid, minimize, or mitigate adverse effects to historic properties. **(T-0)**.

1.15.14.4. Follow stipulations outlined in executed MOA, PAs, NAGPRA Comprehensive Agreements, Plans of Action, and other agreement documents. **(T-0)**.

1.15.14.5. Recognize that failure to adhere to these responsibilities could result in costly project delays, fines, adverse publicity, personnel actions, and lawsuits. **(T-0)**.

1.15.15. ANG Only: Environmental managers serve as Cultural Resource Managers. Environmental Managers shall consult with the ANG Headquarters prior to accomplishing duties outlined **in paragraph 1.13 (T-0)**.

1.16. Installation Natural Resources Manager. The Installation Natural Resources Manager shall:

1.16.1. Ensure compliance with all natural resources laws and regulations. Coordinate with installation components to assess the potential impacts of proposed activities on sensitive natural resources, and make recommendations to reduce, avoid, or mitigate adverse effects to comply with applicable laws and regulations. **(T-0)**.

1.16.2. Prepare, sustain, and implement an installation INRMP pursuant to the Sikes Act, Section 101(a)(2). **(T-0)**.

1.17. Installation Fire Emergency Services, Fire Chief. The Installation Fire Emergency Services Fire Chief shall: 1.17.1. Serve as the incident commander during wildfire incidents, and may delegate incident commander authority to others based on the complexity of the incident. (T-2).

1.17.2. Prepare for both initial and extended wildfire suppression operations per National Fire Protection Association (NFPA) Standard 1710, and in accordance with DoDI 6055.6, Enclosure 3, paragraph 8.1.2. **(T-0)**.

1.17.3. Responsible for fire prevention and minimizing adverse consequences within the Wildland Urban Interface as per AFI 32-2001. **(T-1)**.

1.17.4. Initiate requests for AFCEC/CZOF assistance during a wildfire. **(T-2)**.

1.17.5. Develop Mutual Assistance Agreements with regional and local fire departments and land management agencies for wildfire suppression assistance, and initiate mutual aid requests. (T-3).

1.17.6. Submit requests to the AFCEC/CZOF training manager for NWCG Incident Qualification Cards for qualified Fire Emergency Services personnel. **(T-3)**.

1.18. Installation Wildland Fire Program Coordinator (WFPC). The WFPC shall:

1.18.1. Serve as the primary point of contact between the installation and AFCEC/CZOF for all matters concerning wildland fire. **(T-2)**.

1.18.2. Initiate and ensure appropriate installation coordination and timely completion of the WFMP annual review. **(T-2)**.

1.18.3. Coordinate with the AFCEC/CZOF WSM lead to identify NWCG training requirements needed to implement the installation WFMP. **(T-3)**.

1.18.4. Submit requests for Incident Qualification Cards to AFCEC/CZOF for installations personnel not employed by Fire Emergency Services as specified in the installation WFMP. **(T-3)**.

1.18.5. Coordinate with the installation natural resources manager to assess the need for an Emergency Stabilization Plan and/or a Burned Area Emergency Response Plan after a wildfire incident. **(T-3)**.

1.18.6. Responsible for acquiring required approvals of Agency Administrator Ignition Authorization and Prescribed Burn Go/No Go Checklist prior to initiation of a prescribed burn. **(T-1)**.

1.18.7. Report significant wildfire incidents on the installation as soon as practicable to the RFMO. (See **paragraph 3.82.1**). **(T-1)**.

1.19. Installation Legal Office. The Installation Legal Office shall:

1.19.1. Serve as the primary point of contact between the installation and AFLOA/JACE for all legal matters concerning environmental conservation as it pertains to this instruction. **(T-2)**.

1.19.2. Provide primary legal guidance to installation commanders and installation personnel for all matters concerning environmental conservation as it pertains to this instruction. **(T-2)**.

1.19.3. Nothing in paragraph 1.17 or its subparagraphs is inconsistent with HAFMD 1-14.

Chapter 2

CULTURAL RESOURCES MANAGEMENT

Section 2A—INTRODUCTION

2.1. Program Overview. This chapter addresses the management of cultural resources on Air Force properties to meet Air Force mission requirements and comply with federal law and applicable state standards. This manual provides Air Force installations a framework for planning, implementing, and documenting cultural resources management programs. The primary objective of the Air Force Cultural Resources Program is to balance managing and preserving our nation's heritage, pursuant to applicable statutes and regulations, in concert with timely and efficient support of the Air Force military mission.

2.2. Purpose and Definitions. The Air Force's mission includes protecting our nation's heritage, as well its people and borders. Therefore, the Air Force places a high priority on integrating cultural resources management with other mission priorities. The Air Force Cultural Resources Program is designed to comply with applicable statutes and regulations, and to meet those requirements in concert with the military mission. The Air Force defines cultural resources to include historic properties (defined in the National Historic Preservation Act, 54 USC § 300101 et seq. and 36 CFR Part 800, *Protection of Historic Properties*); cultural items (defined in the Native American Graves Protection and Repatriation Act (NAGPRA), 25 USC §§ 3001-3013 and 43 CFR Part 10); archaeological resources (defined in the Archaeological Resources Protection Act (ARPA), 16 CFR §§ 470aa – 470mm and 32 CFR Part 229, *Protection of Archaeological Resources*); sacred sites (defined in EO13007, *Indian Sacred Sites*, to which access is provided under the American Indian Religious Freedom Act, 42 USC § 1996); and collections (defined in 36 CFR Part 79, *Curation of Federally Owned and Administered Archaeological Collections*).

2.3. Environmental Management System. Consistent with EO 13834, *Efficient Federal Operations*, and AFI 32-7001, that provides direction for implementing and maintaining the Air Force Environmental Management System framework, cultural resources activities are an Environmental Aspect within the Air Force EMS.

Section 2B—IMPLEMENTATION OF THE NATIONAL HISTORIC PRESERVATION ACT

2.4. Air Force Responsibilities under the National Historic Preservation Act.

2.4.1. NHPA of 1966 as amended is codified at 54 USC § 300101 et seq. Nevertheless, the Advisory Council on Historic Preservation (Advisory Council) continues to reference original sections of the law, most often "Section 106" (54 USC § 306108) regarding consultation requirements and "Section 110" (54 USC §§ 306101-306107, 306109-306115) preservation responsibilities. Regulations at 36 CFR Parts 60, 61, 63, 65, 68, 78, 79, and 800 have been promulgated to implement the Act. Congress, through the NHPA, declared historic preservation as a national policy. The Act established the national historic preservation program to implement that policy. NHPA created a federal system for identifying and registering "historic properties," established a federal-state partnership to promote preservation of such properties, and required federal agencies consider historic properties when planning their activities.

2.4.2. NHPA, at 54 USC § 300308, defines historic property as any prehistoric or historic district, site, building, structure, or object included in, or eligible for, inclusion on the National Register of Historic Places (National Register). This includes artifacts, records, and material related to the historic properties. Congress established the National Register in 54 USC Chapter 3021. The National Register is a list of properties important to the Nation, to the States, or to local communities, that meet the eligibility criteria described in 36 CFR § 60.4. The Keeper of the National Register is an office within the National Park Service (NPS) that manages the National Register.

2.4.3. NHPA, at 54 USC Chapter 3041, created the Advisory Council to advise the President and Congress on historic preservation matters and to review federal and federally assisted actions that affect historic properties. The Act, at 54 USC Chapter 3023, also authorizes each governor to designate a State Historic Preservation Officer (SHPO) to participate in the national program.

2.4.4. Federal agency responsibilities are outlined in the following sections of the NHPA:

2.4.4.1. Per NHPA Section 106 (54 USC § 306108) and 36 CFR Part 800, installations will consider the effects their undertakings will have on historic properties, and allow the Advisory Council to comment on those undertakings. The installations will follow the four-step Section 106 process (see **paragraph 2.9.3**) to identify possible conflicts between historic preservation objectives and a proposed activity, and to resolve conflicts in the public interest through consultation. (T-0).

2.4.4.2. Per NHPA Section 101(d)(6)(A) (54 USC § 302706), installation commanders will consult with federally-recognized Indian tribe, on a government-to-government basis, that attaches religious and cultural significance to a property being evaluated during the Section 106 consultation process. (T-0). Installation commanders will review the list of federally recognized Indian tribes and historic ethnographic research (refer to **paragraph 2.15.1.3**) (T-0).

2.4.4.3. Installations will consult with federally recognized Indian tribes' Tribal Historic Preservation Officers, per Section 106 (54 USC § 302702), on undertakings near the boundaries of tribal lands or involving overflights of tribal lands (T-0).

2.4.5. The Air Force will ensure that historic preservation is integrated in their programs by implementation of this manual, policy letters, memorandums, and installation-specific plans for NHPA Section 110 (54 USC §§ 306101-306107 and 306109-306114) compliance and historic property management. Under NHPA, the Air Force shall:

2.4.5.1. Assume responsibility for preserving Air Force-owned or controlled historic properties in a manner consistent with the Air Force mission. This includes identification and evaluation of historic properties for inclusion on the National Register. (T-0).

2.4.5.2. Use and reuse historic properties to the maximum extent feasible. (T-0).

2.4.5.3. Document historic properties prior to alteration or damage. Documentation is accomplished through the NHPA Section 106 review process. (T-0).

2.4.5.4. Plan and take actions to minimize harm to a historic property designated as a National Historic Landmark. Consider all prudent and feasible alternatives to avoid an adverse effect to a National Historic Landmark. (T-0).

2.4.5.5. Use and follow guidelines issued by the Secretary of the Interior and the Advisory Council to comply with the NHPA and its implementing regulations. (T-0).

2.4.6. Per NHPA Section 111 (54 USC §§ 306121-306122), the Air Force will establish and implement alternative uses of historic properties. (T-0). Such uses may include leasing, exchanging, and adaptive reuse of historic property not needed for current or projected Air Force purposes.

2.4.7. Per NHPA Section 304 (54 USC § 307103), the Air Force and installations will withhold from public disclosure information on the location, character, or ownership of a historic resource where such disclosure might cause invasion of property, risk harm to the resource or property, or impede the use of a traditional religious site by practitioners affiliated with that site. (T-0).

2.4.8. Overseas historic and heritage properties. Per NHPA Section 402 (54 USC § 307101(e)), installation commanders will take into account the effects of Air Force undertakings on World Heritage List properties or properties on host country's equivalent of the National Register, and to avoid, minimize, or mitigate any adverse effects. (T-0). Installations located in host nations shall:

2.4.8.1. Obtain the current World Heritage List and host nation register to determine if such properties are under their immediate control. (T-3).

2.4.8.2. Develop internal review procedures to determine if proposed undertakings will cause any adverse effect to historic properties. (T-3).

2.4.8.3. Develop and implement measures to avoid, minimize, or mitigate adverse effects caused by Department of Defense (DoD) undertakings. (T-3).

2.4.8.4. Notify the appropriate host nation agency when a potential historic property is discovered during the course of DoD actions. (T-3).

2.5. Special Topics Pertaining to National Historic Preservation Act Compliance.

2.5.1. Temporary World War II (WWII) Era Buildings, 1939-1946. The 1986 Programmatic Memorandum of Agreement, executed by Department of Defense, the Advisory Council, and the National Conference of State Historic Preservation Officers, required the development of a WWII historic context and the documentation of representative types of WWII temporary buildings and structures according to the Historic American Buildings Survey/Historic American Engineering Record standards. Because of this agreement and resultant documentation, Section 106 consultation is no longer required for the demolition of WWII temporary buildings on Air Force-controlled lands. Exceptions: WWII semi-permanent, permanent properties, and undertakings other than demolition are not covered under the agreement. These undertakings require Section 106 consultation. (T-0).

2.5.2. World War II and Cold War Era (1939-1974) Ammunition Storage Facilities. The 2006 Advisory Council Program Comment covered all Air Force and Navy structures built as ammunition storage facilities during 1939-1974, regardless of their current use. In accordance with the Program Comment, the Air Force mitigated all undertakings that had the potential to affect WWII and Cold War Era ammunition storage facilities, and therefore Section 106 consultation is no longer required prior to undertakings affecting these resources. Exception:

where the facility is a contributing element of a historic district listed on or eligible for the National Register that is not entirely made up of ammunition storage facilities.

2.5.3. Cold War Era Historic Properties, 1946-1991.

2.5.3.1. Facilities associated with nuclear weapons, research and development laboratories, testing and proving grounds, manufacturing, storage and maintenance, strategic or tactical air groups and operations, missile launches, and space exploration are examples of properties that should be evaluated for National Register eligibility under the military Cold War theme. Pursuant to 36 CFR § 60.4(g), facilities associated with the cold war that are less than 50 years old are not eligible to be listed on the National Register unless they are of exceptional importance. As Cold War facilities reach 50 years of age, they must be evaluated under 36 CFR § 60.4(a-d). (T-0). 2.5.3.2. Other kinds of facilities, such as motor pools, administration buildings, housing, and base operations and utilities structures generally are not types of facilities considered exceptionally important under the Cold War theme because they were built during the Cold War era as part of everyday operations and were not directly associated with Cold War strategic or tactical events, plans, or operations.

2.5.4. Cold War Era (1946-1974) Unaccompanied Personnel Housing Program Comment.

2.5.4.1. The August 2006 Unaccompanied Personnel Housing Program Comment addresses the early Cold War build-up of Air Force personnel. These personnel moved often, and "barracks" were built to house them at bases around the U.S. They were fairly uniform in design, and had few, if any, historic characteristics, nor were they associated specifically with significant Cold War events.

2.5.4.2. The Program Comment is still in effect and therefore no further Section 106 consultations is required for the demolition or altering of any remaining unaccompanied personnel housing and associated structures built between 1946 and 1974.

2.5.5. Wherry and Capehart Era (1949-1962) Family Housing and Associated Structures and Landscape Features Program Comment.

2.5.5.1. From 1949-1962, thousands of Capehart and Wherry family housing units where built to accommodate the build-up in personnel required in the early Cold War.

2.5.5.2. The November 2004 Program Comment focused on mitigating several key houses as mitigation for the rest of the thousands built in the 1950s. The Program Comment is still in effect and means that the remaining Capehart-Wherry Era houses and associated structures may be demolished or altered with no further Section 106 consultations.

2.5.6. Museum Objects. NMUSAF is responsible for objects identified, evaluated, and accessioned as museum objects. Such items may be considered as eligible for listing on the National Register only with written approval of the Director, NMUSAF, and/or the Director, Air Force History and Museums Program. Determinations of National Register eligibility for museum objects facilitates Section 106 consultations when the objects are considered contributing elements to an historic district. Movement of the objects from, to, or within an historic district may be subject to Section 106 consultations, and in such cases the Director, NMUSAF, and/or the Director, Air Force History and Museums Program must be consulting parties. **(T-0)**. Standard operating procedures regarding movement or removal of these objects

may be considered adverse effect mitigation measures for development of a MOA or a PA. (see AFI 84-103).

2.5.7. Base Realignment and Closure Program (BRAC). Installation closure, realignment, or transfer are undertakings that may affect historic properties. The installation in coordination with AFCEC, must complete all NHPA Section 106 (54 USC § 306108) consultations, or the terms and conditions of NHPA PAs or Memoranda of Agreements (MOA) must be fulfilled, prior to completion of the BRAC action. **(T-0)**. The installation must complete a thorough inventory of cultural resources on the installation. **(T-0)**. Transfer out of federal ownership is considered an adverse effect; therefore mitigation will be required for the transfer of all National Register eligible historic properties proposed to be transferred out of federal ownership as part of BRAC. **(T-0)**. Mitigation measures may include, but are not limited to, Historic American Buildings Survey/Historic American Engineering Records documentation, marketing plans, easements, and covenants.

2.6. Historic Property Inventory.

2.6.1. Installations must inventory archaeological resources and historic properties under their control through methods commensurate with V48 Federal Register (F.R.) 44716-44742, *Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines*. **(T-0)**. Installations must conduct inventories through:

2.6.1.1. Background research and literature review to understand what has already been documented about cultural resources in an area and if historic context exist for the resource type. **(T-0)**.

2.6.1.2. Consultation with other parties, including Indian tribes, who might be aware of cultural resources in an area. **(T-0)**. Such consultation may be supported by ethnographic, ethnohistoric, or oral history research by qualified anthropologists.

2.6.1.3. Field survey utilizing an appropriate research design and methods suited to the region. **(T-0)**. Installations must consult with the SHPO, AFCEC, Air National Guard or Air Force Reserve when applicable, for assistance identifying methodologies appropriate to the specific installation. **(T-0)**. Installations should coordinate with the SHPO or review the SHPO website for applicable state guidelines for use during work plan design. The Air Force is not legally obligated to follow state guidelines, but doing so facilitates consultation.

2.6.1.4. Evaluation to determine if any encountered cultural resources are historic properties eligible for listing in the National Register. **(T-0)**. See **paragraph 2.8** for discussions of evaluation and National Register eligibility.

2.6.2. Inventory of historic properties by 36 CFR § 800.4(b)(1) requires a "reasonable and good faith effort" which entails using basic but thorough archaeological survey methods to comply with the intent of the NHPA. Air Force policy regarding Section 110 focuses on a program of ongoing or periodic surveys, where long-range planning is considered so that high priority development areas are surveyed before other areas. Sampling is satisfactory methodology for identification of archaeological sites, especially on large installations and ranges. Installation Cultural Resources Manager must use sampling methods that meet professional standards and accurately predict the kinds and numbers of cultural resources and historic properties that exist on lands not surveyed as part of the sample. **(T-3)**.

2.6.3. Although expensive and highly intensive survey techniques are not necessary to comply with Section 110 inventory requirements, they are usually required for identification and evaluation during Section 106 review. Sites encountered during construction will likely cause delays and result in increased expense. Therefore, using more expensive and intensive methods upfront to identify archaeological sites will result in cost savings later. Appropriate intensive methods to identify sites before construction could be cost-effective and efficient.

2.6.4. Environmental managers at ANG installations must always consult with National Guard Bureau subject matter experts to complete inventories of historic properties. **(T-1)**.

2.7. Evaluation and National Register Eligibility.

2.7.1. Section 110(a)(2) (54 USC § 306102) requires the Air Force to nominate historic properties for listing on the National Register of Historic Places (National Register), but establishes no compliance deadline. Historic properties are cultural resources that are listed on or eligible for listing on the National Register. NHPA Section 106 and 36 CFR Part 800 do not require formal nomination and listing of historic properties to the National Register. Nomination and listing do not change the management requirements for historic properties, so the Air Force rarely prioritizes the funds and time necessary to nominate properties. **Exception:** Nominations included as a mitigating measure in a signed PA or MOA.

2.7.1.1. Nomination and listing of an historic property has no effect on the way an historic property is managed by the Air Force. All historic properties controlled by the federal government are afforded the same legal protections and treatments whether listed or eligible for listing. Once an installation determines a property is eligible for the National Register and the SHPO or Keeper of the National Register of Historic Places concurs with the determination, the installation must manage the property as if it were listed. **(T-0)**.

2.7.1.2. Formal nomination of historic properties for listing to the National Register is not a high priority for the Air Force. It is Air Force policy to give priority to nominating only those historic properties the installation will interpret, commemorate, or actively manage as sites of historic significance and which are open to the base community and/or the general public. Nominating a historic property for listing can also be mitigation for an adverse effect of an undertaking.

2.7.2. Evaluation is the process of determining whether a cultural resource is eligible for listing in the National Register. Evaluation is accomplished by study, documentation, and a subjective decision based on application of the criteria for eligibility outlined in 36 CFR § 60.4 and an assessment of the integrity of the resources. The evaluation effort should be based on the type of site and the complexity and urgency of the undertaking.

2.7.2.1. A historic property is a resource that meets one or more of the following criteria found in 36 CFR § 60.4: Criterion A, the resource is associated with important historical events; Criterion B, the resource is associated with people who were important in history; Criterion C, the resource has a distinctive design or construction, is the work of a master architect or designer, has significant artistic value, or is significant and distinguishable entity in its setting; and/or Criterion D, the resource contains, once contained, or is likely to contain important data for interpreting archaeology or history.

2.7.2.2. In addition to meeting one or more eligibility criteria, the resource must retain physical integrity related to the criterion or criteria that make it significant. In other words,

the resource should still communicate what makes it significant. It should have most of the following standards of integrity: location, design, setting, material, workmanship, feeling, or association.

2.7.2.3. Testing of archaeological sites should be limited to the extent necessary to determine National Register eligibility and approximate boundaries. Disturbance of archaeological sites should be kept to a minimum, especially during a Section 110 survey. In order to gain more detailed knowledge of a site, more disturbance than needed to determine eligibility might be required. This can be the case during the Section 106 review process if an archaeological site will be adversely affected by an undertaking. In these cases, evaluation might involve extensive testing to more precisely understand sites to prepare for mitigation by data recovery.

2.7.2.4. Historic buildings and structures are evaluated based on varying combinations of historic research and an assessment of the physical features and integrity of the structure, utilizing qualified architectural historians, historical architects, engineers, historians, and/or anthropologists. Qualified Air Force cultural resource specialists must review reports produced by these experts before final acceptance by the installation. **(T-1)**.

2.7.2.5. Installations and project proponents must utilize contractors or cooperators whose personnel meet the Secretary of Interior Standards to survey, evaluate, and recommend either National Register eligibility or non-eligibility of Air Force cultural resources. **(T-0)**.

2.7.3. Installation Cultural Resources Managers are responsible for determining a property's eligibility for listing on the National Register. After making that determination, the installation seeks concurrence from either the SHPO or, in rare circumstances of disagreement with the SHPO staff, the Keeper of the National Register. The determination of eligibility is essentially an agreement between the installation, SHPO, and others.

2.7.3.1. Installation Cultural Resources Managers must thoroughly review contractor or cooperator eligibility recommendations in reports before submitting them to the SHPO and other consulting parties. **(T-3)**. Air Force Reserve environmental managers must consult with Headquarters prior to submitting reports to SHPO or other parties. **(T-1)**.

2.7.3.2. Contractor recommendations on eligibility become official determinations when the Air Force approves and submits them to SHPOs or other parties for review and concurrence.

2.8. Reducing the Number of Unevaluated Resources. Until a cultural resource is formally determined as eligible or not eligible for listing in the National Register by the Air Force and concurred on by the SHPO or Keeper of the National Register, the resource must be managed as if it is eligible for listing in the National Register by the Air Force. **(T-0)**. Strategies for reducing the number of unevaluated resources on installations are:

2.8.1. Installation Cultural Resources Managers, with AFCEC/CZ, ANG, or AFRC, must program funds to formally evaluate a portion of these archaeology sites or facilities each year. The priority for evaluating resources should be based on the likelihood of development, renovation, soil stability, and the degree of exposure and use.

2.8.2. Installation Cultural Resources Managers, with AFCEC/CZ, ANG, or AFRC, must write statements of work or performance work statements for cultural resource identifications

to require the contractors to evaluate resources for National Register eligibility and provide eligibility recommendations. Installation Cultural Resources Managers should avoid determinations of "potentially eligible," except in rare instances where the resource cannot be appropriately evaluated without additional efforts outside of the limits of the contracted survey. **(T-3)**.

2.8.3. The installation Cultural Resource Manager will use the "Not Assessed Routinely" (NAR) RPA Historic Status Code for those real property assets with a facility code (FACCODE) on the NAR-approved FACCODE list unless a National Register eligibility has been determined. **(T-2)**. This list can be found in the OSD Real Property Information Model. While not routinely assessed, these individual assets could be evaluated pursuant to NHPA Section 106 (54 USC § 306108) and 36 CFR Part 800 if they are within the Area of Potential Effects of an undertaking. For purposes of physical inventory, assets assigned the RPA Historic Status Code value NAR are not considered historic.

2.9. National Historic Preservation Act Section 106 Review Process. All proposed Air Force undertakings that have the potential to affect on-shore or off-shore historic properties are subject to review under NHPA Section 106 (36 CFR Part 800), and, as appropriate, the Abandoned Shipwreck Act of 1988 (43 USC §§ 2101-2106), and the Sunken Military Craft Act (10 USC 113). **(T-0)**.

2.9.1. Air Force personnel must comply with Section 106 consultation requirements described in 36 CFR Part 800, prior to beginning an undertaking that has the potential to affect historic properties. **(T-0).** The Advisory Council has issued guidance documents to assist in meeting those requirements.

2.9.2. Compliance with Section 106 is a procedural process that helps protect the Air Force mission. The Agency official must complete the NHPA Section 106 review prior to awarding a contract for an undertaking, and before any permits are issued (e.g., wetlands permit). **(T-0)**. The time needed to complete Section 106 consultation depends on the complexity of the undertaking and the severity of the effect on historic properties. Therefore, it is essential that planners consider the Air Force's obligations under the NHPA and initiate Section 106 consultation early in the planning process as required by 36 CFR § 800.1(c). Early consultation ensures mission priorities are not impacted by cultural resources concerns and alternatives are developed that can support the mission. The installation Cultural Resources Manager must document the Section 106 review process at each step. **(T-0)**.

2.9.3. The four steps of the NHPA Section 106 review process are:

2.9.3.1. Step One: Initiate the process (36 CFR § 800.3):

2.9.3.1.1. Determine whether a proposed federal action is an undertaking that requires Section 106 consultation. An undertaking, as defined by 36 CFR § 800.16(y), includes all projects, activities, and programs wholly or partially funded or carried out by the Air Force, or requiring Air Force approval.

2.9.3.1.2. Determine if the undertaking has the potential to affect historic properties. Generally projects that disturb the ground, alter the landscape, change patterns of land use, alter flight patterns over land or water, or alter the exterior or interior of buildings or structures have the potential to affect historic properties. Typical examples of

undertakings that have no potential to affect historic properties include buying office supplies, teaching a course in an administrative facility, and repairing an airplane.

2.9.3.1.3. Undertakings that have no potential to affect historic properties do not require Section 106 consultation. For all other undertakings, identify who should be consulted, including the SHPO, federally-recognized tribes and their Tribal Historic Preservation Officers, representatives of local governments, applicants for Air Force permits, community groups (i.e., non-profits, historical society, veterans groups), members of the public (i.e., former installation personnel, retired military, local historians, or others who might have strong interests in buildings, structures, or sites). If the undertaking affects a National Historic Landmark, the program manager must include the National Park Service as a consulting party and must ask the Advisory Council if they want to be involved in the consultation process. **(T-0)**.

2.9.3.2. Step Two: Identify historic properties (36 CFR § 800.4):

2.9.3.2.1. Determine the Area of Potential Effect. The agency official must define the area of potential effect in a broad context, so that both direct and indirect effects are considered. **(T-0)**. Direct effects to a historic resources include, but are not limited to, ground disturbance, demolition, and renovation. Indirect effects to historic resources include, but are not limited to, those that are visual, atmospheric or audible.

2.9.3.2.2. Consult with the SHPO to establish the appropriate level of effort needed to identify historic properties. Gather information on potential historic properties from the SHPO, tribes, informed individuals, interested parties, and from historic and legal sources as a first step in identifying historic properties. **(T-0)**.

2.9.3.2.3. If necessary, contract a professional archaeologist, architect, architectural historic, or historian to inventory and evaluate historic properties within the Area of Potential Effect, and to determine if the undertaking will affect them. Evaluate any properties recorded during the inventory to determine which, if any, are eligible for listing to the National Register. **(T-0)**. Installation Cultural Resources Managers must consult with the SHPO on the determination of eligibility and request their review and concurrence. **(T-0)**.

2.9.3.2.4. If no historic properties are identified within the Area of Potential Effect, or if there are historic properties present but they will not be affected by the undertaking, that agency official shall make a “No historic properties affected” finding and provide it (along with supporting documentation described in 36 CFR § 800.11(d)) to the SHPO and other consulting parties for review. **(T-0)**. If the SHPO does not object to the finding within 30 days, then the Air Force has met its Section 106 consultation responsibilities.

2.9.3.3. If the installation finds that there are historic properties which may be affected by the undertaking, they shall notify all consulting parties, including Indian tribes or Native Hawaiian organizations, invite their views on the effects and assess adverse effects, if any, in accordance with § 800.5.

2.9.3.4. Step Three: Assess adverse effects on historic properties within the Area of Potential Effect (36 CFR § 800.5):

2.9.3.4.1. Installation Cultural Resources Managers must apply the Criteria of Adverse Effect, found at 36 CFR § 800.5(a), while consulting with the SHPO and other appropriate consulting parties. **(T-0)**.

2.9.3.4.2. Examples of adverse effects can include: demolition or damage to any part of the historic property in the Area of Potential Effect; alteration, restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, construction of handicap access, or other action not consistent with 36 CFR Part 68, *The Secretary of the Interior's Standards for the Treatment of Historic Properties*, current edition; moving the property from its historic location; changing the landscape including visual or audible disturbances; and transfer, lease, or sale of property out of Air Force ownership or control.

2.9.3.4.3. If one or more of the Criteria of Adverse Effects are met, the agency official must make an "Adverse effect" finding and notify the SHPO and other concurring parties. The agency official will notify the Advisory Council of the determination and invite the Advisory Council to consult, pursuant to CFR § 800.6(a)(1)(i)(C). **(T-0)**. The Advisory Council may, but is not required to, participate in the consultation.

2.9.3.4.4. If the Criteria of Adverse Effect are not met, the agency official will propose a finding of "No adverse effect" and provide it to the SHPO for review. If the SHPO concurs with the finding, or does not object to it within 30 days, the Section 106 review for the undertaking is complete. The installation must maintain a record of the finding and provide information to the public when requested, unless the information is confidential per 36 CFR § 800.11(c). **(T-0)**.

2.9.3.5. Step Four: Resolve adverse effects (36 CFR § 800.6):

2.9.3.5.1. Installation Cultural Resources Managers must consult with SHPO and other involved parties to develop and evaluate alternatives or modifications to the undertaking that avoid, minimize, or mitigate damage to historic properties. If there is no way to avoid affecting the property, the installation Cultural Resources Manager must consult with the parties to develop strategies to minimize adverse effects to the historic property. **(T-0)**.

2.9.3.5.2. Many approaches to mitigation are available, including data recovery (excavation, analysis, and reporting) on archaeological sites, Historic American Building Survey/Historic American Engineering Record recordation or other forms of documentation such as brochures, videos and websites, and rehabilitation of historic buildings and structures. In some cases, moving the structure might be the only possible alternative to demolition.

2.9.3.5.3. The agency official must specify mitigation measures in a MOA or a PA. **(T-0)**. A PA is commonly used for large and complex undertakings where the adverse effect on historic properties cannot be fully determined prior to approval of the undertaking. PAs set stipulations the installation agrees to meet during execution of the undertaking and, occasionally, focus on stipulations for routine activities that span two or more undertakings on a specific set of facilities.

2.9.3.5.4. A MOA or PA documents the Air Force's compliance with Section 106 and 36 CFR § 800.6 for a specific undertaking. The base or wing commander on, behalf of

the Air Force; the SHPO; and the Advisory Council (if they are participating in the consultation) must sign the MOA or the PA. Other consulting parties who have a role in meeting any of the stipulations of the agreement document must be invited to sign as "Invited Signatories." **(T-0)**. These may include the project proponent, such as a privatized housing partner. Consulting parties who do not have a specific role or responsibility, (e.g., historical societies) can sign the Agreement as "Concurring parties." An invited signatory or concurring party's refusal to sign the Agreement does not make the Agreement invalid.

2.9.3.5.5. The agency official must send a copy of the signed MOA or PA to all signatories to the agreement. **(T-0)**. Whether the Advisory Council participated in the consultation or not, the agency official must send the signed agreement to the Advisory Council pursuant to 36 CFR § 800.11(f). **(T-0)**.

2.9.3.5.6. Once the MOA or PA is signed, the Air Force or project proponent must carry out the stipulations of the pursuant to the Agreement in the time period set forth in the Agreement. **(T-0)**. NEPA compliance can be finalized once the Agreement is signed and the undertaking can occur.

2.9.4. Failure to resolve an adverse effect (36 CFR § 800.7). The 36 CFR Part 800 regulations anticipate that adverse effects will be resolved through an MOA or PA. Nevertheless, in the unusual situation where the Air Force, SHPO, and Advisory Council are unable to agree, the regulation allows any of these three parties to terminate consultation. Within the Air Force, the decision to terminate is made by the SAF/IEE or the Federal Preservation Officer designated by SAF/IEE. The Advisory Council has 45 days to seek the views of all consulting parties (including the public) and submits its recommendations ("Comments") to the Air Force. SAF must consider these comments in reaching a final decision on the undertaking, prepare a summary of the decision including the rationale behind it, provide copies to all consulting parties, notify the public, and make the record available for public inspection. **(T-0)**.

2.9.5. Routine PA (36 CFR § 800.14(b)(i)). A PA can be used to address undertakings where effects on historic properties are similar or repetitive (for example, recurring maintenance in a historic district). Because these PAs include measures that the SHPO has agreed will avoid adverse or resolve effects, consultation requirements are minimized or not required, as described in the PA, before taking an action that is within the scope of a PA. Installations will enter into PAs for routine undertakings when the SHPO agrees, and it benefits the installations. **(T-3)**.

2.9.6. Emergency Situations (36 CFR § 800.12)

2.9.6.1. Emergency situations are those involving a disaster or emergency declared by the President or the governor of a state, or an imminent threat to life or property. Emergency responses must take place within 30 days of the declaration of emergency. **(T-0)**. A failure to consult early in the planning process which delays project execution is not an emergency.

2.9.6.2. While the Air Force has not developed special consultation procedures for use in emergency situations, installations will, in consultation with their SHPO, develop a PA to address emergencies and include the PA in the installation ICRMP standard operating procedures as consulting procedures for emergency situations. **(T-3)**. When there is an emergency response at an installation that has no emergency procedures PA, the

installation should notify the Advisory Council, SHPO, and Indian tribes that attach religious and cultural significance to properties that could be affected by the undertaking. The installation shall allow 7 days for comments if possible; otherwise, invite comments during the time available. **(T-0)**.

Section 2C—IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT

2.10. Overview of the National Environment Policy Act.

2.10.1. NEPA as implemented by the Council on Environmental Quality at 40 CFR Parts 1500-1508, *CEQ Regulations for Implementing the Procedural Provisions of NEPA*, and by the Air Force at 32 CFR Part 989, *Environmental Impact Analysis Process*, defines NEPA compliance specifically for the Air Force. NEPA states that it is federal government policy to preserve important historic, cultural, and natural aspects of our national heritage. It requires the Air Force to consider environmental concerns during project planning and execution. The Act ensures that the Air Force makes fully informed decisions by considering all relevant environmental consequences and public comments and concerns prior to committing resources to carry out a proposed action or undertaking.

2.10.2. Cooperate with the AFCEC National Environmental Policy Act Division (AFCEC/CZN) when conducting Section 106 consultations for Environmental Impact Analysis Processes. Usually all Environmental Impact Analysis Processes are run through the AFCEC/CZN.

2.10.3. Level of Analysis.

2.10.3.1. 40 CFR Parts 1500-1508 and 32 CFR Part 989 require the Air Force to analyze the effects of major federal actions that have the potential to significantly affect the quality of the human environment, including cultural and natural resources. The Air Force must inform the public of the proposed action and provide for the public's participation in the decision-making process. **(T-0)** Both NEPA and the National Historic Preservation Act (NHPA) encourage initiation of consultation early in the planning process. The Air Force must use the following framework when considering what level of analysis -- Categorical Exclusion (CATEX), Environmental Assessment (EA), or an Environmental Impact Statement (EIS) -- is required. **(T-1)**.

2.10.3.2. Categorical Exclusion.

2.10.3.2.1. CATEXs define categories of actions that do not individually or cumulatively have the potential for a significant effect on the environment, and therefore do not require further environmental analysis (32 CFR § 989.13). The Air Force's CATEX list is found at 32 CFR Part 989, Appendix B. Many, but not all CATEXs, require that the rationale for applying the CATEX be documented on an Air Force Form 813, *Request for Environmental Impact Analysis.*

2.10.3.2.2. Proposed actions that are similar to prior actions analyzed and found to have an insignificant impact may qualify for CATEX (32 CFR § 989, Appendix B, A2.3.11). An installation legal advisor should help determine whether the NEPA documentation for the prior action applies to the proposed action. The installation must document application of this CATEX on an Air Force Form 813. **(T-3)**.

2.10.3.2.3. Most proposed actions potentially affecting cultural resources cannot be categorically excluded from NHPA Section 106 review. This is because even if the action itself is on the CATEX list, it still might be an undertaking with the potential to affect historic properties. The ability to categorically exclude a proposed action from NEPA analysis does not exempt the proponent from complying with other applicable federal laws, including NHPA. If the proposed action is a type of activity that has the potential to cause effects to a historic property (in particular, construction, renovation, demolition, or excavation), the installation Cultural Resources Managers must proceed with Section 106 consultation (see 36 CFR §§ 800.3(a) and 800.8(a)(3)). **(T-0)**.

2.10.3.2.4. Activities potentially affecting cultural or natural resources may be categorically excluded only if impacts on these resources are analyzed and fully resolved before the Air Force Form 813 is signed. This is done by completing Section 106 consultation with the SHPO, or Endangered Species Act (ESA) Section 7 consultation with the Fish and Wildlife Service and/or National Marine Fisheries Service, as applicable. Completion of consultation should be documented on the Air Force Form 813.

2.10.3.3. Environmental Assessment (EA).

2.10.3.3.1. An EA is used to analyze impacts of a proposed action when the action does not qualify for a CATEX, but impacts are either expected to be insignificant or are unknown (32 CFR § 989.14). The installation must circulated a draft EA for public comment, but public hearings are not required. **(T-0)**. All EAs must conclude either with a Finding of No Significant Impact (FONSI) or a recommendation to prepare an EIS. If the decision-maker determines that impacts will not be significant, or that significant impacts can be mitigated to insignificance, the proponent documents and publishes the conclusion in a FONSI.

2.10.3.3.2. Types of actions affecting cultural resources that could require an EA include, but are not limited to, renovation, rehabilitation, or demolition of buildings or structures listed on, or eligible for listing on the National Register of Historic Places; or ground disturbing activities where National Register eligible or listed archaeological sites are known or suspected to exist, or where archaeological surveys have not been completed.

2.10.3.4. Environmental Impact Statement (EIS).

2.10.3.4.1. When a proposed action is controversial or is expected to have significant impacts, an installation may choose to prepare an EIS (32 CFR § 989.16). An EIS provides the maximum opportunity for public participation through public hearings, and concludes in a Record of Decision (ROD).

2.10.3.4.2. Types of activities affecting cultural resources that typically require an EIS include (but are not limited to):

2.10.3.4.2.1. Demolishing any part of a National Historic Landmark.

2.10.3.4.2.2. Large-scale, ground-disturbing activities where relatively large numbers of historic buildings or structures, or eligible or listed archaeological sites, sacred sites or traditional cultural properties are known or likely to be present.

2.10.3.4.2.3. Demolishing any part of a built historic district that will likely engender opposition by local and regional, or national historic preservation or historical advocacy groups, significantly alter the associated historic landscape, or be associated with hazardous material abatement, removal, or remediation.

2.10.4. Coordinating the NEPA and NHPA processes.

2.10.4.1. NEPA and laws protecting cultural resources (e.g., NHPA, Native American Graves Protection and Repatriation Act, Archaeological Resources Protection Act, American Indian Religious Freedom Act) are separate statutes, each with their own set of requirements. Since the NEPA environmental impact analysis process provides a means of complying with these other requirements but compliance with NEPA does not necessarily satisfy these other requirements, the installation must meet the individual requirement of all applicable environmental laws and document that compliance. **(T-0)**.

2.10.4.2. Installation Cultural Resources Managers must initiate NHPA Section 106 consultation early in the planning process, when the purpose of, and need for, the proposed action are being defined, and a wide range of alternatives are being considered. **(T-1)**.

2.10.4.3. Installations typically conduct consultation concurrently with, but independently of, the larger NEPA analysis. Alternatively, 36 CFR § 800.8(c) allows proponents to substitute NEPA analysis for a separate NHPA Section 106 review (54 USC § 306108), but requires the installation to notify the State or Tribal Historic Preservation Officer and Advisory Council in writing before consultation is initiated on the proposed action. The NEPA analysis must identify the consulting parties and historic properties, and assess effects of the undertaking on those properties in a manner consistent with 36 CFR §§ 800.4 and 800.5.

2.10.4.4. EAs and EISs for actions producing adverse effects to historic properties require that a MOA (36 CFR § 800.6(c)) or PA (36 CFR § 800.14(b)) with the SHPO be signed into effect before a FONSI or ROD may be signed. The Air Force Federal Preservation Officer or Deputy Federal Preservation Officer may waive this policy in extraordinary circumstances. However, except in emergency circumstances (see **paragraph 2.10.6**), the installation shall not start an undertaking until a MOA or PA has been signed. **(T-0)**.

2.10.5. Using the NEPA review process to identify Section 106 consulting parties.

2.10.5.1. Consult with individuals and organizations likely to have knowledge of, or concerns with, historic properties in the area, or who can identify issues needing to be addressed in the NEPA analysis per 36 CFR §§ 800.3(f) and 800.4(a). The NEPA scoping process will aid in identifying interested parties, and might include local governments; local history, archaeology, or preservation groups and associations; retired military members who worked or lived on the installation; garden or botanical clubs (historic landscapes); and other members of the public who have identified themselves as interested in the installation's cultural resources.

2.10.5.2. Invite affiliated federally recognized Indian tribes to be consulting parties. Include Indian tribes with aboriginal, past, or current religious or cultural affiliations to the installation whose interests might be affected by the proposed action. Exercise care and reasonableness in identifying culturally affiliated Indian tribes. Those Indian tribes who accept the installation's invitation in writing are considered consulting parties.

2.10.5.3. Consult with federally recognized Indian Tribes and Native Hawaiian organizations to identify properties of religious and cultural significance. Only these entities have the ability to identify such properties, which may include archaeological sites, geologic formations, and sacred locations. Communications with tribes should reflect their status as domestic dependent nations and comply with DoDI 4710.02, Section 3.

Section 2D—IMPLEMENTATON OF THE ARCHAEOLOGICAL RESOUCES PROTECTION ACT (ARPA)

2.11. Archaeological Resources Protection Act of 1979 (ARPA), as amended (16 USC § 470aa-470mm); as implemented by 32 CFR Part 229; 43 CFR Parts 3 and 7. ARPA authorizes federal land managers to issue permits for the excavation or removal of artifacts from lands under their jurisdiction. The Act requires that relevant American Indian tribes be notified prior to permit issuance to determine if significant religious or cultural sites will be affected. It prohibits the sale or trafficking of artifacts removed from federal lands across interstate or international boundaries; and levies both civil and criminal penalties for illegal excavations, damages, or the defacement of archaeological sites, and for the sale or trafficking of cultural materials illegally removed from federal lands.

2.11.1. ARPA overlaps and partly supersedes the Antiquities Act. It provides legal penalties for actual or attempted unauthorized excavation, removal, damage, alteration, or defacement of archaeological resources that are 100 years or older on federal land. The threshold of concern is age of the site, not National Register eligibility. Both National Register eligible and non-eligible archaeological sites are covered by ARPA.

2.11.2. ARPA defines an archaeological resource as any material remains of past human life or activities that are of archaeological interest. Such remains include whole or fragments of pottery, basketry, bottles, weapons, projectiles, tools, structures or portions of structures, pit houses, rock paintings or carvings, intaglios, graves, human skeletal remains, fire features such as charcoal lenses, roasting pits, and burned rock, and animal or plant remains associated with evidence of past human life.

2.11.3. Paleontological specimens, deposits, and remains are not considered archaeological resources under ARPA, unless found in an archaeological context. However, important paleontological specimens and deposits are considered significant scientific data under the Archaeological and Historic Preservation Act of 1974 (AHPA Section 3) and the National Environmental Policy Act (NEPA). Significant paleontological resources are generally vertebrate fossils of any age, or especially rich, diverse, detailed, or otherwise important deposits of invertebrate or plant fossils. Identify significant paleontological deposits and localities in installation Integrated Cultural Resources Management Plans (ICRMPs) to ensure their protection and consideration during planning.

2.11.4. ARPA establishes a permitting system to authorize excavation or removal of archaeological resources by qualified applicants. Any archaeological resources excavated remain property of the U.S.

2.11.4.1. Installations issue ARPA permits after the installation commander notifies and seeks comments on the proposed archaeological project from affiliated Indian tribes, per 43 CFR § 10.5 and 32 CFR §§ 229.5-229.11. Base Civil Engineers [or Environmental

Directors in Air Force Materiel Command (AFMC)], or the Headquarters Air National Guard or AFRC Cultural Resources Managers, shall sign and issue ARPA permits to qualified applicants and provide a copy of the signed permit to AFCEC. **(T-0)**.

2.11.4.2. Air Force staff and contractors carrying out official duties, who meet professional qualifications and whose investigations meet the requirements of 32 CFR § 229.8, are not required to obtain ARPA permits to conduct archaeological work on Air Force installations.

2.11.5. To implement ARPA objectives, the installation Cultural Resources Manager shall:

2.11.5.1. Monitor permitted activities to ensure that the terms and conditions of issued permits are being met. If not, the installation must revoke the permit. **(T-0)**.

2.11.5.2. Ensure that Security Forces, installation legal staff, the installation Public Affairs Office, and fish, game, and recreation staff are all familiar with the requirements and the civil and criminal penalties under ARPA. **(T-3)**.

2.11.5.3. Establish a program to increase public awareness of installation archaeological resources and ARPA. **(T-3)**. Examples of such programs include posters, brochures, presentations at schools, and participation in annual Archaeology Week or Earth Day activities. Funding and Air Force mission priorities require installation public awareness programs to be relatively inexpensive and non-burdensome to Cultural Resources Managers and other installation staff.

2.11.6. Discourage Arrowhead Collecting. Air Force personnel shall not move or collect arrowheads or other surface artifacts. **(T-3)**. Collecting of stone arrowheads from the ground surface is not prohibited by ARPA or 32 CFR Part 229, nor can penalties under ARPA be assessed for this activity. However, surface collection of artifacts disturbs archaeological sites, and Congress encouraged agencies to use land access permits and governing procedures to control such activities. Collecting arrowheads or other surface artifacts is unethical behavior for Air Force personnel, employees, and contractors**.**

2.11.7. Areas of concern under ARPA include:

2.11.7.1. ARPA permit applicants must provide at minimum, sufficient detail in their permit applications to ascertain the applicant's qualifications, proposed scope, timetables, and other requirements outlined in 43 CFR § 7.8. **(T-0)**.

2.11.7.2. Issuing an ARPA permit may trigger separate compliance responsibilities for the installation under NHPA, NEPA, and the Native American Graves Protection and Repatriation Act.

2.11.7.3. Installation personnel with law enforcement authority and cultural resource management responsibilities should receive ARPA training so they are aware of the specialized requirements of ARPA investigations and are alert to suspicious activity on Air Force-controlled land.

2.12. Archaeological Resources Protection Act (ARPA) Permits.

2.12.1. AFCEC/CZ, AFRC, or the Headquarters ANG Cultural Resources Manager must perform a technical review prior to the Base Civil Engineer or ANG Cultural Resource Manager (ANG CRM) issuing an ARPA permit for a qualified individual to perform an

archaeological investigation. **(T-3)**. An individual qualified to receive an Air Force ARPA permit meets or exceeds standards defined in 48 Federal Register 44716-44742, *Professional Qualifications Standards, Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines*, or in 36 CFR Part 61, *Secretary of the Interior Standards and Guidelines*.

2.12.2. The ARPA permit process is as follows:

2.12.2.1. The installation CRM will forward the permit application, consisting of the following: completed application form, responses from notified Indian tribes, and a letter identifying the installation or ANG OPR who will oversee, manage, and ensure review of the products of the permitted activity. The package must be sent to AFCEC/CZ, AFRC, or the ANG CRM for proposed projects on ANG installations. **(T-1)**. The package must contain an agreement for curation of archaeological collections with a 36 CFR Part 79 compliant curation facility. **(T-0)**.

2.12.2.2. The AFCEC/CZ archaeologist, AFRC, or ANG CRM must review the application, make a recommendation, and return the completed permit form to the installation. **(T-1)**.

2.12.2.3. The CRM must send the permit application to the Base Civil Engineer (or environmental manager) for signature. The Headquarters ANG CRM must sign ARPA permits for projects on ANG installations. **(T-0)**.

2.12.2.4. The CRM or ANG CRM, must send one copy of the signed permit to the proponent and another to the AFCEC archaeologist. **(T-0)**. The CRM or ANG CRM office must maintain a copy of the signed permit. **(T-0)**.

2.12.2.5. The CRM or ANG CRM must monitor the permitted project to ensure compliance with terms of the permit, and that the project is completed within the allotted time. **(T-0)**.

2.12.2.6. The CRM or ANG CRM must ensure that artifact collections and project records are processed and curated according to the terms of the permit. **(T-0)**.

Section 2E—IMPLEMENTATION OF TH ENATIVE AMERICAN GRAVES PROTECTION AND REPATRATION ACT

2.13. 25 USC §§ 3001-3013, the National American Graves Protection and Repatriation Act of 1990, as implemented by 43 CFR Part 10, and Department of Defense Instruction (DoDI) 4710.02. In accordance with NAGPRA, the Air Force was required to inventory collections to identify American Indian, Native Alaskan or Native Hawaiian human remains and associated funerary objects, collected prior to 1995. The intent of NAGPRA is to ensure the protection and rightful disposition of American Indian cultural items located on federal or Indian lands, and in the federal government’s possession or control. NAGPRA required information about the provenience and origin of funerary objects not associated with burials (called unassociated funerary objects), sacred objects and objects of cultural patrimony within these same collections to be summarized. NAGPRA, Section 2 and 43 CFR Part 10, provide detailed definitions of cultural items regulated under NAGPRA. The Air Force completed inventories for NAGPRA remains and objects and summarized existing collections by 1990. If requested, installations must returned NAGPRA items to the affiliated groups. **(T-0)**.

2.13.1. Future discovery of American Indian, Native Alaskan or Native Hawaiian human remains during an Air Force undertaking must trigger an immediate cessation of activity near the find for up to 30 days from the date the affiliated tribes or Native Hawaiian organizations are notified. **(T-0)** Air Force representatives must consult with these groups and produce a plan of action for treatment and disposition of the remains. **(T-0)**. Excavations into sites that might contain, or are likely to contain, American Indian human remains, funerary or sacred objects, or objects of cultural patrimony require notification and consultation with appropriate American Indian groups. To the maximum extent possible, the Air Force shall enter into Comprehensive Agreements with Indian Tribes or Native Hawaiian organizations to address all activities on Air Force-controlled land that could result in intentional or unintentional excavation of human remains or other NAGPRA-related objects. **(T-1)**.

2.13.2. Installations shall provide documentation of completed NAGPRA Summary and Inventory requirements to the Air Force Federal Preservation Officer and Tribal Liaison Officer through AFCEC and AF/A4C, if requested. **(T-1)**.

2.13.3. Installations shall not accept NAGPRA Cultural Items or Remains from non-Air Force lands for reburial on installation lands or storage in installation facilities. **(T-0)**.

2.13.4. NAGPRA requires Air Force commands, installations, and activities in North American and Hawaii to:

2.13.4.1. Determine if an installation has possession or control of archaeological or ethnographic collections made prior to passage of NAGPRA on 16 November 1990. The Air Force may not possess or permanently control NAGPRA remains or objects collected after 16 November 1990. Pre-November 1990 collections might reside in installation displays, exhibits, museums, historical holding facilities, facilities at satellite installations, off-installation museums and curation facilities, contractor offices, or in universities. NAGPRA specifies the disposition of cultural items that are property (i.e. made prior to November 1990) of the U.S. (hence the Air Force), regardless of where such cultural items are currently stored. NAGPRA remains or objects with unknown collection dates from Air Force lands must be treated as pre-November 1990 collections.

2.13.4.2. Sections 5 and 6 of NAGPRA require the Air Force to identify what Native American remains and/or cultural items are within its possession or located at its facilities. Although the November 1995 deadline for completing inventories has passed, installations should inventory and produce written summaries as soon as the installation becomes aware that NAGPRA cultural items have been identified in Air Force collections made prior to 16 November 1990. "Inadvertent discovery" and “Intentional Excavation” of Native American human remains and cultural items discovered on Air Force controlled lands after 16 November 1990 are covered under NAGPRA Section 3(d) and 43 CFR §§ 10.3 and 10.5.

2.13.4.3. NAGPRA Section 3(c) and 43 CFR § 10.3 describe procedures for the intentional archaeological excavation of NAGPRA cultural items and human remains. In such instances, the installation commander must first determine if a planned activity might result in the excavation of cultural items. Prior to issuing approval or permits for such activities, the installation commander must give written notification to the Indian tribes that are likely culturally affiliated with the cultural items that might be excavated. The installation

commander must also provide written notice to any present-day Indian tribes that are likely to have a cultural relationship to the items. **(T-0)**.

2.13.4.3.1. The written notice must describe the planned activity, its location, the rationale behind the determination that cultural items might be excavated, and the basis for determining custody per 43 CFR § 10.6. **(T-0)**.

2.13.4.3.2. The written notice must also propose a time and place for meetings or consultations to further consider the activity, the installation's proposed treatment of the cultural items, and the proposed disposition of the excavated items. Written notice should be followed by telephone contact if the tribal representative does not respond within 15 days. Must consult in accordance with 43 CFR § 10.5. **(T-0)**.

2.13.4.4. Section 3(d) of NAGPRA and 43 CFR § 10.4 describe requirements and procedures for the inadvertent discovery of NAGPRA cultural items. These regulatory procedures are complex, and the installation commander should consider developing a Comprehensive Agreement, or a Contingency Plan of Action, with affected tribes to streamline the process.

2.13.4.4.1. Inadvertent discovery of buried human remains does not in itself trigger NAGPRA. Ensure that the items are truly NAGPRA cultural items or remains before invoking NAGPRA notification and consultation procedures. This might entail notifying the local police authorities, hiring an archaeologist to determine the nature, stratigraphic and contextual relations, and surface of origin of the objects, conducting radiocarbon or biometric analyses of the remains or associated materials, and researching local histories, titles, or other records to determine whether the remains or objects are covered by NAGPRA.

2.13.4.4.2. Inadvertent discovery of verified NAGPRA items on Air Force lands triggers a number of actions, which should already be explicitly defined in standard operating procedures in each installation's Integrated Cultural Resources Management Plan (ICRMP). In general, these actions include notifying the installation CRM and commander, certifying that the commander was notified, notifying affiliated Indian tribes, consulting with appropriate Indian tribes on a Plan of Action, executing the Plan of Action, and dealing with the objects according to 43 CFR § 10.6.

2.13.4.5. Areas of concern in complying with NAGPRA:

2.13.4.5.1. Installations should not assume that because their inventories and/or summaries are complete that their NAGPRA responsibilities have been met. The installation commander and/or the Installation Tribal Liaison Officer, must be involved in consultations required for inadvertent discoveries, intentional excavations, transfers of custody, and other mandates of NAGPRA. **(T-1)**.

2.13.4.5.2. NAGPRA responsibilities apply to all lands under the "control" of Air Force installations, including fee-title lands, and lands that are withdrawn, leased, used under permit or agreement, or otherwise under the control of the installation.

2.13.4.5.3. Planned activities that have a high probability for uncovering NAGPRA cultural items are likely to be controversial. On-going consultation programs between installations and affiliated tribes will minimize potentially contentious reactions and

facilitate positive negotiations. Comprehensive Agreements, which act as contingency Plans of Action, should be developed to facilitate NAGPRA compliance and ease of operations.

2.13.4.5.4. Comprehensive Agreements between installations and affiliated federally recognized tribes are recommended to allow early resumption of activities after inadvertent discovery of NAGPRA cultural items. Comprehensive Agreements outline plans for dealing with NAGPRA items that might be discovered during future construction activities.

2.13.4.6. Per 43 CFR Part 10, the National Park Service is designated to provide oversight and support of NAGPRA compliance. Three National Park Service sources accomplish this oversight and support: the National Park Service Consulting Archaeologist, the NAGPRA Review Committee, and the National NAGPRA Office.

2.13.4.6.1. The installation Cultural Resources Manager shall submit NAGPRA summary reports, notifications, identification processes, and proposed repatriation activities to the appropriate National Park Service office to comply with NAGPRA **(T-0)**.

2.13.4.6.2. The NAGPRA Review Committee advises Congress on matters related to NAGPRA, including monitoring agency compliance, providing recommendations to facilitate dispute resolutions, and compiling records of culturally unidentifiable remains in the possession or control of Federal agencies. When asked, the Committee also recommends specific disposition of culturally unidentified Native American remains. Review Committee recommendations or comments on Air Force actions are advisory only.

2.13.4.6.3. The National NAGPRA Office assists agencies in all aspects of NAGPRA compliance and is charged with developing and revising promulgating regulations under 43 CFR Part 10.

2.13.4.7. Federally recognized Indian tribes and official representatives of tribal governments receive federal funds to conduct tribal business. They should not be provided additional "consulting" fees by installations for NAGPRA consultations. Nevertheless, qualified tribal archaeologists, traditional religious practitioners and other traditional cultural authorities can be paid for services they provide in support of Air Force activities. The installation Commander may also use appropriate local funds to pay travel expenses of tribal representatives to NAGPRA consultation meetings, when doing so is advantageous to the government (also for consultations under NHPA, ARPA, National Environmental Policy Act, and EO 13007).

Section 2F—MISCELLANEOUS REQUIREMENTS

2.14. Other Applicable Cultural Resources Management Federal Statutes, Regulations, Executive Orders, and Memoranda.

2.14.1. 18 USC § 1866(b) provides for the protection of historic and prehistoric ruins and objects of antiquity and authorizes scientific investigation of antiquities on federal lands, subject to permits and other regulatory requirements.

2.14.2. 54 USC §§ 320101-320 states that it is federal policy to preserve historic and prehistoric properties of national significance.

2.14.3. 44 USC §§ 2101-2118, 2301-2308, 2501-2506, 2901-2909, 3101-3106, and 3301-3324 (known as the Federal Records Act of 1950); as implemented by 36 CFR Parts 1222-1238. Directs federal agencies to properly manage and appropriately preserve books, papers, maps, photographs, documents, and machine-readable materials and other documents that provide evidence of the government's organization, functions, policies, decisions, operations, and activities, as well as, basic historical information. This Act is overseen and implemented by the National Archives and Records Administration.

2.14.4. 42 USC § 1996 and 1996a (known as the American Indian Religious Freedom Act (AIRFA) of 1978) and EO 13007. AIRFA establishes U.S. policy to protect and preserve the inherent rights of freedom to believe, express, and exercise traditional religions for American Indians, Eskimos, Aleuts, and Native Hawaiians. These rights include, but are not limited to, access to sites, use and possession of sacred objects, and freedom to worship through ceremony and traditional rites. Installation commanders will consider American Indian tribal requests for access to religious sites on Air Force controlled property; and are encouraged (but not required) to grant access if mission objectives and schedules permit. **(T-3)**.

2.14.4.1. AIRFA applies First Amendment guarantees of religious freedom to American Indians. The Act has no implementing regulations.

2.14.4.2. The Air Force will comply with the spirit, meaning, and intent of AIRFA by consulting with appropriate Indian tribes on locations, preservation and management of, and possible access to, sacred sites on Air Force-controlled lands. **(T-0)**.

2.14.4.3. Consultation should seek to identify sites necessary for traditional religious practices and the time or season when Indian tribes desire access to these sites. Installation commanders should maintain open dialogue with tribal representatives regarding the terms and restrictions on access, keeping in mind the need to ensure safety and national security, and to avoid impacting the Air Force mission. The installation commander will assist in providing privacy for religious rites and ceremonies. **(T-0)**.

2.14.4.4. Consultation with traditional religious leaders is important to comply with the intent and meaning of AIRFA. However, some traditional religious leaders might not wish to be identified. In such cases, installations will request that tribal governmental leaders speak for or communicate the wishes of traditional religious leaders during consultation. **(T-3)**.

2.14.4.5. Installations should develop procedures to meet the sacred sites access and protection requirements of EO 13007 and AIRFA. Such procedures should dovetail with NHPA consultation requirements where Air Force undertakings might adversely affect the integrity of identified sacred sites.

2.14.4.6. Compliance with EO 13007 is tied to consultation. A relationship of trust and respect established through open communication will contribute significantly to meeting the goals of EO 13007, as well as those of other consultative authorities.

2.14.4.7. The installation Commander will appoint an Installation Tribal Liaison Officer to maintain consistency in communicating with tribal representatives regarding AIRFA,

Native American Graves Protection and Repatriation Act (NAGPRA), NHPA, ARPA, and other authorities involved with consultation or notification. **(T-0)**.

2.14.5. Refer to DoDI 4710.02 for information on DoD tribal relations:

2.14.5.1. Trust Responsibilities: Installation commanders will review their relations with federally recognized Indian tribes annually. **(T-0)** This review ensures:

2.14.5.1.1. Federal responsibilities to tribes are met.

2.14.5.1.2. Tribal concerns are addressed regarding those cultural and natural resources associated with tribal traditions, tribal rights, and activities on Air Force lands.

2.14.5.2. Government-to-Government Relations: The policy outlines several methods to ensure Department of Defense (DoD) agencies build stable and enduring relations with tribes and installation leaders that promote effective government-to-government relations based upon recognized tribal sovereignty.

2.14.5.3. Consultation: After establishing government-to-government communications, Air Force installations should fully integrate the principle and practice of meaningful consultation and communication with tribes in all future interactions. This means that staff officers at the installation level continue open, meaningful, and good faith relations with tribal staff officials to ensure coordination on installation decisions that affect affiliated tribes.

2.14.5.4. Cultural and Natural Resource Protection: Most tribal members make no distinction between cultural and natural resources. Important natural resources are cultural resources, essential for tribal welfare and well-being. The DoD policy recognizes and respects the significance tribes ascribe to certain natural resources and properties of traditional or customary religious or cultural importance. The policy outlines several ways DoD agencies will protect these resources, including:

2.14.5.4.1. Conserve tribal resources protected by treaties through attentive management.

2.14.5.4.2. Protect and manage tribal trust resources whenever DoD carries out programs that might affect those resources.

2.14.5.4.3. Allow access to sacred and resource gathering sites on Air Force lands consistent with military training, security, safety, and readiness requirements.

2.14.5.4.4. Develop specific protocols with each appropriate tribe to protect information on tribal resources located on Air Force lands.

2.14.6. Installation commanders should:

2.14.6.1. Afford tribal leaders the same respect as shown to a head of state.

2.14.6.2. Coordinate compliance activities through the head of a tribal government.

2.14.6.3. Consult with the appropriate head of a federally recognized tribal government before taking actions that could impact culturally significant resources of the tribe.

2.14.6.4. Represent the U.S. in the government-to-government relationship between the installation and the head of a federally recognized tribal government.

2.14.7. Curation of Federally-Owned and Administered Archaeological Collections (36 CFR Part 79). Installation Cultural Resources Managers shall follow 36 CFR Part 79 guidelines to properly curate and store artifacts and samples collected during archaeological studies and associated records undertaken on federal lands or sponsored by federal agencies. **(T-0)**. Associated records include letters, permits, contracts, documentation, field notes, photographs, maps, laboratory notes, artifact catalogs, inventories, and accession records, and reports associated with archaeological investigations.

2.14.7.1. Following 36 CFR Part 79 guidance, installations shall properly maintain collections to ensure long-term preservation. **(T-0)**. Archaeological collections always remain Air Force property and must be maintained in perpetuity. Installations must acquire curatorial and storage services from federal, state, or private curation facilities that meet the requirements of 36 CFR Part 79. **(T-0**). For lists and descriptions of suggested curation facilities in each state, consult *Department of Defense and U.S. Army Corps of Engineers Curation Options Project, Western and Mid-Atlantic States (1999),* and *Department of Defense and U.S. Army Corps of Engineers Curation Options Project, Eastern States, 2000*. A sample memorandum of understanding (MOU) for curatorial services is contained in 36 CFR Part 79.

2.14.7.2. Installations must stipulate archaeological curation requirements, and consider associated costs in scopes of work for archaeological projects or in ARPA permits.

2.14.7.3. Installations shall regularly inspect collections in repositories, and regularly inspect curation facilities for compliance with 36 CFR Part 79. **(T-0)**. Inspections shall be conducted at least once every 5 years. **(T-0)**. Inspection intervals shall be specified in curation agreement documents between the Air Force and agencies providing curation facilities. **(T-1)**.

2.14.8. EO 13006, *Locating Federal Facilities on Historic Properties in our Nation's Central Cities,* directs the Air Force to give preferential consideration to utilizing historic buildings in historic districts. If such buildings are not suitable, compatible new construction within historic districts is the next choice, followed by use of historic buildings not in historic districts.

2.14.9. EO 13175, *Consultation and Coordination with Indian Tribal Governments*, directs agencies to establish meaningful and regular consultations and collaborations with Indian tribes in the development of environmental policies that might have substantial direct effects on tribes.

2.14.10. EO 13287, *Preserve America,* directs agencies to take a leadership role in the protection and preservation of historic properties through partnerships and heritage tourism.

2.14.10.1. The Air Force shall seek partnerships with state and local governments, American Indian tribes, and others to promote local economic development and public benefit through the use, reuse, and rehabilitation of historic properties. **(T-0)**. Such partnerships will contribute to the long-term preservation and productive use of those historic properties.

2.14.10.2. Air Force personnel shall support heritage tourism that promotes the use and preservation of its historic properties. **(T-0)**.

2.15. Consulting with Native Americans. Consultation with federally recognized American Indian Tribes must be ongoing and integrated fully into the installation's base planning processes. Consult government-to-government, which is, installation or wing commanders meeting with tribal governmental leaders (not traditional leaders unless they are invited by tribal governmental leaders). Goals of initial and regularly scheduled government-to-government consultations include identifying Air Force and tribal staff members and establishing protocols for conducting and monitoring the progress of staff-level consultations.

2.15.1. Sections 106 and 110 of the NHPA, and 36 CFR Part 800 require consultation with federally recognized American Indian tribes and Alaska Natives. NAGPRA requires consultations with these groups plus Native Hawaiian organizations. **(T-0)**

2.15.1.1. The extent of consultation is project-specific; there is no formal step-by-step process other than the procedures outlined in the Section 106 regulations and NAGPRA. Staff-level consultations allow installation CRMs to share and obtain information regarding identification, care and treatment of affected sites with culturally affiliated tribes.

2.15.1.2. Tribes are diverse political and geographic entities with their own protocols. After government-to-government consultations have established acceptable protocols, identified the staff personnel to be involved, and other important consulting issues; planning, projects, and other relevant topics may be discussed at one or several levels (e.g., between Air Force environmental or operational staff and tribal staff, tribal government and religious leaders, lineal descendants, or other tribal members).

2.15.1.3. To determine whether a proposed tribe is federally recognized and which tribes to consult, refer to the most current list published by the Bureau of Indian Affairs in the Federal Register, which is updated at least annually.

2.15.1.3.1. There is no requirement to consult with non-federally recognized tribes (unless an individual from a non-federally recognized tribe requests recognition as a member of the public and seeks consulting party status). In some instances, a federally recognized tribe may represent the interests of the non-federal tribe in addition to their own.

2.15.1.3.2. Contact local federally recognized tribes in the area to begin consultation. However, do not assume that tribes in physical proximity to the installation are the only tribes that may have an interest in the Air Force's undertaking. Many tribes have moved from their ancestral tribal lands, often to other regions of the country. They may retain cultural affiliation with their previous tribal lands (for example, the Five Civilized Tribes of Oklahoma [Chickasaw, Cherokee, Seminole, Choctaw, and Creek] were relocated to Oklahoma between 1831 and 1838 from states in the southeastern U.S.).

2.15.1.4. Make a good faith effort to identify affected federally recognized tribes by conducting background research. Obtain professional assistance from contractors, universities or other service centers to have qualified anthropologists prepare ethnographic, ethnohistoric, or oral history research on which tribes should be consulted. Writing a letter to the tribe informing them of the installation's proposed undertaking and requesting their comment does not by itself constitute meaningful and good faith effort. It is highly likely

that a tribe will not respond in writing. Use other means to contact the tribe, including traveling to the tribe. At a minimum, follow up all letters with phone calls to the tribal offices. Successful consultation means clearly communicating the installation's proposed undertaking and timeline, and listening to and considering alternative viewpoints.

2.15.1.5. Do not make commitments that cannot be met. Be candid with the tribe about the limited protection for release of sensitive information, and about project planning and timelines.

2.15.1.6. Recognize that while the goal is to reach mutually acceptable agreements, it may not be possible to resolve all outstanding issues. The point of consultation is to conduct an open and honest dialogue, listen and consider the tribe's viewpoint in making decisions about Air Force undertakings that may affect them.

2.15.2. Ensure that government-to-government consultation is maintained year-to-year. Installation Commanders must meet periodically with tribal leadership, ideally once a year and/or whenever there is a change of command at the installation or a change of tribal government. **(T-0)**.

2.15.3. Remember the government-to-government relationship and act accordingly. Tribal contact should be conducted at the appropriate level (installation commander to tribal chairman/president and tribal staff person to installation staff person).

2.15.3.1. ITLOs, with their installation Cultural Resources Managers, must establish appropriate protocol procedures and document them for ease of reference. Remember that these protocols might change from time to time or with changes in tribal government. **(T-3)**. Be flexible and proactive. Contact a tribal representative for advice and information before planning or attending a meeting. A personal friendly relationship with one or more tribal members can be invaluable in ensuring contact with tribal members is conducted in a respectful and proper manner.

2.15.3.2. Installation leadership must request permission to meet with tribal representatives. Do not show up unannounced or declare an intended visit with the tribe without having received an invitation or been given their approval to visit. Give the tribal point of contact time to discuss the request within his or her tribal hierarchy since a visit to discuss a project could require input and discussion from other tribal government representatives. **(T-0)**.

2.15.3.3. Many tribes consider it appropriate for visiting governmental representatives to bring gifts for tribal council members, the tribal president, or elders who will attend the meeting. Well before attending a meeting, contact the tribal point-of-contact (POC), a tribal liaison officer, public relations officer, or other knowledgeable tribal member to discuss matters of appropriate gifts and attire, and specific behavior expected on tribal lands and during meetings with tribal leaders and elders. Be especially careful to stay out of tribal politics. Avoid dealing with tribal groups outside the elected tribal government.

2.15.3.4. Tribal representatives do not offer comment or make decisions unilaterally or quickly. Typically they seek guidance from tribal elders, officials and religious leaders. This can take time, and usually means that decisions on important issues are not made for days, weeks, or months after meetings with government representatives.

2.15.4. The ITLO, with the installation Cultural Resources Manager, must document the installation's consultation efforts for each undertaking. **(T-0)**. Notes, meeting minutes, written correspondence, telephone logs, and summaries of telephone conversations should be retained as part of the project record. **(T-0)**.

Section 2G—GENERAL MANAGMENT

2.16. Curation of Archaeological Collections and Records. This section provides basic guidelines to assist installations in properly collecting, conserving, curating, and storing archaeological collections, including records, from lands under their control. Long-term curation and storage of significant prehistoric and historic artifacts, and their associated records, collected from Air Force-controlled lands is required by NHPA Section 101 (54 USC § 302107) and 36 CFR Part 79. Consult DoD Legacy Management Program Office Project No. 98-1714, *Guidelines for the Field Collection of Archaeological Materials and Standard Operating Procedures for Curating Department of Defense Archaeological Collections* (hereafter referred to as *DoD Guidelines*), for detailed information on complying with 36 CFR Part 79 (See **paragraph 2.15.7** of this Manual for more information).

2.16.1. There are four guiding principles for curating and storing Air Force archaeological collections:

2.16.1.1. Curation begins before archaeological materials are collected from the field, or before a document is created. This means, think ahead. Archaeological materials often deteriorate after they are removed from their environment, especially if they are not properly handled. Carefully evaluate the environment from which the artifacts or records will be removed, and ensure that their handling after removal will not contribute to deterioration before they can be properly stored in an appropriate curation facility. Consult professional conservators, if necessary, to establish procedures to preserve waterlogged, fragile, burned, or otherwise sensitive artifacts before they are disturbed or collected.

2.16.1.2. Consider that all actions could have permanent, rather than temporary, effects. A general rule in archaeology is that every treatment associated with archaeological materials and records should be reversible if possible. For example, labels should be permanent, but removable in the future if preservation or a specific kind of analysis requires they be removed. Use only archival quality materials at all stages of archaeological investigation, even if the present action is intended to be temporary (such as using inexpensive acidic paper bags to transfer artifacts from the field to the laboratory, where they are to be cleaned and stored in archival-quality packages). Many collections have been stored for extended periods in their original "temporary" packages or with "temporary" labels. These collections usually have suffered significant deterioration, have lost their location (provenience) data, or both. In other words, these collections have become nearly useless for preserving and interpreting data about the past. Refer to Chapter 6 of the *DoD Guidelines* for information on proper archival-quality labeling, packaging, and practices.

2.16.1.3. Document each action. This requirement cannot be overemphasized. In addition to the field notes, artifact catalog, photographic record, report, and administrative files required for each archaeological project, create a Curation History for each collection. The Curation History details how the materials were excavated, processed, created, labeled, conserved (if that was required), and packaged. It also details what kinds of products were

used in each of these steps. Air Force statements of work for archaeological projects should require creation of Curation Histories for all artifacts and records associated with the projects. Curation Histories should be kept on file at the installation, and must be included with the collection when it is curated at an appropriate facility.

2.16.1.4. Curate collections in a repository that meets the basic requirements of 36 CFR Part 79. To comply, a repository must be able to provide long-term professional curation services, including professional curation staff, atmospheric stability, appropriate fire suppression, intruder detection, and appropriate storage spaces and shelving. Temporary storage by archaeological contractors, or at an installation, are not suitable unless these criteria are met. See *DoD Guidelines*, Table 7, for recommendations on implementing the requirements of 36 CFR Part 79.

2.16.2. Maintain administrative control of Air Force collections. Each installation is responsible for maintaining control over archaeological materials and records collected from its property, collected using funds provided by the installation, or collected under permits issued by the installation. The installation Cultural Resource Manager, or other designated POC, is responsible for:

2.16.2.1. Knowing the location and condition of all collections (archaeological materials and associated documentation) and maintaining up-to-date lists and records about the location, size, and condition of all installation collections.

2.16.2.2. Routinely inspecting the storage locations and taking immediate action to rectify any problems noted during the inspection or reported by the curating facility.

2.16.2.3. Making the collections available for appropriate uses. This might entail writing a letter approving display of certain artifacts, or allowing the curation facility to use parts of the collection in traveling displays, supporting graduate student access to a collection for research, or giving permission for limited destructive analysis for dating or other purposes that will further scientific knowledge about the past.

2.16.2.4. Budgeting for long-term curation, conservation, and storage costs. These costs should be described in the Curation Agreement or MOU that establishes roles and responsibilities and defines the curation relationship between the installation and the facility.

2.16.3. Proper curation and administrative control will ensure that Air Force archaeological collections are preserved and accessible for study long into the future. Collections that have been properly collected, prepared, curated, stored, and administered can be used over and over again to interpret the past, to provide research data, or to assist Native Americans in conducting traditional religious ceremonies.

2.17. Integrated Cultural Resources Management Plans (ICRMPs).

2.17.1. All Air Force installations must prepare ICRMPs, unless they receive a waiver from AFCEC/CZ or NGB/A4. ICRMP must meet the requirements outlined in DoDI 4715.16. **(T-1)**.

2.17.2. The ICRMP is a 5-year planning document that describes the extent of an installation's cultural resources and identifies proposed activities and actions to meet requirements for cultural resources management and legal compliance. All installation actions that might affect

cultural resources should be identified, along with recommendations on specific compliance actions to deal with those effects.

2.17.3. The ICRMP should be comprehensive and integrate cultural resources compliance requirements with other installation planning activities, including 5-year projections for:

2.17.3.1. Installation development and land use planning.

2.17.3.2. Natural resources management (the Integrated Natural Resources Management Plan (INRMP)).

2.17.3.3. Planning for real property, facilities, and housing.

2.17.3.4. Installation operations and maintenance activities.

2.17.4. The ICRMP may contain varying levels of detail depending on the installation's needs and resource types. Highly industrialized installations might have ICRMPs devoted almost exclusively to historic real property assets, while most installations with ranges will have archaeological, traditional cultural property, as well as, historic real property components in their ICRMPs.

2.17.5. The ICRMP should be flexible enough to accommodate changing mission requirements. **(T-3)**. Installation CRM staff must annually, at minimum, review and update the installation ICRMP, while overall 5-year updates may be done in-house or under contract by qualified individuals. **(T-0)**.

2.17.6. ICRMP standard operating procedures must clearly identify how the installation will address cultural resources issues related to proposed or planned installation activities. Standard operating procedures are written for installation staff and must be easy to understand. They must identify recurring activities, identify each point of contact's responsibilities for required actions and decisions, and list specific procedures based on those established in the ICRMP. Standard operating procedures also must address inadvertent discoveries of cultural resources, specific emergency actions that could affect cultural resources, Bird Aircraft Strike Hazard (BASH) issues relevant to historic and unevaluated structures as outlined in the BASH Plan, and standard treatment measures for maintaining historic buildings and structures. Installation Cultural Resources Managers must include NHPA and NAGPRA compliance in the standard operating procedures. **(T-2)**.

2.18. Guidelines for Cultural Resources Components of Integrated Natural Resources Management Plans (INRMPs). Natural resources management may involve ground-disturbing activities that could adversely affect historic properties and other cultural resources. The INRMP should include these issues to ensure mutual cultural and natural resources management objectives are addressed. These guidelines focus on three areas of overlap: compliance requirements; contributions that cultural resources studies can make to ecosystem management; and human activities that should be supported and sustained in developing and implementing an INRMP.

2.18.1. Compliance requirements might arise under NEPA, NHPA, ARPA, NAGPRA, AIRFA, or one of the executive orders relating to sacred sites and government-to-government relations between Indian tribes and the Air Force.

2.18.1.1. Requirements related to these statutes, their associated regulations, and Executive Orders should be considered throughout an INRMP, rather than included in a single section on cultural resources.

2.18.1.2. The INRMP must specify those natural resources management activities that could trigger the NHPA Section 106 (54 USC § 306108) consultation process. These can include all ground-disturbing activities associated with forest management (e.g., harvesting and planting), habitat management (e.g., soil preparation for food plots, cover plantings, and pond and wetland restoration), cantonment area landscaping (historically appropriate landscaping might be an issue if the cantonment is a historic district), soil surveys, land rehabilitation and maintenance (e.g., erosion control and contour restoration), and agricultural out-leasing (plowing, seeding, grazing) are undertakings that should be reviewed for Section 106 compliance. Similar guidance must be provided in the INRMP for NAGPRA, ARPA, and AIRFA. **(T-2)**.

2.18.2. Archaeological data from the installation and nearby locations can help interpret how current environments and natural resources evolved through the analysis of recovered animal bone, pollen, plant remains, insects, ancient soils, tree-ring data, or radiocarbon dating. These data provide further knowledge about how humans have changed the local and regional environment, sometimes through thousands of years. Such data can be used for modern biodiversity studies, and for determining which installation species are "native" and "natural" and should be sustained or restored. Historical photographs and records also can provide information about past environmental conditions to assist in ecosystem management decisions.

2.18.3. Under AIRFA and EO 13007, the Air Force is required to allow Indian tribes reasonable access to sacred and ceremonial sites on installation land. Sacred sites are sometimes locations where Indian people traditionally collected certain animal or plant species. The EO 13007 adds that the Air Force is to avoid adverse effects to the physical integrity of sacred sites and to ensure reasonable notice to Indian tribes when land management policies might restrict future access or impact sacred sites. These requirements should be significant elements in INRMPs on installations where natural resources-related sacred sites or Traditional Cultural Properties have been identified.

2.19. Confidentiality Requirements.

2.19.1. Installation staff, including by not limited to public affairs and the installation Cultural Resources Manager, must restrict public knowledge regarding the specific location of archeological resources, traditional cultural resources, and other important historic properties to protect them from unauthorized trespass, vandalism, or other harm. **(T-0)**.

2.19.2. ARPA Section 9 (16 USC § 470hh) allows the installation to withhold information concerning the nature and location of archaeological resources from the public. NHPA Section 304 (54 USC § 307103) also requires withholding information about the location, character, or ownership of a historic property when disclosure might cause a significant invasion of privacy, risk harm to the historic property, or impede the use of a traditional religious site by practitioners.

2.20. Recognition of Outstanding Cultural Resources Management. The Air Force General Thomas D. White Award and the Secretary of Defense environmental awards program recognizes outstanding individual and installation contributions to cultural resources management. Contact AFCEC/CZ, see AFI 36-2817, Civil Engineer Awards Program, for standards and submittal procedures.

2.21. Fossils. The Antiquities Act (54 USC §§ 320301-320303), establishes policies governing the management, collection, and removal of paleontological resources on lands controlled by the installation. These policies are included in the ICRMP and INRMP. Installations must address known and probable paleontological resources in environmental impact analysis process documentation prepared for actions that might impact or cause irreparable loss or destruction of such resources. **(T-0)**.

Chapter 3

NATURAL RESOURCES MANAGEMENT

Section 3A—INTRODUCTION

3.1. Program Overview. This Chapter addresses the management and enforcement of natural resources on Air Force properties to meet Air Force mission requirements and comply with federal law and applicable state laws. This AFMAN provides Air Force installations a framework for planning, implementing, enforcing, and documenting natural resources management programs. The primary objective of Air Force natural resources programs is to sustain, restore, and modernize natural infrastructure to ensure operational capability and no net loss in the capability of Air Force lands to support the military mission of the installation.

3.2. Environmental Management System (EMS). AFI 32-7001 provides directions for implementing and maintaining the Air Force Environmental Management System framework. Natural Resources activities are an Environmental Aspect within the Air Force EMS.

Section 3B—IMPLEMENTING INTEGRATED NATURAL RESOURCES MANAGEMENT

3.3. Integrated Natural Resources Management Plan (INRMP). In accordance with the Sikes Act, 16 USC § 670 *et seq.*, the Integrated Natural Resources Management Plan (INRMP) is the principal tool for managing natural resources on a military installation. Each military installation in the U.S. under the jurisdiction of the Secretary of Defense must prepare and implement an INRMP unless a determination is made that the absence of significant natural resources makes preparation of such a plan inappropriate. **(T-0)**. (see **paragraph 3.4**). Prepare INRMPs to provide guidance to installation personnel for the conservation and rehabilitation of natural resources consistent with the use of the installation to ensure the readiness of the Armed Forces. The INRMP defines natural resources management goals and objectives that are consistent with the military mission, and ensures no net loss in the capability of installation lands to support the military mission. All installation organizations, to include tenant units, must support the implementation of INRMP goals and objectives, as applicable. **(T-0)**.

3.4. Determining the Need for an Integrated Natural Resources Management Plan. AF/A4C or his delegate shall determine the requirement for an installation INRMP based on Category I and II criteria defined below. The U.S. Fish and Wildlife Service and the state fish and wildlife agency must be consulted when determining if significant natural resources exist to warrant an INRMP. Installations including or bordering marine environments must also consult with the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries). **(T-0)**.

3.4.1. **Category I Criteria.** Installations will develop and implement an INRMP if they have significant natural resources **(T-0)**. An installation has natural resources if any of the following criteria apply:

3.4.1.1. The installation conducts on-the-ground military missions on unimproved lands that necessitates conservation measures to maintain the natural resources and minimize impacts of military testing and training activities (e.g., soil erosion control).

3.4.1.2. Species listed as threatened or endangered in accordance with 16 USC §§ 1531-1544 (referred to as the Endangered Species Act throughout this manual) are present on the installation, or critical habitat has been designated or is currently proposed on the installation, and active installation conservation measures are necessary to conserve the species.

3.4.1.3. Hunting, fishing or other natural resources-based outdoor recreation activities (e.g. off-road vehicles) are allowed on the installation when consistent with the military mission.

3.4.1.4. The installation operates outgrants (leases, licenses, permits) for livestock grazing, crop production, or stable operations that allow horseback riding on unimproved lands.

3.4.1.5. The installation operates a commercial forestry program or implements forest management practices in support of readiness and training activities, maintaining forest health, or in support of other ecosystem management goals and objectives.

3.4.1.6. The installation has significant Bird/Wildlife Aircraft Strike Hazard issues that require habitat manipulation on or near the managed airfield; or require wildlife hazing or depredation activities that are beyond the scope of standard bird/wildlife prevention, control, and dispersal operations conducted under the auspices of a Bird/Wildlife Aircraft Strike Hazard (BASH) Plan administered by the Wing Flight Safety office.

3.4.1.7. Important or unique biological resources are present, such as wetlands, species listed for state protection, candidate species for federal protection, or unique habitats that provide essential loafing, nesting, or foraging areas for migratory birds, bats, or other wildlife protected by state or federal law. The unique character of a biological resource is determined through consultation with the USFWS and applicable state fish and wildlife agency, whereby it is established that ecological issues related to the resource require a level of planning and management that can only be addressed by an INRMP.

3.4.2. Category II Criteria. Category II installations do not require an INRMP. Category II installations are deemed exempt from the INRMP requirement because of the absence of significant natural resources as defined by the Category I criteria. Submit requests to AFCEC/CZ to confirm Category II status with documentation of collaborating agency concurrences. (T-1).

3.5. Cooperative Integrated Natural Resources Management Plan (INRMP) Preparation. Installations will prepare INRMPs in cooperation with appropriate stakeholders. Notify stakeholders when a new or revised INRMP is prepared, and solicit participation and input to the INRMP development and review process. (T-0).

3.5.1. Internal Stakeholder Participation. The entire installation, including tenant organizations, shall collaborate on the implementation of an INRMP to ensure mission readiness. (T-0). Solicit participation from known installation stakeholders early in the INRMP preparation process, to include the Flight Safety office.

3.5.2. Interagency Stakeholder Participation. The Sikes Act Section 101(a)(2) (16 USC § 670a(a)(2)), requires that an INRMP be prepared in cooperation with the USFWS, the appropriate fish and wildlife agency for the state in which the military installation is located, and NOAA Fisheries for installations that include or border marine environments. Installations

shall invite the USFWS, NOAA Fisheries (if applicable), and the state fish and wildlife agency to participate in the scoping, design, and preparation of an INRMP. (T-0). For installations occupying lands withdrawn from the public domain, invite the Bureau of Land Management to participate in the scoping and design of an INRMP. On withdrawn lands where the Bureau of Land Management is a stakeholder, a MOU between the installation and the Bureau of Land Management may be used to establish agreement on the roles and responsibilities of each party for the management of installation natural resources. (T-1).

3.5.3. Internal Review. New and revised draft INRMP documents must be reviewed internally prior to release for review and comment by external agencies and the general public. (T-3).

3.5.3.1. The installation natural resources manager shall submit the draft INRMP for formal review and comment within the installation chain of command. Incorporate comments into the INRMP as appropriate. (T-3).

3.5.3.2. Installations shall submit the draft INRMP for appropriate security review before making it available to the public. Restricted information, such as classified imagery, budgetary details and sensitive locations must be excised before submitting for external review. (T-1).

3.5.3.3. Installations will provide the AFCEC, Installation Support Section and, for ANG or Reserve installations, the Headquarters, ANG or AFRC, the opportunity to review and comment on draft INRMP documents. **(T-3)**.

3.5.4. Interagency Review. Installations shall provide the USFWS, state fish and wildlife agency, and NOAA Fisheries (when applicable), the opportunity to review a new or revised draft INRMP before submitting the document for public review. For installations occupying lands withdrawn from the public domain, ensure the Bureau of Land Management is also given the opportunity to review a draft INRMP before submitting for public review. **(T-1)**.

3.5.5. Public Review. In accordance with Section 2905(d) of Public Law 105-85, provide an opportunity for the public to review any initial draft INRMP document, or significant INRMP revision, and provide comments. Notify the public when a draft INRMP is available for comment, and ensure the period allowed for the submittal of comments is no less than 30 days. Ensure the USFWS, state fish and wildlife agency, and NOAA Fisheries (if applicable), are also given the opportunity to review all public comments received on an INRMP. Will make final INRMPs available electronically to the general public through an installation website or other appropriate means approved by Public Affairs. **(T-0)**.

3.6. Integrated Natural Resources Management Plan (INRMP) Approval. An INRMP is considered compliant with the Sikes Act if it has been approved by signature, or in writing in a signed letter, by the appropriate representative from each cooperating agency. Consistent with the Sikes Act, (16 USC § 670a(a)(2)), approval of a new or revised INRMP as current, as to operation and effect, shall be documented by signature from the installation commander (or designee), the authorized signatory representative of the USFWS, and the authorized signatory representative of the state fish and wildlife agency within the past 5 years. A letter of coordination and approval signed by the authorized representative of a cooperating agency suffices in lieu of a signature on the INRMP signature page. Although approval by NOAA Fisheries or the Bureau of Land Management is not mandated by the Sikes Act, ensure that these agencies are given the opportunity to review and comment on draft INRMP documents when the agencies are identified as

stakeholders. The INRMP is considered current until an annual review coordination process results in a determination by the cooperating agencies that a revision is necessary; or if concurrence is rescinded by notice from a cooperating agency. **(T-0)**.

3.6.1. Establishment of Mutual Agreement. Each signature on an INRMP signature page or approval letter reflects the mutual agreement of the parties on those portions of the INRMP within the scope of each agency's authority. By signature of the authorized representative from a cooperating agency, the agency asserts agreement that the INRMP is sufficient and compliant in accordance with the Sikes Act. Mutual agreement is the goal with respect to the entire INRMP. However, mutual agreement is necessary only with respect to those elements of the INRMP that are subject to the jurisdictional authority of the USFWS or NOAA Fisheries as specified by law, or the inherent rights of the state to conserve, protect, and manage fish and wildlife resources.

3.6.2. Failure to Reach Mutual Agreement. In cases where the USFWS or state withholds its agreement to an INRMP based on objections to elements of the INRMP that are clearly not within the scope of the particular agency's authority, an installation may, notwithstanding the objections, finalize the INRMP and proceed to manage the installation natural resources in accordance with the terms of the plan. The installation shall seek a written explanation from a cooperating agency to document why a signature is withheld. **(T-1)**.

3.7. Integrated Natural Resources Management Plan (INRMP) Update and Revision . Installations shall conduct INRMP updates and revisions in cooperation with the USFWS, state fish and wildlife agency; and the Bureau of Land Management and NOAA Fisheries, where applicable. Include all appropriate internal and external stakeholders in the update and revision process. In accordance with the Sikes Act (16 USC § 670a(b)(2)), ensure the cooperating agencies review an INRMP on a regular basis, but not less often than every 5 years. **(T-0)**. Cooperating agencies should mutually agree that the INRMP presents a natural resources management program that is current as to operation and effect for those elements of the INRMP under the jurisdictional authority of each agency.

3.7.1. INRMP Update. An INRMP update consists of minor edits within the existing INRMP that provide current information, or adjusts implementation timelines that would not result in changes to management goals and objectives that are substantively different than those previously agreed to by the cooperating agencies, and would not result in environmental consequences different from those in the existing INRMP. Minor update requirements are identified during the INRMP annual review and coordination (see **paragraph 3.8**). An INRMP update documents minor changes agreed to by the cooperating agencies on how the INRMP is implemented, and does not represent a change in the scope of the INRMP that would require renewed signatures by the authorized representative from each agency. An INRMP update does not require public review and comment on the decision to continue implementing the INRMP as updated.

3.7.2. INRMP Revision. Revise an INRMP if changes in the installation mission or land use would alter the biogeophysical environment such that significant edits need to be made to ensure that the INRMP reflects the current natural resources management requirements. Changes to the INRMP goals and objectives constitute an INRMP revision. Revise an INRMP if a change in land use or condition would result in environmental impacts not anticipated by the parties to the INRMP when the INRMP was last reviewed as to operation and effect. The

need for an INRMP revision is determined during the INRMP annual review (see **paragraph 3.8**). Provide an opportunity for the public to review and comment on a draft INRMP revision (see **paragraph 3.5.5**). For new and revised INRMPs, mutual agreement by a cooperating agency is documented by the signature of an authorized representative from each agency on the signature page for the INRMP, or by written correspondence (see **paragraph 3.6**).

3.8. Integrated Natural Resources Management Plan (INRMP) Annual Review and Coordination. In accordance with the guidance in DoDI 4715.03, *Natural Resources Conservation Program*, installations must review the INRMP annually in coordination with internal and external stakeholders. **(T-0)**. Invite representatives of the USFWS, state fish and wildlife agency, and NOAA Fisheries or the Bureau of Land Management where applicable, to participate in the INRMP Annual Review. Installations will document the findings of the annual review in an INRMP Annual Review Summary. If any agency declines to participate in an on-site annual review or annual review teleconference, the installation shall submit an INRMP Annual Review Summary document to the agency via official correspondence and request return correspondence with concurrence. **(T-1)**. For overseas installations, the INRMP Annual Review shall be coordinated internally with the appropriate installation offices and documented in an INRMP Annual Review Summary. **(T-3)**.

3.8.1. INRMP Annual Review Summary. Installations with INRMPs must ensure the following is included in the INRMP Annual Review Summary:

3.8.1.1. The INRMP Annual Review Summary shall include a summary of specific INRMP accomplishments since the last INRMP annual review. **(T-1)**.

3.8.1.2. The INRMP Annual Review Summary shall include an update of the Annual Work Plan for implementing the INRMP that includes the current year and at least four future fiscal years. The Annual Work Plan must include all projects and activities identified as essential for the successful implementation of INRMP goals and objectives, and an implementation schedule that is realistic and practicable. **(T-1)**. The Annual Work Plan may include a consensus by the collaborating agencies on relative project priority for projects in the Annual Work Plan (e.g. High, Medium, or Low) based upon the significance of the project for attaining the INRMP goals and objectives.

3.8.1.2.1. Projects rated as High in the Annual Work Plan are essential for achieving INRMP goals and objectives in the year they are programmed. Sikes Act cooperating agencies would consider the INRMP to not be implemented if the project is not accomplished in the year programmed.

3.8.1.2.2. Projects rated as Medium in the Annual Work Plan constitute actions that cooperating agencies agree to be important to achieve INRMP goals and objectives; but the projects may be deferred if not completed in programmed year.

3.8.1.2.3. Projects rated as Low in the Annual Work Plan support INRMP goals and objectives and enhance the natural resources program, but cooperating agency partners would agree that the activity is not deemed essential to implement INRMP goals and objectives.

3.8.1.3. The INRMP Annual Review Summary must include a statement indicating the projects in the Annual Work Plan for which the collaborating agencies have expressed an interest in participating in project execution. As indicated in the Sikes Act (16 USC §

670a(d)(2)), priority shall be given to Federal and state agencies having responsibility for conservation and management of fish and wildlife for execution of implementation and enforcement of INRMPs. If the collaborating agencies do not express an interest in executing projects in the Annual Work Plan, then shall include the following statement in the Annual INRMP Review Summary: "The execution strategy for the Annual Work Plan has been discussed with the participating agencies, and the agency representatives have not expressed an interest in participating in project execution, and agree that implementation will be performed through other authorized acquisition methods." **(T-1)**.

3.8.1.4. The INRMP Annual Review Summary shall include a statement asserting whether or not sufficient numbers of qualified natural resources management and enforcement personnel and resources are available to oversee implementation of projects and activities identified in the INRMP Work Plan. **(T-1)**.

3.8.1.5. The INRMP Annual Review Summary shall include a summary of any required updates to the INRMP determined necessary to keep the INRMP current in operation and effect for the management of installation natural resources; or alternatively, a statement that significant changes to the installation mission or natural resources goals require an INRMP revision (see **paragraph 3.7**). **(T-1)**.

3.8.1.6. An INRMP Annual Review Summary may substitute for the more formal 5-year review for Sikes Act compliance, provided that the INRMP Annual Review Summary lists all updates made to the INRMP since the last review and the installation documents signatures by the installation commander (or designee) and the authorized signatory representatives of the USFWS and the state fish and wildlife agency (see **paragraph 3.6**).

3.9. Environmental Impact Analysis Process and INRMP Implementation. Installations may, but are not required to, complete an environmental impact analysis of an INRMP before it is signed. However, actions proposed in development of an INRMP are subject to 40 CFR Parts 1500-1508, *CEQ Regulations for Implementing the Procedural Provisions of NEPA*, and 32 CFR Part 989, *Environmental Impact Analysis Process*. An appropriate level of analysis must be completed before such actions are implemented. Where an installation has previously completed an environmental impact analysis of an INRMP, it may (consistent with 40 CFR § 1500.4, 40 CFR § 1502.4(b), and 40 CFR § 1502.20) tier from that analysis when performing subsequent analyses on specific actions proposed in the INRMP.

3.10. Ecosystem Management. The INRMP implements ecosystem management on Air Force installations by setting goals for attaining the desired land condition. When preparing or revising an INRMP, shall follow the ecosystem management principles and guidelines in DoDI 4715.03 and the guidance provided herein. **(T-0)**.

3.10.1. Air Force Principles for Ecosystem Management.

3.10.1.1. Maintain or restore native ecosystem types across their natural range where practical and consistent with the military mission.

3.10.1.2. Maintain or restore natural ecological processes such as fire and other disturbance regimes where practical and consistent with the military mission.

3.10.1.3. Maintain or restore the hydrological processes in streams, floodplains, and wetlands when feasible and practical and consistent with military mission.

3.10.1.4. Use regional approaches to implement ecosystem management on an installation by collaboration with other DoD components, as well as, other Federal, state and local agencies, and adjoining property owners.

3.10.1.5. Provide for outdoor recreation, agricultural production, harvesting of forest products, and other practical utilization of the land and its resources, provided that such use does not inflict long-term ecosystem damage or negatively impact the Air Force mission.

3.10.2. Biodiversity Conservation. Biodiversity conservation is an integral part of ecosystem management. Maintain or reestablish viable populations of all native species on Air Force-controlled lands when practical and consistent with the military mission and not in conflict with airfield operations and flight safety. Consider the effects of climate variability in plans to restore native ecosystems.

3.10.3. Climate Considerations for INRMP**s**. Climate variability and extreme climate events may significantly affect native ecosystems and require the Air Force to adjust natural resources management strategies to support military mission requirements and address the needs of sensitive species. The installation INRMP must consider historical regional trends in climate, and projections of future climate change vulnerabilities and risk to natural infrastructure and sensitive species using authoritative region-specific climate science. **(T-2)** The INRMP should list, or include by reference, installation-specific historical climate data and region-specific climate projections. INRMP goals and objectives for ecosystem management and biodiversity conservation must employ an adaptive ecosystem-based management approach that will enhance the resiliency of the ecosystem to adapt to changes in climate.

3.10.4. Exotic and Invasive Species Control. The INRMP must identify any exotic and invasive species or feral animals present on an installation, and identify any impacts of exotic or invasive species on military activities and flight safety. The INRMP must identify any existing programs and strategies to control and/or eradicate those species when practical and consistent with the military mission. **(T-3)**.

3.11. INRMP Implementation. In accordance with DoDI 4715.03, installations will use professionally trained natural resources management personnel with a degree in the natural sciences to develop and implement the installation INRMP. **(T-0)**.

3.11.1. Outsourcing Natural Resources Management. As stipulated in the Sikes Act, 16 USC § 670 *et seq.*, the Office of Management and Budget Circular No. A-76, *Performance of Commercial Activities,* does not apply to the development, implementation and enforcement of INRMPs. Activities that require the exercise of discretion in making decisions regarding the management and disposition of government-owned natural resources are inherently governmental. When it is not practicable to utilize DoD personnel to perform inherently governmental natural resources management duties, they may, in accordance with the Sikes Act (16 USC § 670a(d)(2)), obtain inherently governmental services from federal agencies having responsibilities for the conservation and management of natural resources. **(T-0)**.

3.11.2. Implementation of INRMPs through Sikes Act Agreements. In accordance with the Sikes Act, 16 USC § 670c-1, interagency agreements with other federal agencies, and cooperative agreements with states, local governments, Indian Tribes, and nongovernmental entities may be used to implement actions in support of an INRMP. Agreements for the

maintenance and improvement of natural resources outside installation boundaries are appropriate if the purpose of the cooperative agreement or interagency agreement is to eliminate current or anticipated challenges that could restrict or interfere with current or anticipated military activities. Funds committed to a cooperative agreement or interagency agreement under 16 USC § 670c-1 may be obligated to cover the cost of goods and services provided under the cooperative agreement or interagency agreement during any 18-month period beginning in that fiscal year, without regard to whether the agreement crosses fiscal years. Obligations made by a receiving Federal agency under an interagency agreement for the maintenance and improvement of natural resources on behalf of the Air Force shall be subject to a performance period consistent with the policy of the supporting agency. **(T-2)**.

3.11.3. Use of Non-Appropriated Fund Personnel. Non-Appropriated Fund personnel and resources may be utilized to assist in the implementation of natural resources management programs. In such cases, supervision and control of natural resources management programs remain under the designated installation natural resources program manager.

3.11.4. Wildland Fire Management and Conservation Law Enforcement. An interagency agreement or cooperative agreement in accordance with 16 USC § 670c-1 may be used to reimburse federal agencies and states for the cost of using their personnel to provide wildland fire and conservation law enforcement services. However, 10 USC § 2465 prohibits contracts for performance of firefighting or security guard functions unless an exception described in the statute applies. Since controlled burns are a natural resources management activity rather than a firefighting function, assistance for controlled burns may be acquired by interagency agreement, cooperative agreement, or contract.

3.12. Integration of Natural Resources Management with Other Air Force Programs.

3.12.1. Integration with the Installation Planning Process. The INRMP is a key component plan of the Installation Development Plan developed in accordance with AFI 32-1015, *Integrated Installation Planning.* The INRMP identifies natural resource features that need to be considered and incorporated into the Installation Development Plan and other component plans in support of future installation development decisions.

3.12.2. Integration with the Air Force Environmental Impact Analysis Process. The installation or AFCEC/CZ natural resources manager will collaborate with the action proponent and the installation Environmental Impact Analysis Process manager to ensure that activities that may affect natural resources are fully considered in compliance with the NEPA**.** **(T-0)**.

3.12.3. Integration with Other Installation Programs. Coordinate draft INRMP revisions through the installation chain of command and other identified stakeholders involved in INRMP implementation, to include the Bird Hazard Working Group. Ensure that the INRMP, Integrated Cultural Resources Management Plan (ICRMP), Bird/Wildlife Aircraft Strike Hazard (BASH) Plan (see **Section 3M**), Integrated Pest Management Plan, and Air Installation Compatible Use Zone studies are mutually supportive and not in conflict.

3.13. Preventing Natural Resources Damage from Air Force Activities.

3.13.1. Prior to initiation of any new construction activity, the installation natural resources manager will coordinate on all Certificates of Compliance for Critical Planning Actions

prepared in accordance with AFI 32-1021, *Planning and Programming Military Construction (MILCON) Projects*. **(T-2)**.

3.13.2. Installations must ensure Environmental Restoration Program operations conducted in accordance with AFI 32-7020, *The Environmental Restoration Program*, include plans to mitigate potential damage to natural resources from restoration activities. **(T-2)**

3.13.3. Real property outleases, Enhanced Use Leases, easements, licenses, or privatization initiatives on Air Force property shall not negatively impact the ability of an installation to meet statutory requirements for compliance with federal and applicable state laws related to natural resources conservation. **(T-0)**.

3.14. Assessing Natural Resource Damage by Other Parties. In the event that natural resources under Air Force control are damaged by another party, such as an accidental spill of a hazardous substance, the installation incurring the damage assesses and claims damages. Refer to Title 43, CFR Part 11, *Natural Resource Damage Assessments* for guidance on claiming damages. Recovered funds are used to restore, replace, or acquire equivalent natural resources on the installation where the damage occurred. Installations must coordinate with AFCEC/CZ, SAF/IEE and AFLOA/JACE during the claims process. **(T-1)**.

3.15. Natural Resources Program Metrics. DoDI 4715.03 identifies the natural resources conservation metrics that must be tracked and reported to DoD as part of the annual OSD Environmental Management Review, and included in the Defense Environmental Programs Annual Report to Congress. AF/A4C may develop and track other measures of merit to monitor natural resources program performance and ensure compliance with law. Installations will report required metrics data to AFCEC/CZ for integration and upward reporting to AF/A4C and SAF/IE. **(T-0)**.

3.16. Recognition of Outstanding Natural Resources Management. The Air Force General Thomas D. White Award and the Secretary of Defense environmental awards program recognizes outstanding individual and installation contributions to natural resources management. Contact AFCEC/CZ for standards and submittal procedures.

Section 3C—WETLANDS AND WATERS OF THE UNITED STATES

3.17. Protection of Wetlands. In compliance with EO 11990, *Protection of Wetlands*, the Air Force will seek to preserve the natural values of wetlands while carrying out its mission on both Air Force lands and non-Air Force lands. To the maximum extent practicable, the Air Force will avoid actions which would either destroy or adversely modify wetlands. The Air Force will fully disclose the location of known wetlands, and any land-use restrictions imposed by regulatory authority, on lands that are leased, transferred or sold to non-federal entities. Installations must develop a baseline inventory and map using the best available data to indicate the location of known wetlands, water bodies, and waterways on lands controlled by the Air Force. **(T-0)** The baseline wetlands inventory would include all wetland areas, regardless of regulatory status. Installations are not required to update existing wetland inventory maps unless there exists a change in hydrology or in the wetland delineation methodology.

3.18. Clean Water Act (33 U.S. Code § 1251 et seq.) Compliance. Activities that may impact waters and wetlands of the United States as defined in 40 CFR § 110.1, require evaluation for compliance with Clean Water Act regulations. **(T-0)**.

3.18.1. Waters of the U.S. (WOTUS). WOTUS, also referred to as jurisdictional wetlands, are those wetlands, water bodies and waterways that fulfill the criteria as jurisdictional WOTUS subject to the regulatory requirements of the Clean Water Act. Site level jurisdictional delineations of WOTUS are mandatory for proposed development activities that may affect wetlands, streams, and water bodies, and are the responsibility of the proponent as part of project costs. (T-0) The proponent of any activity that may affect known or suspected WOTUS should conduct a jurisdictional delineation utilizing the criteria approved by the Environmental Protection Agency and affirmed by the U.S. Army Corps of Engineers (USACE). The Air Force will refer to and accept as determinative the current USACE definitions for WOTUS under USACE jurisdiction. Jurisdictional delineations are valid for a limited period of time, as established by the USACE district regulatory office. Installations are not required to update an expired jurisdictional delineation unless there exists a proposed mission activity that necessitates an updated demarcation of jurisdictional WOTUS boundaries by the proponent activity.

3.18.2. Clean Water Act Section 404 Compliance. Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged or fill material into jurisdictional waters and wetlands of the U.S. Actions that may impact wetlands, to include dredging, filling, and activities that may displace soil or other materials into a wetland, may require a Section 404 permit from the USACE and/or delegated state authority. Submit USACE Engineer Form 4345, Application for Department of the Army Permit to the appropriate USACE District Engineer prior to any land disturbance activity located in or near a regulated wetland area or regulated WOTUS. Along with the permit application, submit a vicinity map and site development plan that includes a cross-sectional view of the affected area showing limits of jurisdictional waters, the normal water level, volume of fill material to be discharged below ordinary high water. In some states, the authority to issue Clean Water Act Section 404 permits has been delegated to the state, and additional procedures may apply. **(T-0)**.

3.18.3. Clean Water Act Section 401 Compliance. Clean Water Act Section 401 directs that any proponent of an action that requires a federal license or permit, such as a Section 404 or National Pollution Discharge Elimination System permit, must obtain a water quality certificate from the state water pollution control agency. The water quality certificate certifies that the action complies with state water quality criteria. State permits to undertake projects within a specified buffer zone surrounding wetlands may also be required. When applying for a permit under state wetland protection laws, certain information not required for an USACE permit, such as a delineation of a regulated buffer area, may also be required. In some cases, permit applications may be submitted concurrently for review by both the state and the USACE. **(T-0)**.

3.18.4. Finding of No Practicable Alternative (FONPA). DoDI 4715.03, Clean Water Act Sections 401, 404 and 404(b)(1) guidelines, and provisions of EO 11990, prohibit agencies from undertaking or supporting any new construction or related activities located in wetlands unless the SecAF, or the Chief of the National Guard Bureau, or an official duly delegated authority to act on his/her behalf for Air National Guard, finds that (1) there is no practicable alternative to such new construction or related activities, and (2) that the proposed action includes all practicable measures to minimize harm to the wetlands from such use. When there is no practicable alternative to taking an action in a wetland, makes a Finding of No Practicable

Alternative determination via signature on the Finding of No Significant Impact or Record. **(T-0)**.

3.18.4.1. The FONPA is included within a NEPA FONSI or ROD. It explains why there are no practicable alternatives to an action affecting a wetland, as established in an appropriate level NEPA analysis. When there is no practicable alternative to taking an action in a wetland, a FONPA determination is made by the SecAF, (or an official who has been duly delegated the authority to act on the Secretary's behalf,) or the Chief of the National Guard Bureau (or an official duly delegated authority to act on his/her behalf), via signature on the FONSIor ROD (see paragraph 3.20).

3.18.4.2. To support the required FONPA, prior to any new construction or related activities located in wetlands, proponents first prepare an analysis and documentation, in accordance with Clean Water Act Sections 401, 404 and 404(b)(1) guidelines, DoDI 4715.03, and provisions of EO 11990, Protection of Wetlands that demonstrates no practicable alternatives to such construction or activities exist, and that the proposed action includes all practicable measures to minimize harm to wetlands. Proponents will follow the process outlined in paragraph 3.20 for the required assessments of proposed actions potentially affecting wetlands. **(T-0)**.

3.19. Rivers and Harbors Act of 1899 Compliance. The Rivers and Harbors Act of 1899, 33 USC § 401, establishes a program to regulate activities affecting navigable WOTUS. Section 10 of the Act (33 USC § 403) directs that proponents must obtain a Section 10 permit administered by the USACE for construction, excavation, or deposition of materials in, over, or under navigable waters, or for any work which would affect the course, location, condition, or capacity of those waters. Activities requiring Section 10 permits include structures (e.g., piers, wharves, breakwaters, bulkheads, jetties, weirs, transmission lines) and work such as dredging or disposal of dredged material, or excavation, filling, or other modifications to the navigable WOTUS. Installations must contact the USACE prior to construction or other activities that may affect open water habitats to determine if a Section 10 permit is necessary. **(T-0)**.

3.20. The Environmental Impact Analysis Process (EIAP) for Actions that May Affect Waters of the United States . Proposed actions (i.e. new construction) that may affect wetlands and WOTUS shall require full compliance with the EIAP, 32 CFR §§ 989 et seq; Clean Water Act Sections 401, 404 and 4041(b)(1); and EO 11990 prior to implementation. (T-0).

3.20.1. Proponents shall take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in carrying out their responsibilities. **(T-0)**.

3.20.2. Installations must ensure supporting NEPA documentation includes consideration of alternatives to actions that could potentially affect wetlands **(T-0)**.

3.20.3. In the Environmental Impact Analysis Process, installations must ensure early and meaningful public involvement in accordance with Section 2(b) of EO 11990 and 32 CFR § 989.14(l). Early public notice will be prepared and made available to the public in accordance with 32 CFR § 989.24(c). Prepare a Notice of Intent per 32 CFR § 989.17. Initiate a public scoping process to solicit written comments from the public. Ensure the public notice includes a description of the action, its purpose and expressly states the proposed action is subject to the requirements and objectives of EO 11990. Additionally, ensure that the public notice

identifies state and federal regulatory agencies with special expertise that have been contacted. Whenever practicable, the notice should provide 30 days for public comment. **(T-0)**.

3.20.4. The environmental planning function shall make a determination whether to conduct a scoping meeting in accordance with 32 CFR § 989.18, or to hold a public meeting or public hearing on the required assessments based upon public comments received during the scoping process, the magnitude of the proposed action, and the potential for controversy. **(T-1)**.

3.20.5. The Notice of Intent will include a description of the action and its purpose, and will expressly state the proposed action is subject to the Clean Water Act Sections 401, 404 and 404(b)(1) guidelines, and the requirements and objectives of EO 11990, Protection of Wetlands. The Notice of Intent shall identify state and federal regulatory agencies with jurisdiction and/or special expertise that have been contacted, and request public comment on the proposed action and any practicable alternatives. **(T-0)**.

3.20.6. Pursuant to 32 CFR § 989.14, and based upon the magnitude and complexity of the proposed action and the public comments, the installation environmental planning function shall determine whether an Environmental Assessment (EA) or Environmental Impact Statement (EIS) is required. **(T-0)**.

3.20.7. If the analysis determines an EA is to be accomplished, the environmental planning function shall make the EA and unsigned FONSI available for public review for at least 30 days before FONSI approval and implementing the action. **(T-0)**.

3.20.8. When the analysis reveals a significant impact that cannot be mitigated to insignificance, the installation environmental planning fucntion must follow the procedures of 32 CFR §§ 989.17-989.21. (T-0). In cases where there is no practicable alternative to the proposed new construction in wetlands and WOTUS, SecAF, or an approved alternative, or the Chief of the National Guard Bureau, or an approved alternative, shall make a FONPA determination within the supporting FONSI or ROD. **(T-0)**.

3.20.9. Application of a categorical exclusion (CATEX) to new construction located in a wetland is not appropriate. **(T-1)**.

3.21. Wetland Mitigation Banks. A wetland mitigation bank is a wetland area that is currently being created, restored, or enhanced, and set aside to compensate for future actions that may negatively impact other wetlands within the same watershed and provide like (in-kind) wetland functions. A wetland bank is established by means of a formal agreement with the USACE or other appropriate regulatory agency(ies). A wetland mitigation bank must be established and certified before credits can be utilized. **(T-0)**. The value of a bank is determined through cooperation with the regulating agency to quantify the wetland values restored, enhanced, or created in terms of compensatory mitigation credits. Purchase of credits from certified third-party mitigation banks is encouraged when practicable as a cost-effective method to reduce the uncertainty and delays that may be associated with mitigation requirements for future installation development. Development of new wetland mitigation banks by Air Force must occur off-installation, and must be coordinated in advance with Flight Safety to ensure compliance with Bird/Wildlife Aircraft Strike Hazard avoidance objectives. **(T-1)**. Costs associated with wetland mitigation banking may be treated as eligible project costs for military construction.

Section 3D—Floodplains

3.22. Floodplain Boundary Determination. Use the National Flood Insurance Program (NFIP) maps distributed by the Federal Emergency Management Agency to determine whether a proposed action occurs in a floodplain. If NFIP maps are not available for the affected area, installations will develop a floodplain map that is certified by a professional engineer, and provide the map data to the NFIP. **(T-1)**.

3.23. Assessment of Proposed Actions within Floodplains. Air Force installations must ensure that proposed actions within a floodplain, or actions that could affect floodplains, are properly assessed to identify the effects of the proposed action on flood risk. **(T-0)**. EO 13807, *Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects*, directs federal agencies to make informed decisions concerning the environmental impacts of infrastructure projects, and ensure that infrastructure development occurs in an environmentally sensitive manner. EO 11988, *Floodplain Management*, requires that infrastructure development projects reduce the risk of flood loss, minimize flood impacts on human safety, health, and welfare, and preserve or restore the natural and beneficial values served by floodplains.

3.23.1. The Environmental Impact Analysis Process (EIAP) for Actions that May Affect Floodplains. The installation environmental planning function must adhere to the AF EIAP for proposed actions that will occur in, or could adversely affect floodplains. **(T-0)**.

3.23.1.1. Ensure National Environmental Policy Act (NEPA) documentation reflects consideration of alternatives to actions proposed in floodplains, or actions which potentially adversely affect floodplains that would increase the risk of flood loss. Include measures necessary to minimize potential harm to the floodplain or reduce the risk of loss in accordance with 40 CFR § 1508.20 and 32 CFR § 989.22(a). For such actions initially considered within an EIAP, prepare early public notice to encourage early and meaningful public involvement. In accordance with EO 11988, Section 2(a)(4), and 32 CFR § 989.14(l), the public notice shall include a description of the proposed action, purpose of the action, practicable alternatives to the action, and identify the state and federal regulatory agencies that may have responsibility to review the action. The public notices should expressly state that the proposed action is subject to the requirements and objectives of EO 11988 because the proposed action is within a floodplain. Whenever practicable, the notice should provide 30 days for public comment.

3.23.1.2. Pursuant to 32 CFR § 989.14(l), and based upon the magnitude and complexity of the proposed action and the public comments, the installation environmental planning function shall determine whether an Environmental Assessment (EA) or Environmental Impact Statement (EIS) is required. **(T-0)**.

3.23.1.2.1. If an analysis determines that an EA is to be accomplished, the environmental planning function shall make the EA and unsigned FONSI available for public review for at least 30 days before FONSI approval and implementing the action. **(T-0)**.

3.23.1.2.2. If the analysis reveals a significant adverse impact, and an EIS is undertaken, follow the procedures for EISs in 32 CFR §§ 989.17-989.21. When there is no practicable alternative to taking an action within a floodplain, SecAF, or an

approved alternative, or the Chief of the National Guard Bureau, or an approved alternative, shall make a FONPA determination within the supporting FONSI or ROD. **(T-0)**.

3.23.1.2.3. Application of Categorical Exclusions to actions located in, or adversely affecting floodplains is normally not appropriate, given the additional analysis requirements required by Section A2.2.7 of Appendix B to 32 CFR Part 989, and the level of public involvement required.

3.24. Actions Altering Floodplain Hydrology. If an action is taken within a floodplain that permanently alters the flood hazard delineations on a NFIP map, installations must prepare and submit recommended map modification to the Federal Emergency Management Agency in accordance with current agency guidance. **(T-1)**.

Section 3E—Coastal and Marine Resources

3.25. Protection of Coastal and Marine Resources. The Air Force will conserve and protect all coastal and marine resources whenever feasible as part of the overall natural resources management program.

3.26. Coastal Zone Management Act Compliance. Title 16 USC §§ 1451-1462 (known as Coastal Zone Management Act) authorizes coastal states to establish a Coastal Zone Management Plan to coordinate state, local, and federal programs for the management of coastal areas. The National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, administers the program at the federal level. Once a state's program is federally approved, the Coastal Zone Management Act allows participating states to set goals and procedures that control the use and development of designated Coastal Zones.

3.26.1. Coastal Zone Management Act Applicability. A Coastal Zone is the area specified or delineated by a state within its federally approved Coastal Zone Management Program. All Air Force activities, operations, projects, and programs that affect any lands, water use or natural resources of a state's Coastal Zone must be consistent to the maximum extent practicable with the state Coastal Zone Management Plan. For Air Force installations within a Coastal Zone management area, the Integrated Natural Resources Management Plan (INRMP) must specifically address how activities and operations are consistent with the state Coastal Zone Management Plan. **(T-0)**.

3.26.2. Federal Consistency Determination. Installations must prepare a Federal Consistency Determination to assess consistency with the State Coastal Zone Management Program for any activity, regardless of location, that is likely to affect any land, water, or natural resource of a Coastal Zone in the reasonably foreseeable future. An installation must submit a Federal Consistency Determination to the appropriate state agency (e.g. Coastal Zone Coordination Council) at least 90 days before final approval of the proposed action, unless otherwise agreed upon. **(T-0)** The state produces a federal consistency review response indicating whether or not the state concurs with the determination. Ensure actions requiring consistency determinations are fully considered and addressed in applicable National Environmental Policy Act (NEPA) documentation. Analysis of the proposed action, and the purpose for the proposed action, are addressed no later than the draft version of the NEPA documentation, and provided

to the applicable state office for review and comment. The state response becomes part of the Air Force Environmental Impact Analysis Process documentation for the proposed project.

3.27. Coastal Barrier Resources Act of 1982 Compliance. The *Coastal Barrier Resources Act* (16 USC §§ 3501-3510) regulates the expenditure of federal funds to discourage development within boundaries of undeveloped, unprotected coastal barriers (such as a bay barrier, barrier spit, or barrier island) on the Atlantic and Gulf Coasts, as identified in the Coastal Barriers Resources System maps established by the Act. Federal funds may be used for permissible activities listed in 16 USC § 3505, which include national security-related military actions and the management, protection and enhancement of natural resources, and maintenance of existing structures for navigation and shoreline stabilization. Proponents must consult with the USFWS when planning activities and operations that may impact lands identified in the Coastal Barriers Resources System. **(T-0)**.

3.28. Marine Mammal Protection Act of 1972 Compliance. 16 USC §§ 1361 - 1421(h)) (referred to as the Marine Mammal Protection Act in this document) protects marine mammals, their critical habitat, and migratory routes. Installations with marine resources must address the protection of marine mammals in the Integrated Natural Resources Management Plan (INRMP) and submit a draft INRMP update or revision to the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) for review and comment. **(T-0)**. Any action undertaken by the Air Force in a marine or coastal environment, to include activities that generate noise, requires an assessment of the potential impact on marine mammals before they begin. Proponents whose activities may impact marine mammals must coordinate the proposed actions with NOAA Fisheries. **(T-0)**.

3.29. Coral Reef Protection. EO 13089, *Coral Reef Protection*, directs the protection of all coral reef ecosystems, to include those species, habitats, and other natural resources associated with coral reefs within all maritime areas and zones subject to the jurisdiction or control of the U.S. (e.g., federal, state, territorial, or commonwealth waters). Installations shall identify all coral reefs and related endemic mangrove and sea grass ecosystems within their jurisdiction in the INRMP. Installations with these protected ecosystems must address the conservation and management of these habitats in the INRMP. **(T-0)**.

3.30. Coastal America Partnership. The Department of Defense, Air Force, and other federal agencies with statutory responsibilities for coastal resources formed the Coastal America Partnership by Memoranda of Understanding. The purpose of the Coastal America Partnership is to (1) protect, preserve, and restore the Nation's coastal ecosystems through existing federal capabilities and authorities; (2) collaborate and cooperate in the stewardship of coastal living marine resources; and (3) provide a framework for action that effectively focuses expertise and resources on jointly identified problems to produce demonstrable environmental and programmatic results that may serve as models for effective management of coastal resources. In support of the Coastal America Partnership, Air Force installations are encouraged to coordinate and cooperate with partners in support of regional programs for the protection and restoration of coastal ecosystems, and to incorporate Coastal America goals within the installation INRMP when compatible with statutory authorities and military mission activities. Collaborative projects that protect or restore coastal resources on Air Force installations may be submitted for consideration to the Coastal America Awards Program.

Section 3F—FISH AND WILDLIFE MANAGEMENT

3.31. Wildlife Management Programs on Air Force Lands. The Integrated Natural Resources Management Plan (INRMP) should address the management of game and non-game fish and wildlife on Air Force installations, to include any requirement to inventory and monitor fish and wildlife resources. Prepare the INRMP in cooperation with the USFWS, state fish and wildlife agency, and National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) for installations that include or are adjacent to marine environments. Installations will ensure the resulting plan reflects the mutual agreement of the installation and the cooperating agencies for the conservation, protection, and management of wildlife resources (see **paragraph 3.6**). **(T-0)**.

3.32. Hunting, Fishing, Trapping and Outdoor Recreation Programs.

3.32.1. Program Management. The Sikes Act, 16 USC § 670a(a)(3)(A), requires that, consistent with the use of military installations to ensure the preparedness of the Armed Forces, military installations provide for the sustainable multipurpose use of the resources, to include hunting, fishing, trapping, and non-consumptive recreational access. Hunting, fishing, trapping, and dispersed outdoor recreation programs are appropriate on Air Force installations when they are consistent with INRMP goals for natural resources management, and are in accordance with installation security and safety requirements. As per 10 USC § 2671, ensure that hunting, fishing and trapping activities on Air Force installations comply with all state fish and game laws. Installation hunting, fishing, and trapping must also comply with federal laws and regulations, and be consistent with Department of Defense (DoD) principles for ecosystem management and biodiversity conservation. **(T-0)**. The designated installation natural resources manager is responsible for the oversight of hunting and fishing programs, and for inclusion of program goals and objectives in the installation INRMP. Installations may utilize the voluntary assistance of others to help manage hunting and fishing programs, to include the state fish and wildlife agency, units of the Air Force Personnel Center Directorate of Services, Force Support Squadrons, and non-Air Force affiliated clubs (e.g. Rod and Gun Club); but these organizations may not direct activities related to hunting, fishing, trapping and outdoor recreation that are outside the scope and direction of the installation INRMP. **(T-1)**. Program support provided by a Force Support Squadron may be reimbursed from user fees.

3.32.2. Fee Collection. Hunting, fishing, trapping and outdoor recreation access fees are collected by the installation and deposited into the Air Force account for fish and wildlife management (Account 57 5095). Fees shall be utilized for the conservation and management of fish and wildlife, habitat improvements, and investments in assets that directly benefit hunting, fishing, or trapping opportunities for permit holders. **(T-0)**. The INRMP should address the installation procedures for the collection of fees for hunting, fishing, trapping and access to outdoor recreation areas. Upon termination of a fee collection program for hunting, fishing, trapping, or outdoor recreation, installations must notify AFCEC/CZ and close the collection account. Refer to **paragraph 3.66.4** for additional guidance on the collection and management of user fees. **(T-2)**.

3.32.3. Access and Participation. As per the Sikes Act, 16 USC § 670a(b), the INRMP must address the specific rules and procedures for authorized participation and access to Air Force installations for hunting, fishing, trapping and dispersed outdoor recreation. The INRMP should identify access areas by category, and the authorized participants for each access area

category, using the criteria established below. A commander may restrict or exclude hunting, fishing and trapping if such activity is not compatible with the military mission. When access is denied to the general public, the installation environmental planning function must include the rationale for that determination in the INRMP. **(T-1)**.

3.32.3.1. Access Categories. Installations with unimproved lands must identify within the INRMP the availability of lands, by access category, for hunting, fishing, trapping and other dispersed outdoor recreation activities. **(T-1)**. The INRMP establishes the criteria used to designate lands into each access category, and identifies how access category designations may change with each Force Protection Condition (Normal, Alpha, Bravo, Charlie, Delta) imposed on the installation. There are three basic access area categories: Open Areas, Restricted Areas, and Off Limits Areas.

3.32.3.1.1. Open Areas. Unrestricted areas on the installation where hunting, fishing, trapping and outdoor recreation are permitted to all participants, to include the general public.

3.32.3.1.2. Restricted Areas**.** Areas designated by the commander where hunting, fishing, trapping and outdoor recreation are permitted to certain categories of participants, or under special conditions as defined by the commander. The INRMP should state the rationale by which access to an area is limited to certain categories of participants.

3.32.3.1.3. Off Limits Areas. Areas designated by the commander as being off limits to recreational hunting, fishing, trapping and dispersed outdoor recreation by any person at any time. These are areas where mission security and safety concerns do not allow such use. The INRMP should state the rationale by which access to an area is designated to be off limits due to security and safety considerations.

3.32.3.2. Participant Categories. The INRMP should establish criteria and protocols addressing user access and conduct for Open and Restricted areas by Participant Category. Do not confuse these Participant Categories with the Eligibility Categories described in AFI 34-101 *Air Force Morale, Welfare, and Recreation (MWR) Programs and Use Eligibility*. Installation policy for hunting, fishing, trapping, and dispersed recreational access to unimproved lands shall be based upon consideration of safety, mission requirements, and the ability of the natural ecosystem to sustain these activities. For Open and Restricted areas, ensure the INRMP identifies appropriate access privileges for the following categories of participants:

3.32.3.2.1. Active Duty Military (includes Reserve on full-time orders and National Guard on active duty (Title 10 status).

3.32.3.2.2. Department of Defense Civilians

3.32.3.2.3. Active Duty Military Dependents and Family Members

3.32.3.2.4. Disabled Veterans

3.32.3.2.5. Military Retirees

3.32.3.2.6. Department of Defense Civilian Retirees

3.32.3.2.7. Employees of Installation Prime Contractors (defined as a contractor under a 5-year or more term contract).

3.32.3.2.8. Civilians enlisted in the National Guard and Reserve that are not on active duty (Title 10 status).

3.32.3.2.9. General Public.

3.33. Conservation Law Enforcement. Commanders are responsible for the enforcement of state and federal laws for the protection and management of natural resources on Air Force installations. In accordance with the Sikes Act (16 USC § 670a(b)(1)(H)), installations must address how natural resource laws will be enforced in the INRMP. **(T-0)**. DoDI 5525.17, *Conservation Law Enforcement Programs (CLEP)* provides guidance for implementing conservation law enforcement requirements on DoD installations.

3.33.1. Cooperative Law Enforcement. Pursuant to the Sikes Act (16 USC § 670a(d)) and DoDI 4715.03, Air Force installations shall coordinate with appropriate agencies to support conservation law enforcement to enforce federal and applicable state laws and regulations pertaining to the management and use of natural resources. **(T-0)**. Pursuant to the Sikes Act (16 USC § 670a(d)(2)), reimbursable agreements for conservation law enforcement services are authorized with federal and state agencies having responsibility and jurisdiction over fish and wildlife resources. **(T-0)**. The installation commander shall give access to federal or state conservation law enforcement officers for the purpose of fish and wildlife law enforcement. **(T-1)**.

3.33.2. Conservation Law Enforcement by Air Force Personnel. The Sikes Act (16 USC § 670e-1) authorizes the DoD to enforce all federal natural resources laws on military installations. In accordance with DoDI 5525.17, *Conservation Law Enforcement Program (CLEP)*, all federal CLEOs, regardless of previous law enforcement training, must successfully complete the Land Management Training Program curriculum at the Federal Law Enforcement Training Center within 1 year of being hired. **(T-0)**. Individuals that have successfully completed the Land Management Training Program, but have not trained or worked as a CLEO within 1 year of completion, must re-take the training prior to receiving enforcement authority. **(T-1)**.

3.33.2.1. The installation commander shall assign CLEO duties to Air Force personnel who meet the training and certification requirements. **(T-1)**. AFCEC/CZ is responsible for tracking CLEO training and certification records, and for the management of badges and credentials to an authorized CLEO in accordance with established policy.

3.33.2.2. Air Force CLEOs must complete a minimum of 40 hours of annual refresher training specific to conservation law enforcement **(T-1)**. When feasible, they should receive training from the state fish and wildlife agency to attain knowledge of state laws and local natural resources enforcement strategies.

3.33.2.3. CLEO Position Descriptions**.** CLEO Position Descriptions shall include the specialized duties required of a CLEO as specified in DoDI 5525.17, Enclosure 3. CLEO Position Descriptions shall be developed to attain employees with a level of expertise and professionalism commensurate with other federal land management agency standards. Recommended Job Series is 1801, General Inspection, Investigation, Compliance. CLEO

job duties specified in a position shall coordinate with the Office of Special Investigations in accordance with AFI 71-101V1, *Criminal Investigations Program*. **(T-1)**.

3.33.3. Conservation Law Enforcement Actions.

3.33.3.1. Violation Notices. For minor offenses of installation regulations not covered by criminal law statutes, CLEOs may use their discretion when determining whether to issue a warning or a Violation Notice. If a CLEO decides to issue a warning, verbal or written, the incident shall be noted on a Field Information Report with the individual's information, and entered into Law Enforcement Management Information System. (T-0). The individual shall receive a copy of the warning. If a Violation Notice is issued, a U.S. District Court Violation Notice is used as the charging document to notify the magistrate court of misdemeanor offenses and 10 USC 2671 violations that occur within the Court's jurisdiction.

3.33.3.2. Violation Notices to Active Duty Military Personnel. Active duty personnel are subject to the Uniform Code of Military Justice and the penalties issued by military commanders. Active Duty personnel, to include Air National Guard personnel on Title 10 orders, may be issued a Violation Notice for natural resource violations that do not require a court appearance. When a CLEO issues a Violation Notice to an active duty person, the CLEO will provide the installation legal office with a Report of Investigation within three days of issuance. The installation legal office will determine appropriate jurisdiction over the case in accordance with the Uniform Code of Military Justice. **(T-1)**.

3.33.3.3. Felony Violations. Felonies committed on military land are referred to the local U.S. Attorney's Office. CLEOs must coordinate with the Air Force Office of Special Investigations and other federal agencies with jurisdictional authority on Felony violations to ensure notification to the assigned Assistant U.S. Attorney. **(T-0)**.

3.34. Protection of Migratory Birds. In accordance with 16 USC §§ 703-712 (referred to as the Migratory Bird Treaty Act throughout this manual) and EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, installations must conserve migratory birds and their habitats. **(T-0)**. This includes preventing or abating pollution or detrimental alteration of the environment, and incorporating migratory bird conservation into the installation INRMP when consistent with the Bird/Wildlife Aircraft Strike Hazard Plan.

3.34.1. Intentional Takes of Migratory Birds. Any proposal to intentionally kill, wound, capture, or collect a migratory bird requires a migratory bird depredation permit issued by the USFWS in accordance with 50 CFR § 21.41. **(T-0)**. Installations must submit an application to renew a migratory bird depredation permit at least 30 days prior to the expiration of a current permit Depredation of migratory birds is also subject to National Environmental Policy Act (NEPA) analysis and the Air Force Environmental Impact Analysis Process. **(T-0)**. Once a depredation permit is issued, installations will maintain records and submit reports as mandated under the terms of the permit. **(T-0)**. As per 50 CFR § 21.43, a permit is not required to control blackbirds, cowbirds, grackles, magpies, and crow species listed in the regulation. 50 CFR § 21.50 authorizes the USFWS to issue permits to remove the nests and eggs of resident Canada geese when necessary to resolve a safety issue.

3.34.2. Incidental Takes of Migratory Birds During Military Readiness Activities. In accordance with Section 315 of the Bob Stump National Defense Authorization Act of 2003

(P.L. 107-314), the Migratory Bird Treaty Act general prohibition against killing migratory birds codified at 16 USC § 703 do not apply to the incidental taking of a migratory bird by a member of the Armed Forces during a military readiness activity. A military readiness activity, as defined at 50 CFR § 21.3, includes all training and operations that relate to combat. It does not include routine operation of support functions, operation of industrial activities, or construction or demolition of support or industrial facilities. Ensure incidental takes during military readiness activities conform to the regulations in 50 CFR § 21.15. An incidental take of migratory birds for military readiness activities are allowed provided that a determination is made by the NEPA process (32 CFR Part 989) that the proposed readiness action does not have significant negative effects on a population of migratory birds. If it is determined that the readiness action has significant negative effects on a population of migratory birds, the installation must confer with the USFWS to develop and implement appropriate conservation measures to minimize and mitigate, to the extent practicable, adverse impacts of military readiness activities on migratory birds; and to monitor the impacts of such activities on affected migratory bird species. **(T-0)**. Not all operations and maintenance activities on an installation qualify as a military readiness activity. Seek legal advice if uncertain whether an activity qualifies as a military readiness activity consistent with 50 CFR § 21.15. Vegetation management within the airfield Clear Zones and Primary Surface, as defined in UFC 3-260-01, *Airfield and Heliport Planning and Design*, is a military readiness activity covered under 50 CFR § 21.15.

3.35. Bald and Golden Eagle Protection Act. The Bald and Golden Eagle Protection Act (16 USC § 668-668c) prohibits harm or harassment to bald and golden eagles. This includes removal of inactive nests as well as active nests. In accordance with 50 CFR Part 22, installations must obtain a permit from the USFWS to remove bald or golden eagle nests. **(T-0)**. Conditions of the permit may include mitigation actions to minimize impacts. Eagle permits authorize take only in circumstances where the take cannot be practicably avoided in the course of an otherwise lawful activity. Conditions of the permit may include mitigation actions to minimize impacts.

3.36. Wildlife Damage Control.

3.36.1. Nuisance Wildlife Control. Installation pest management personnel shall have primary responsibility for the control of nuisance wildlife species, although the program can receive assistance from natural resources management personnel for control of wildlife that requires specialized training and permits. **(T-3)**.

3.36.1.1. Installations must contact the state fish and wildlife agency prior to killing or trapping nuisance wildlife. Activities that affect migratory birds may require a federal permit (see **paragraph 3.34.1**). Any action that may affect a species listed for protection under the auspices of the Endangered Species Act requires consultation with the USFWS (see **Section 3G**). **(T-0)**.

3.36.1.2. The INRMP should address nuisance wildlife control objectives, appropriate control techniques, and the installation organizations responsible for each aspect of nuisance wildlife control. The installation INRMP, Integrated Pest Management Plan, Solid Waste Management Plan, and Bird/Wildlife Aircraft Strike Hazard (BASH) Plan should be mutually supportive, and adequately differentiate the responsibilities for natural resources, pest management, flight safety, public health, and veterinary services personnel for the control of nuisance wildlife. Include procedures for animal carcass disposal.

3.36.2. Wildlife Control in Support of Bird/Wildlife Aircraft Strike Hazard Reduction. The INRMP and BASH Plan must incorporate the guidance within AFI 91-202, *USAF Mishap Prevention Program* and AFI 91-212, *Bird/Wildlife Aircraft Strike Hazard (BASH) Management Program.* Coordinate draft INRMP updates with airfield operations and Flight Safety personnel to ensure conformance with airfield safety criteria. Installations may request assistance for BASH-related wildlife control issues from personnel from the Air Force Safety Center BASH office (AFSEC/SEFW). See **Section 3M** for additional BASH program requirements.

3.36.3. Emergency Wildlife Control. Emergency wildlife control measures may be warranted if unanticipated wildlife problems endanger installation operations or threaten public health. Ensure the installation INRMP, consistent with the Integrated Pest Management Plan and BASH Plan, identifies the protocols and notification requirements for emergency wildlife control consistent with the terms of federal and state depredation permits.

3.37. Participation in Conservation Banking Programs . An installation may enter into agreements for, and make payments to, an off-installation conservation banking program or other "in-lieu-fee" mitigation sponsor, to satisfy a mitigation responsibility necessary for new construction or other military activity that has the potential to adversely impact species protected under the Endangered Species Act or Migratory Bird Treaty Act. Payments made to a conservation banking program or "in-lieu-fee" mitigation sponsor for the purpose of facilitating military construction may be treated as eligible costs of the military construction project.

Section 3G—THREATENED AND ENDANGERED SPECIES MANAGMENT

3.38. Endangered Species Act (ESA) Compliance. 16 USC §§ 1531-1544 requires protection and conservation of federally listed threatened and endangered (T&E) plants and animals and their habitats. **(T-0)** Section 7(a)(1) of the ESA states that all federal departments and agencies shall utilize their respective authorities to conserve T&E species. **(T-0)**.

3.38.1. Federally Listed Species. Installations that sustain federally listed T&E species or designated critical habitat must address T&E species conservation in the Integrated Natural Resources Management Plan (INRMP). **(T-1)**. Ensure the INRMP goals and objectives provide an overall ecosystem management strategy for the protection and recovery of T&E species. When practical and consistent with military mission requirements, provide similar protection to plants and animals that are candidate species for protection by federal listing. Ensure the INRMP includes provisions addressing the requisite "benefit to the species" criteria to support a critical habitat exemption (see **paragraph 3.41**).

3.38.2. State Listed Species. INRMPs should provide for the protection and conservation of state-listed protected species when practicable and consistent with the military mission. Although not required by the ESA or federal law, provide similar conservation measures for species protected by state law when such protection is not in direct conflict with the military mission. When conflicts occur, consult with the appropriate state authority to determine if any conservation measures can be feasibly implemented to mitigate impacts.

3.38.3. Host Nation Protected Species. For installations and Air Force operations outside the U.S. and its territories, responsibility for protection of host nation-protected species is as specified in the Final Governing Standards for the host country (refer to AFI 32-7091).

3.39. Inventory and Monitoring. All installations must conduct a basic reconnaissance survey to determine the presence of any suspected federally listed Threatened, Endangered or Candidate species on an installation. **(T-1)**. Determine the survey methodology, scope, and species considered in the inventory after consultation with the USFWS or National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries), depending upon jurisdiction. Follow-up reconnaissance surveys are necessary if the USFWS or NOAA Fisheries determines that a new federally listed species may occur on the installation. Periodic resurveys and monitoring of known listed species are necessary if they are stipulated in: (1) the 'Terms and Conditions' that implement the 'Reasonable and Prudent' conservation measures rendered in a Biological Opinion from the USFWS or NOAA Fisheries, (2) a USFWS or NOAA Fisheries Species Recovery Plan, or (3) an INRMP, coordinated and approved in accordance with the Sikes Act (16 USC §§ 670a-f). Share all information collected on military lands and waters that pertains to a federally listed Threatened, Endangered, or Candidate species with the USFWS and/or NOAA Fisheries. If practical, installations shall share known information on state-listed species with the relevant state fish and wildlife agency. **(T-3)**.

3.40. Endangered Species Act (ESA) Consultation.

3.40.1. Endangered Species Act (ESA) Section 7 Consultation. Section 7(a)(2) of the ESA requires agencies to consult with the USFWS or NOAA Fisheries when proposed or ongoing actions, including the implementation of an INRMP, may affect a listed species or designated critical habitat. Installations must consult with the USFWS for terrestrial species, freshwater aquatic species, and for polar bear, Pacific walrus, manatee, and sea otters, and with NOAA Fisheries for protected saltwater fish and other marine mammals. **(T-0)**. The *Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act*, published by the USFWS and National Marine Fisheries Service, provides detailed guidance on how Section 7 consultations are done. Installations must notify the Air Force Civil Engineer Center Environmental Directorate (AFCEC/CZ) when entering into formal consultations under 50 CFR § 402.14. **(T-1)**.

3.40.2. Integrated Natural Resources Management Plan (INRMP) coordination for Endangered Species Act compliance. Installations where federally listed species occur on or near the installation should address ESA Section 7 consultation early in the preparation and review process for INRMP updates and revisions. When submitting an INRMP for interagency review, identify if the plan submitted for review covers the protection and conservation of a federally listed species. The INRMP should include an evaluation of the potential effects of INRMP implementation on listed species and their habitats, and indicate the conservation measures that are employed to manage those effects. Installations shall not include objectives for the conservation of a federally listed species in the INRMP if that species does not occur on or near the installation**. (T-1)**. If an ESA Biological Opinion has been issued as a result of an ESA Section 7 consultation, the INRMP becomes the document the Air Force uses to describe the specific programs and activities that are implemented to satisfy the required terms and conditions of the Biological Opinion.

3.40.3. Endangered Species Act (ESA) and the Environmental Impact Analysis Process (EIAP). The NEPA (Public Law 91–190, NEPA, § 102(H)), 40 CFR Parts 1500-1508, *CEQ Regulations for Implementing the Procedural Provisions of NEPA*,, and 32 CFR Part 989, Air Force Environmental Impact Analysis Process implementing regulations, require proponents

to fully consider the possible impacts of proposed actions on federally listed T&E species early in the EIAP planning and scoping process. **(T-0)**.

3.40.3.1. The ESA Section 7 requires proponents of actions that may affect a federally listed T&E species or designated critical habitat to consult with USFWS and/or NOAA Fisheries, as applicable. Submit draft EIAP documents to the USFWS and/or NOAA Fisheries for review and comment. As per Appendix B to 32 CFR Part 989, do not apply an Air Force categorical exclusion (CATEX) to a proposed action unless ESA required consultation is complete and the USFWS and/or NOAA Fisheries has concurred in writing that the action is not likely to adversely affect a federally listed threatened and endangered species. **(T-0)**. Before applying a CATEX, coordinate with the AFCEC National Environmental Policy Act Division (AFCEC/CZN) and Air Force Legal Operations Agency, Civil Law and Litigation Directorate, Environmental Law and Litigation Division (AFLOA/JACE-FSC) to ensure the use of a CATEX is appropriate and legally supportable.

3.40.3.2. Include in a Final Environmental Assessment or Environmental Impact Statement, all written correspondence with the USFWS or NOAA Fisheries documenting the completion of consultation (NEPA, § 102(C)). Mus forward copies of the final decision documents (e.g. FONSI or ROD to the USFWS and / or NOAA Fisheries when federally listed species are involved. **(T-0)**.

3.41. The Integrated Natural Resources Management Plan (INRMP) as a Substitute for Critical Habitat Designation. Pursuant to Section 4(a)(3)(B)(i) of the ESA, the Secretary of Interior "shall not designate as critical habitat any lands or other geographical areas owned or controlled by the DoD, or designated for its use, that are subject to an INRMP prepared under Section 101 of the Sikes Act (16 USC § 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation." In accordance with 50 CFR § 424.12(h), an INRMP is considered sufficient for critical habitat exemption if it meets the following criteria:

3.41.1. The INRMP provides a conservation benefit to the species. The cumulative benefits of the management activities identified in the INRMP, for the period covered by the INRMP, should maintain or provide for an increase in a species' population, or the protection, maintenance, enhancement or restoration of its habitat within the area covered by the INRMP (i.e., those areas deemed essential to the conservation of the species). A conservation benefit may result from reducing fragmentation of habitat, maintaining or increasing populations, insuring against catastrophic events, enhancing and restoring habitats, buffering protected areas, or testing and implementing new conservation strategies. Wildlife habitat management practices must be consistent with AFI 91-212 and the installation BASH Plan (See Section 3M for additional BASH program requirements). Assistant Secretary of the Air Force for Installations, Environment, and Energy (SAF/IE) shall approve any such restrictions on land use before the INRMP or agreement is signed.

3.41.2. The INRMP provides assurance that the management activities necessary to implement the goals and objectives of the plan are implemented. Persons charged with INRMP implementation should be capable of accomplishing the objectives of the INRMP, have adequate funding to implement the INRMP, have the authority to implement the INRMP, and have obtained all the necessary authorizations or approvals. Installations must ensure the

INRMP provides an implementation schedule (including projected completion dates) to achieve the goals and objectives identified in the plan. **(T-2)**.

3.41.3. The INRMP provides assurance that the conservation effort is effective. Use the following criteria to determine if an INRMP provides an effective conservation effort:

3.41.3.1. The INRMP includes biological goals (broad guiding principles for the program) and objectives (measurable targets for achieving the goals);

3.41.3.2. The INRMP provides quantifiable, scientifically valid parameters that demonstrate achievement of objectives, and standards for these parameters by which progress is measured;

3.41.3.3. The INRMP includes provisions for monitoring and, where appropriate, adaptive management;

3.41.3.4. The INRMP includes provisions for reporting progress on implementation (based on compliance with the implementation schedule) and effectiveness (based on evaluation of quantifiable parameters) of the conservation effort.

3.42. Exclusion of Military Lands from Critical Habitat Designation Due to Economic Impacts or National Security Issues. In accordance with ESA Section 4(b)(2) (16 USC § 1533(b)(2)), the Secretary of Interior may exclude areas owned or controlled by the DoD from critical habitat designation if the USFWS or NOAA Fisheries determines that the benefits of such exclusion outweigh the benefits of specifying the area as critical habitat; and that the exclusion of such area from critical habitat will not result in the extinction of the species concerned. When requesting the USFWS or NOAA Fisheries exclude military lands from a critical habitat designation proposal, the installation must provide evidence of how a critical habitat designation would impact national security. **(T-0)**.

3.43. Marine Mammal Protection Act Compliance. Installations must consult with NOAA Fisheries or the USFWS when an ongoing or proposed activity, including the preparation and implementation of an INRMP, has the potential to impact marine mammals protected under the authority of Title 16, USC §§ 1361-1421h. This requirement may be in addition to ESA consultation requirements if the species is also listed as threatened or endangered under that law. **(T-0)**.

Section 3H—FOREST MANAGMENT

3.44. Forest Management Practices on Air Force Lands. The principal objective of forest management on Air Force installations is to maintain and enhance the ecological integrity of forested landscapes while supporting the military mission. Under the principles of ecosystem management (see **paragraph 3.10**), forest treatments, to include the harvesting of forest products, may be used to achieve installation goals for forest enhancement and restoration, wildlife habitat improvement, wildfire protection, recreational development, military training requirements, airfield safety compliance, and wood production.

3.44.1. Commercial Forestry Activities. Commercial harvesting of forest products on Air Force lands is authorized, provided that such use is compatible with the military mission and consistent with the goals stated in the Integrated Natural Resources Management Plan (INRMP). Never harvest forest products for short-term profit at the expense of long-term

sustainability of other ecosystem functions. The Range Operating Agency will determine the availability of lands for commercial forestry activities on military training and testing ranges in accordance with AFMAN 13-212V1.

3.44.2. Timber Harvesting Methods. Use appropriate silvicultural practices to maintain the forest ecosystem in a healthy condition and to achieve the goals stated in the installation INRMP. Ensure the INRMP outlines the acceptable timber harvesting practices for the installation and explains, in terms of current and desired future condition, how the chosen management practices achieve the INRMP goals.

3.44.3. Best Management Practices. Implement Best Management Practices (BMPs) in forest management operations to minimize environmental impacts. Utilize applicable state BMPs for forest management operations.

3.44.4. Reforestation. Conduct reforestation activities as detailed in the INRMP. The INRMP should state the acceptable reforestation practices to meet the stated goals and objectives and minimize soil disturbance and ecological impacts.

3.44.5. Forest Road Construction and Maintenance. Installations with a commercial forest resource must evaluate the existing network of forest access roads and trails in the INRMP. **(T-3)**. Forest road construction and management should be consistent with the ecosystem management objectives stated in the INRMP. Design and maintain forest access roads in accordance with applicable state BMPs. Construct new single-purpose forest access roads only when absolutely necessary. Close temporary roads and trails constructed solely for timber harvesting operations to vehicular traffic after the timber removal is completed.

3.44.6. Forest Inventory. Installations with commercial forest land capable of producing more than 20 cubic feet/acre/year in wood biomass must maintain a forest inventory. Update forest inventories at least once every 10 years. Installations must utilize a geographic information system to record and access forest inventory data. **(T-3)**.

3.44.7. Airfield Safety. Installations with active airfields must manage forest areas so that trees do not pose a hazard to air operations. Refer to Unified Facilities Criteria (UFC) 3-260-01 for specifications on airfield flight surfaces and safety zones, and to AFI 91-212 for additional guidance on airfield safety. **(T-1)**.

3.45. Forest Product Sale Procedures. In accordance with Department of Defense Financial Management Regulation DoD 7000.14-R, Volume 11A, Chapter 16, *Accounting for Production and Sale of Forest Products,* collect payment for all forest products with economic value that are removed from Air Force lands. As per DoDI 4715.03, an installation shall not give away, abandon, carelessly destroy, and use to offset contract costs, or trade for services or supplies any forest products with marketable value. Forest products may not be used to offset contract costs associated with construction, land clearing, or other contracted activity. **(T-0)** Marketable forest products requiring removal, including those on lands under lease or designated for privatization, must be disposed of by the Air Force, or the value of the forest products deposited into the Air Force forestry account. Installations shall make an attempt to offer for sale any forest products that require removal prior to initiation of construction or other land clearing operation. These restrictions do not apply to materials determined to have no commercial value, as determined by the AFCEC/CZ Natural Resources Subject Matter Expert or a Forester employed by the federal government. Refer to **paragraph 3.66.1.1** for guidance on forest product sale revenue collection.

3.45.1. Small-Lot Sales. Forest products with an appraised value at $25,000 or less may be sold by means of an installation small-lot sales permit. Installations shall not split larger timber disposal sales into small lots to avoid formal bids. Installations may use a small-lot sales permit to remove timber appraised at greater than $25,000 when immediate tree removals are necessary to clear timber downfall resulting from a natural disaster, or to meet airfield safety requirements as defined by an impending downgrade of airfield operability status. Installations must solicit informal bids from at least three potential buyers. Document all contacts made and bids received, including contacts that respond with no bid. Upon official request from the installation, the AFCEC/CZ Natural Resources Subject Matter Expert may conduct appraisals and small-lot sales on behalf of the installation.

3.45.2. Large Sales. Installations must dispose of forest products with an appraised value at greater than $25,000 by contract sale. **(T-2)**. Utilize competitive bidding procedures and the following guidelines:

3.45.2.1. Sale Preparation. For all large forest product sales, installations must prepare contract specifications that describe in detail the forest products offered, sale areas, allowable harvest methods and restricted activities. Include maps or drawings of the gross sale area and net removal area. Installations must ensure a professional Forester or trained Forest Technician supervises the marking and harvest of forest products within the sale area. Prior to removal of forest products, installations must evaluate and document the effects of the proposed action in accordance with the Environmental Impact Analysis Process defined in 32 CFR Part 989.

3.45.2.2. Sale Appraisal. Installations must obtain an appraisal of the fair market value of forest products offered for sale. **(T-2)**. Installations must not sell forest products for less than their appraised value without first preparing a written justification approved by the installation commander or civil engineer squadron commander. **(T-2)**. Utilize regionally accepted standards for scaling, measuring, or weighing forest products. **(T-2)**. Mark forest product sale appraisal documents with "FOR OFFICIAL USE ONLY," and release appraisal documents only on a need-to-know basis. **(T-2)**.

3.45.2.3. Sale Marketing. For each forest product sale contract, prepare a solicitation for bid describing the forest products offered for sale and required harvesting specifications. Solicit bids either by means of lump-sum value or by scaled value per unit volume for each product class. Advertise forest products for sale to as many potential buyers as possible within the region specified by the servicing contracting office.

3.45.2.4. Sale Contract Term. Require removal of forest products within 1 year or less from the date of contract award unless a longer term is deemed to be in the best interest of the government. For sales extending longer than 3 years, include a rate predetermination clause to reflect changes in market value. Collect security deposits when appropriate to encourage buyers to honor payment and harvesting terms identified in the contract.

3.45.2.5. Sale Inspection. Regularly inspect ongoing forest harvesting activities. The forest products buyer is responsible for executing all the terms and conditions of the contract. The contracting office makes a determination on contract completion based upon a final inspection report indicating that all contractual obligations have been met. Document discrepancies and report them to the contracting office. Make a final inspection

at the conclusion of the contract. Allow buyers of forest products the opportunity to repair any site damage in violation of contract terms prior to withholding security deposits.

3.45.3. Protection of Sensitive Cultural and Natural Resources. In contracts for commercial harvesting of forest products, installations shall specify safeguards for protection of sensitive cultural and natural resources. To protect sensitive cultural and natural resources, include clauses that identify penalties for damages incurred, and penalties for removal of forest products not designated for disposal. **(T-2)**.

3.46. Procuring Forest Management Services.

3.46.1. Federal Assistance. Under the authority of the Sikes Act, Air Force installations may enter into interagency agreements that provide for the transfer of funds to other federal land management agencies for assistance in the form of personnel, agency services, or assistance with contracting actions that implement forest management practices, including forest product sales. The U.S. Army Corps of Engineers (USACE), under authority of 31 USC § 1535, (known as the Economy Act), may also be used as a contracting agent for the disposal of forest products or for other forest management assistance on Air Force lands. For installations on lands withdrawn from the public domain, the installation must confer with the Bureau of Land Management to determine the appropriate management and disposition of forest resources. **(T-0)**.

3.46.2. State Assistance. Under the authority of the Sikes Act (16 USC § 670c-1), installations may enter into cooperative agreements with states, local governments, Indian Tribes, and non-governmental organizations for the maintenance and improvement of natural resources, to execute forest management activities that implement the goals and objectives of an INRMP. If an agreement is executed with a state agency, the agreement should provide a means by which the state is reimbursed for obligations incurred in support of the forest management practices authorized by that agreement.

3.46.3. Service Contracts. Use service contracts for forest management support when federal, state, or in-house assistance is not available. Ensure a professional Forester, employed by the government, reviews all service contracts that implement forest management practices.

3.47. Financial Management. 10 USC § 2665 authorizes refunding forest management obligations with proceeds derived from the sale of forest products. Department of Defense Financial Management Regulation DoD 7000.14-R, Volume 11A, Chapter 16, lists the appropriate expenditures that can be reimbursed from forestry program funds. Refer to **paragraph 3.66** for additional guidance on financial management procedures for Reimbursable Conservation Programs.

3.48. Forest Protection.

3.48.1. Protection from Insects and Disease. To the extent practicable, and within budget limits, support federal, state, and local programs for the detection, control and eradication of epidemic forest insects and diseases. Refer to AFI 32-1053, *Integrated Pest Management* for guidance on the use of pesticides for forest health protection. Public Law 95-313, *Cooperative Forestry Assistance Act of 1978* and Title 16 USC § 2104 provide for U.S. Department of Agriculture (USDA), Forest Service assistance for forest health problems on all federal lands. To obtain USDA Forest Health Protection funds, contact the appropriate U.S. Forest Service state and private forestry office to obtain the required biological evaluation and endorsements.

If a USDA Forest Service biological evaluation indicates the need for insect or disease control, complete the Forest Service funding request form, and submit a copy of the funding request application along with a copy of the biological evaluation to the AFCEC/CZ Natural Resources Subject Matter Expert. AFCEC/CZ will review and consolidate Air Force funding requests and submit them to the Forest Service for consideration; with copy to the Armed Forces Pest Management Board. **(T-0)**

3.48.2. Forest Fire Protection. Refer to **Section 3Q** for guidance on wildland fire protection.

Section 3I—AGRICULTURAL OUTGRANS

3.49. Agriculture Outgrant Programs on Air Force Lands. Air Force lands may be outgranted in the form of lease, license, or permit for agricultural purposes in accordance with AFI 32-9003, *Granting Temporary Use of Air Force Real Property*, and the additional guidelines contained herein.

3.49.1. Compatibility with the Military Mission. All agricultural outgrants shall be compatible with the military mission of the installation, as determined by the installation commander. The Range Operating Agency will determine the availability of outgrant lands on military training and testing ranges in accordance with guidelines in AFMAN 13-212 and AFI 91-212. **(T-3)**.

3.49.2. Compatibility with the Integrated Natural Resources Management Plan (INRMP). Agricultural outgrants must be consistent with the goals and objectives of the installation INRMP. Agricultural outgrants for crop production, livestock grazing, equestrian operations, commercial seed harvesting, apiary placement, maple sugar collection and any other agricultural product may be conducted where feasible and compatible with the INRMP. The overriding principles of ecosystem management (see **paragraph 3.10**) also apply to any outgrant of Air Force lands for agricultural uses.

3.50. Agricultural Outgrant Program Management.

3.50.1. Administration. The USACE is the primary supporting agency for administrating agricultural outgrants on Air Force lands. The Air Force Civil Engineer Center Installations Directorate (AFCEC/CI) provides assistance for identifying the appropriate USACE District contacts when preparing or updating an agricultural lease. The installation natural resources manager collaborates with the local USACE District representative for developing agricultural outgrant documents. The supporting USACE real property office will bill outgrantees in accordance with the terms of the outgrant. **(T-2)**.

3.50.2. Outgrant Instruments. Agricultural use of Air Force property requires a lease, license, or permit prepared, awarded, and executed in accordance with AFI 32-9003. Ensure all agricultural leases require the outgrantee to pay cash, provide services, and/or make improvements to the extent that the government is receiving a fair market value for use of the land. Government-owned livestock are exempt from the fee collection requirement. Licenses and permits for agricultural uses at less than fair market value are not allowed unless the licensee or permittee is eligible for an exception from the consideration requirements under AFI 32-9003.

3.50.3. Outgrant Revenue Collection. Record revenues collected from agricultural outgrants on a DoD Form 1131, *Cash Collection Voucher*. Deposit proceeds from agricultural outgrants to Deposit Fund Account 57 F 3875.00AG (see **paragraph 3.66.3**).

3.50.4. Land Use Rules. All agriculture outgrants, to include grazing/cropland leases, licenses, and permits, require written land use rules as requirements in the outgrant to ensure the compatibility of outgrant activities with the military mission, as well as to conserve the soil, water, and other sensitive natural resources within the areas included in the outgrant. Installations will draft land use rules that implement the appropriate Best Management Practices for erosion and sedimentation control as established by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service and state guidelines. Land use rules should also be written to support the natural resources management goals and objectives in the INRMP. Installations will develop a compliance checklist from the land use rules that can be used to perform objective inspections of outgrant operations to monitor compliance. **(T-2)**.

3.50.5. Technical Oversight. The installation natural resources manager, installation Flight Safety office, and Range Operating Agency, must review and approve the agricultural outgrant documents and their associated land use rules. **(T-3)**. When practicable, seek technical assistance from an agricultural specialist from the Natural Resources Conservation Service or state cooperative extension service, local soil and water conservation district, or other agency experienced in the management of agricultural and grazing lands.

3.50.6. Compliance Inspection. Schedule inspections of agricultural outgrant operations in accordance with guidelines stated in AFI 32-9003. A qualified agronomist, livestock grazing specialist, or natural resources management specialist inspects outgrant sites to ensure that the outgrantee complies with the technical terms of the outgrant and associated land use rules. Cooperating agency personnel can assist with on-site reviews of the outgrant program to assess crop and grazing land conditions and outgrant compliance on behalf of the Air Force. The inspector completes the land use rules compliance checklist at each review. The installation natural resource manager will ensure all inspection reports are delivered to the administering real property office for further action. **(T-2)**.

3.50.7. Improvements and Services. Agricultural outgrants may require or permit the outgrantee to provide agricultural land improvements, services, or other in-kind consideration in lieu of a portion or all of the cash payment due the U.S. government for the value of an agricultural lease. The administering real property office calculates the fair market value of any such improvements and services, and deducts the amount calculated from the cash rent or payment due the U.S. government. Ensure outgrant instruments provide that all such improvements become the property of the U.S. government. Installations with outgrants that allow improvements, services and other in-kind consideration in lieu of a portion or all of the cash payment must provide a justification for the substitution of in-kind consideration for the cash payment in the INRMP. **(T-2)**. The INRMP justification should evaluate the impact of improvements, services, and other in-kind consideration to the economic sustainability of the program, to the military mission, and to the achievement of INRMP goals and objectives. **(T-2)**.

3.51. Guidelines for Livestock Grazing. Installations will ensure livestock grazing programs adhere to the following guidelines:

3.51.1. Livestock grazing must be consistent with the use of the installation to support military readiness. **(T-2)**.

3.51.2. Livestock grazing programs must support the goals and objectives of the installation INRMP. **(T-2)**. Grazing may not be authorized unless such use is documented in the INRMP as appropriate to achieve land management goals. **(T-2)**.

3.51.3. Livestock grazing programs must not degrade the natural ecological integrity of the landscape. **(T-2)**. Installations must not allow grazing within native plant communities where it has been determined that such use is inappropriate for the plant community type. **(T-2)**. Must suspend grazing on lands where historic overgrazing and other abusive grazing practices have limited the ability of the plant community to recover. **(T-2)**.

3.52. Guidelines for Agricultural Crop Production. Crop production programs should support the goals and objectives of the installation INRMP and Bird/Wildlife Aircraft Strike Hazard Plan. Installations with active runways must coordinate any new cropland outgrant proposals with the installation Safety Office and Airfield Manager. **(T-2)**.

3.53. Monitoring Outgrant Lands for Compliance with the INRMP. Installations must monitor outgranted lands to ensure that land use is in compliance with the applicable land use rules and the land stewardship goals, objectives, and implementing guidelines stated in the INRMP. **(T-2)**. Installations with agricultural outgrants should include a description of the monitoring program in the INRMP. Installations will ensure monitoring programs adhere to the following guidelines:

3.53.1. Monitor cropland outgrants annually, or when environmental conditions warrant, to ensure that they do not create unacceptable soil losses from erosion or cause point-source or non-point pollution to any natural water body. **(T-2)**. Also monitor other direct and indirect impacts of agriculture outgrant activities on surrounding land and water resources. **(T-2)**.

3.53.2. Monitor water runoff from cropland outgrants as needed to detect levels of pesticides or fertilizer that exceed state regulatory requirements. **(T-2)**. Determine the location, method and frequency of water samples through consultation with the appropriate state agency. **(T-2)**.

3.53.3. Monitor livestock grazing outgrants using sample plots, photo points, permanent grazing enclosures, and other acceptable means to evaluate forage condition, trend, and utilization, and determine if the overall health of the rangeland resources are being sustained. **(T-2)**. Also note the presence and extent of invasive plant species. **(T-2)**.

3.53.4. Monitor all agricultural outgrants to ensure they do not attract wildlife that pose a risk to airfield operations. **(T-2)**. Refer to AFI 91-212 for additional guidance on airfield safety requirements. **(T-2)**. Consult with Air Force Safety Center (AFSEC/SEFW) wildlife control specialists if wildlife control measures are warranted. **(T-2)**.

3.54. Pest Management on Outgranted Lands.

3.54.1. Use of Pesticides by Outgrantee. Ensure any application of pesticides on Air Force lands complies with AFI 32-1053. Ensure outgrantees performing pesticide application on Air Force lands maintain the certification requirements of the state, territory, or host nation in which the installation lies. Outgrant instruments require that the outgrantee obtain the approval of the installation pest management point of contact prior to any pesticide application, and report all actual pesticide usage (in pounds of active ingredient) to the pest management point of contact.

3.54.2. Control of Noxious, Exotic, and Invasive Species. Air Force agricultural outgrant programs must comply with the requirements of the Federal Noxious Weed Act 7 USC § 2801.

(T-0). Outgrant programs should, to the extent practicable and within the limits of available funds, support state and federal programs for the control of noxious, exotic, and invasive plant species (see **Section 3L**). Installations may enter into cooperative agreements with local area government entities that establish integrated pest management principles for the control of undesirable plant species. Expenditure of agricultural program funds to control noxious, exotic and invasive species should be consistent with the level of effort exhibited on similar federal, state or private agriculture and grazing lands in the vicinity of the installation.

3.55. Financial Management. 10 USC § 2667 authorizes the use of revenues from agricultural outgrants for agriculture program operating expenses as well as to support other Air Force natural resources program initiatives. Refer to **paragraph 3.66.3** for guidance on financial management procedures for Air Force agricultural outgrant programs.

Section 3J—OUTDOOR RECREATION

3.56. Outdoor Recreation Planning. The Sikes Act (16 USC § 670c) authorizes military installations to carry out a program for the development, enhancement, operation, and maintenance of public outdoor recreation resources in accordance with the installation Integrated Natural Resources Management Plan (INRMP). Ensure all developed and dispersed outdoor recreation activities are consistent with the INRMP. Allow use of outdoor recreation resources by the general public when such use is deemed by the commander to be compatible with the military mission and does not exceed the recreational carrying capacity of the land. Natural resources managers should collaborate with the installation Community Planner, Air Force Personnel Center Directorate of Services, Force Support Squadron, Flight Safety, and other stakeholders in the planning and development of outdoor recreation on an Air Force installation; and with the Range Operating Agency for Air Force ranges. The INRMP identifies the areas on the installation where outdoor recreation activities are appropriate, and discusses the compatibility of outdoor recreation programs with the military mission. Natural resource managers will ensure installation recreation areas are categorized in the INRMP in accordance with the access and participation guidelines in **paragraph 3.32.3**. **(T-1)**.

3.57. Recreational Off-Road Vehicle Use. Ensure the INRMP includes installation policy on the use of off-road vehicles, to include mountain bikes. Allow use of off-road vehicles only after thoroughly analyzing the impact of such use on soils, archeological sites, wildlife, water quality, and other ecosystem attributes. Periodically monitor and evaluate for damage any areas designated for off-road vehicle use. Refer to EO 11989, *Off-road Vehicles on Public Lands*, May 24, 1977, for federal policy on off-road vehicle use.

3.57.1. Restrict use of off-road vehicles, including mountain bikes and other all-terrain vehicles, to areas that can sustain their use without damage to natural or cultural resources.

3.57.2. Close areas that are damaged from off-road vehicle use to prevent further damage. Undertake rehabilitation projects to restore the damage.

Section 3K—LAND MANAGMENT

3.58. Land Management Programs. Air Force land management activities are intended to protect and enhance desirable natural and man-made features on the installation. Air Force land management programs include landscape design, grounds maintenance, urban forest management,

golf course maintenance, Bird/Wildlife Aircraft Strike Hazard (BASH) reduction, irrigation and water management, pest management, invasive species management, erosion control and non-point source pollution prevention.

3.58.1. Landscape Design. Landscape design and maintenance activities should comply with the land management goals of the Integrated Natural Resources Management Plan (INRMP) and the BASH Plan. To the maximum extent possible, utilize regionally native plants in landscape designs for improved and semi-improved grounds. Do not utilize non-native species that tend to be invasive and reproduce outside the intended growing area. When feasible, convert landscapes dominated by non-native plants to native trees, shrubs, or grasses. Design landscapes that reduce maintenance inputs in terms of energy, water, manpower, and equipment. Choose plant materials adapted to local environmental conditions that have the potential to reduce the need for irrigation, fertilization or pesticides to maintain a healthy condition. Irrigate installation grounds only when necessary to fulfill a justified user requirement. Do not establish or maintain vegetative species on or adjacent to the airfield that provide food, cover, roosting or nesting habitat to wildlife. Refer to the installation BASH Plan for a list of recommended landscape plants that are least attractive to wildlife.

3.58.2. Grounds Maintenance Categories. Establish grounds maintenance practices according to grounds maintenance category delineations. For purposes of designating the intensity of grounds maintenance, ensure the INRMP identifies and maps installation grounds into categories of ‘improved’, ‘semi-improved’, and ‘unimproved’ as defined below. The INRMP should describe the scope of grounds maintenance activities that are planned to take place within each category. Where practicable, convert improved grounds to semi-improved or unimproved grounds, and convert semi-improved grounds to unimproved grounds.

3.58.2.1. Improved Grounds. Includes land occupied by buildings and other permanent structures as well as lawns and landscape plantings on which grounds maintenance personnel annually plan and perform intensive maintenance activities. Improved Grounds include the cantonment area, parade grounds, drill fields, athletic areas, golf courses (excluding roughs), cemeteries, and housing areas. Grass in these areas is normally maintained by regular mowing during the growing season.

3.58.2.2. Semi-Improved Grounds. Land where periodic maintenance is performed primarily for operational reasons (such as erosion and dust control, bird control, and visual clear zones). This land use classification includes areas adjacent to runways, taxiways, aprons, runway clear zones, lateral safety zones, rifle and pistol ranges, weapons firing and bombing ranges, picnic areas, ammunition storage areas, antenna facilities, and golf course roughs. Semi-improved grounds areas are mowed less often than the maintained turf grass on improved grounds.

3.58.2.3. Unimproved Grounds. Land that is not classified as ‘improved’ or ‘semi-improved’ grounds. Unimproved grounds include forest lands, croplands and grazing lands, lakes, ponds, and wetlands, and any areas where natural vegetation is allowed to grow unimpeded by maintenance activities.

3.58.3. Urban Forest Management. The INRMP should state long-term goals and objectives to achieve a desired future condition for installation landscape trees (i.e., the urban forest). The INRMP should include a list of recommended landscape trees and shrubs that is based upon site compatibility, life expectancy, maintenance requirements, and are not attractive to wildlife

as per BASH safety requirements. Replacement plantings should favor native trees and shrubs or other species that are able to survive with minimal maintenance requirements. Do not plant trees or shrubs that require irrigation for survival beyond an initial two-year establishment period. Ensure that tree plantings do not create a future hazard for aircraft and flight operations. An Urban Forest Management Plan may be developed as a component plan of the INRMP.

3.58.4. Pest Management. In accordance with AFI 32-1053, ensure the installation Integrated Pest Management Plan addresses all strategies for managing pests. Natural resources managers will coordinate with pest management personnel to ensure that the Integrated Pest Management Plan and INRMP are mutually supportive and not in conflict. **(T-1)**.

3.58.5. Erosion Control and Non-point Source Pollution Prevention. Use applicable Best Management Practices (BMPs) to minimize soil erosion and non-point sources of water pollution. To determine appropriate BMPs, consult the USDA Natural Resource Conservation Service, local soil and water conservation district, state agricultural extension office, or state water quality office.

3.59. Mineral Leasing. The Bureau of Land Management is responsible for mineral leasing on federal lands. The Air Force Civil Engineer Center, Installations Directorate is the point of contact for coordination on all proposed mineral exploration and mining on land controlled by the Air Force, and for negotiation of reclamation requirements. The Air Force will ensure mineral leases include provisions for Air Force to be reimbursed for any damage to natural resources or removal of commercial timber resulting from oil and gas leasing or mineral exploration and mining.

3.60. Clean Water Act (33 U.S. Code § 1251 et seq.) Compliance. Activities that may impact waters and wetlands of the United States as defined in 40 CFR § 110.1, require evaluation for compliance with Clean Water Act regulations. (T-0).

3.60.1. Waters of the U.S. (WOTUS). WOTUS, also referred to as jurisdictional wetlands, are those wetlands, water bodies and waterways that fulfill the criteria as jurisdictional WOTUS subject to the regulatory requirements of the Clean Water Act. Site level jurisdictional delineations of WOTUS are mandatory for proposed development activities that may affect wetlands, streams, and water bodies, and are the responsibility of the proponent as part of project costs. (T-0) The proponent of any activity that may affect known or suspected WOTUS should conduct a jurisdictional delineation utilizing the criteria approved by the Environmental Protection Agency and affirmed by the U.S. Army Corps of Engineers (USACE). The Air Force will refer to and accept as determinative the current USACE definitions for WOTUS under USACE jurisdiction. Jurisdictional delineations are valid for a limited period of time, as established by the USACE district regulatory office. Installations are not required to update an expired jurisdictional delineation unless there exists a proposed mission activity that necessitates an updated demarcation of jurisdictional WOTUS boundaries by the proponent activity.

3.60.2. Clean Water Act Section 404 Compliance. Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged or fill material into jurisdictional waters and wetlands of the U.S. Actions that may impact wetlands, to include dredging, filling, and activities that may displace soil or other materials into a wetland, may require a Section 404 permit from the USACE and/or delegated state authority. Submit USACE Engineer Form 4345, Application for Department of the Army Permit to the appropriate USACE District Engineer prior to any land disturbance activity located in or near a regulated wetland area or

regulated WOTUS. Along with the permit application, submit a vicinity map and site development plan that includes a cross-sectional view of the affected area showing limits of jurisdictional waters, the normal water level, volume of fill material to be discharged below ordinary high water. In some states, the authority to issue Clean Water Act Section 404 permits has been delegated to the state, and additional procedures may apply. (T-0).

3.60.3. Clean Water Act Section 401 Compliance. Clean Water Act Section 401 directs that any proponent of an action that requires a federal license or permit, such as a Section 404 or National Pollution Discharge Elimination System permit, must obtain a water quality certificate from the state water pollution control agency. The water quality certificate certifies that the action complies with state water quality criteria. State permits to undertake projects within a specified buffer zone surrounding wetlands may also be required. When applying for a permit under state wetland protection laws, certain information not required for an USACE permit, such as a delineation of a regulated buffer area, may also be required. In some cases, permit applications may be submitted concurrently for review by both the state and the USACE. (T-0).

3.60.4. Finding of No Practicable Alternative (FONPA). DoDI 4715.03, Clean Water Act Sections 401, 404 and 404(b)(1) guidelines, and provisions of EO 11990, prohibit agencies from undertaking or supporting any new construction or related activities located in wetlands unless the SecAF, or the Chief of the National Guard Bureau, or an official duly delegated authority to act on his/her behalf for Air National Guard, finds that (1) there is no practicable alternative to such new construction or related activities, and (2) that the proposed action includes all practicable measures to minimize harm to the wetlands from such use. When there is no practicable alternative to taking an action in a wetland, makes a Finding of No Practicable Alternative determination via signature on the Finding of No Significant Impact or Record. (T-0).

3.60.4.1. The FONPA is included within a NEPA FONSI or ROD. It explains why there are no practicable alternatives to an action affecting a wetland, as established in an appropriate level NEPA analysis. When there is no practicable alternative to taking an action in a wetland, a FONPA determination is made by the SecAF, (or an official who has been duly delegated the authority to act on the Secretary's behalf,) or the Chief of the National Guard Bureau (or an official duly delegated authority to act on his/her behalf), via signature on the FONSIor ROD (see paragraph 3.20).

3.60.4.2. To support the required FONPA, prior to any new construction or related activities located in wetlands, proponents first prepare an analysis and documentation, in accordance with Clean Water Act Sections 401, 404 and 404(b)(1) guidelines, DoDI 4715.03, and provisions of EO 11990, Protection of Wetlands that demonstrates no practicable alternatives to such construction or activities exist, and that the proposed action includes all practicable measures to minimize harm to wetlands. Proponents will follow the process outlined in paragraph 3.20 for the required assessments of proposed actions potentially affecting wetlands. (T-0).

3.61. Rivers and Harbors Act of 1899 Compliance. The Rivers and Harbors Act of 1899, 33 USC § 401, establishes a program to regulate activities affecting navigable WOTUS. Section 10 of the Act (33 USC § 403) directs that proponents must obtain a Section 10 permit administered by the USACE for construction, excavation, or deposition of materials in, over, or under navigable

waters, or for any work which would affect the course, location, condition, or capacity of those waters. Activities requiring Section 10 permits include structures (e.g., piers, wharves, breakwaters, bulkheads, jetties, weirs, transmission lines) and work such as dredging or disposal of dredged material, or excavation, filling, or other modifications to the navigable WOTUS. Installations must contact the USACE prior to construction or other activities that may affect open water habitats to determine if a Section 10 permit is necessary. (T-0).

3.62. Invasive Species Management Policy. EO 13112, *Invasive Species*, requires all Federal agencies to prevent the introduction of invasive species, provide for their control, and minimize their economic, ecological, and human health impacts. Under EO 13112, installations will, to the extent practicable and permitted by law, not authorize, fund, or carry out management actions that are likely to cause the introduction or spread of invasive species. Furthermore, Title 7 USC § 2814 requires that each federal agency establish and adequately fund an undesirable plants management program through the agency's budgetary process. **(T-0)**.

3.63. Air Force Invasive Species Management Program. Installations must address invasive species management in the installation Integrated Natural Resources Management Plan (INRMP). **(T-0)**. Formulate and implement INRMP goals and objectives to detect, respond to, and control populations of invasive species in a cost-effective and environmentally sound manner whenever and wherever practical. The installation natural resources manager shall give priority consideration to control of invasive species that impact Air Force testing and training operations, and where control measures have the greatest opportunity to restore a self-sustaining native ecosystem. INRMP goals should be consistent with the Federal Invasive Species Management Plan and other guidelines promulgated by the National Invasive Species Council. The invasive species management element of the INRMP should provide specific information on species to be controlled, recommended control methods, and appropriate level of control effort in consideration of available resources.

3.63.1. Invasive Species Detection and Monitoring. The INRMP should include a current assessment of the presence and extent of exotic and invasive species on the installation. Conduct surveys to detect and map invasive species. Installations will monitor invasive species populations and update inventory information as new species are discovered and known populations are controlled or eliminated.

3.63.2. Invasive Species Control on Agricultural Outgrants. Cropland and grazing outgrants on Air Force properties should include requirements for the outgrantee to prevent the introduction and spread of invasive species. Agricultural outgrant agreements may include requirements to implement and report control measures for invasive species that are identified in the INRMP.

3.63.3. Control of Feral Animals. Installations will not, to the extent practicable and permitted by law, authorize, fund, or carry out activities that are likely to cause the introduction or spread of feral dogs, cats, horses, cattle, pigs, goats or other non-native domesticated animals on Air Force-controlled lands. The INRMP must address the specific policies, programs and methods used to control feral animals on Air Force installations. Feeding or harboring of feral domesticated species on Air Force installations is prohibited **(T-2)**.

3.63.4. Interagency Cooperation. Title 7 USC § 2814 and the Sikes Act (16 USC § 670-c-1) authorize cooperative agreements with state agencies, Indian Tribes, local governments, and nongovernmental entities for the control of undesirable plant species on federal lands. Partner

with other federal, state, and local agencies and adjacent landowners in joint control strategies to collaborate efforts for the control of undesirable species and increase the effectiveness of control measures. Installations may participate in state or regional Exotic Pest Plant Councils and Cooperative Invasive Species Management Areas at a level of effort that is commensurate with efforts by the partners and within the legal authority of the Air Force.

3.63.5. Biosecurity. The movement of invasive and exotic species through the worldwide transportation network directly threatens military readiness and operations. The installation INRMP must support installation biosecurity protocols for the transport of materials. When necessary, the INRMP shall include goals and objectives to prevent the intrusion of invasive and exotic species at critical control points for inbound and outbound cargo.

Section 3L—Bird/Wildlife Aircraft Strike Hazard

3.64. Bird/Wildlife Aircraft Strike Hazard (BASH) Program. The mission of the Air Force BASH program is to prevent wildlife-related aircraft mishaps and reduce the potential for wildlife hazards to aircraft operations. Accomplishing this goal requires knowledgeable natural resources management on and adjacent to installation airfields by personnel with an understanding of wildlife hazards to flight safety. Military airfields are artificially designed environments, specifically intended for the launch and recovery of aircraft. Installation natural resources management activities must comply with the requirements of AFI 91-202, AFI 91-204, *Safety Investigations and Reports*, and AFI 91-212. Vegetation management practices within or beneath the airfield clear zones, primary surface, lateral clearance zone, accident potential zones, and approach-departure clearance surface, as defined in Unified Facilities Criteria (UFC) 3-260-01 *Airfield and Helicopter Planning and Design*, must be managed to prevent the development of habitat for wildlife that pose a threat to flight safety. The AFSEC/SEFW is the OPR to provide technical assistance to installations on BASH issues. The Air Force Civil Engineer Center, Operations Directorate (AFCEC/CO) and Environmental Directorate (AFCEC/CZ) also provide technical assistance and support to the Air Force BASH program.

3.64.1. The installation Integrated Natural Resources Management Plan (INRMP) and the BASH Plan must be mutually supportive and consistent. **(T-1)**. The INRMP should address habitat management techniques that can reduce the potential for wildlife hazards to aircraft operations. Reference the BASH Plan in the INRMP. A BASH Plan designated For Official Use Only is exempted from public review, but is available to the USFWS and state wildlife agency upon request.

3.64.2. Natural resources personnel will assist the installation Flight Safety office and others in the development and implementation of the BASH Plan. Natural resource personnel will assist the Flight Safety office in providing oversight to external agencies or contractors involved in the implementation of the BASH program on Air Force property. **(T-1)**.

3.64.3. The installation natural resources manager must be an active member of the installation Bird Hazard Working Group. **(T-1)**.

3.64.4. Installations will establish procedures for coordination and review of construction and infrastructure improvement projects (e.g. landscaping, waste water treatment, golf courses etc.) to ensure that any BASH-related impacts are considered. **(T-1)**.

3.65. Natural Resources Management in the Airfield Environment. Review all aspects of installation natural resources management for potential wildlife hazards to aircraft operations. Manage the land adjacent to aircraft operations areas to minimize attractions to wildlife. Refer to Federal Aviation Administration Advisory Circular 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports* for guidance on identifying land uses near airfields that have the potential to attract hazardous wildlife.

3.65.1. Airfield Vegetation Management. Manage vegetation within and around airfields to discourage wildlife. Vegetation management within the airfield environment must support BASH Plan objectives. Manage vegetation within all areas identified as a Wildlife Exclusion Zone in the BASH Plan to satisfy wildlife abatement objectives. Promote the establishment of a vegetative cover that reduces the attractiveness of the airfield to wildlife within a minimum distance of 500 feet from any aircraft movement area, and in accordance with grass height requirements specified in AFI 91-212 and AFI 91-202. Maintenance of vegetation also requires prevention of tree penetration into the airfield imaginary surfaces. Airfield Manager, Flight Safety, and the installation Community Planner must coordinate and approve airfield vegetation management objectives stated in an INRMP. **(T-1)**.

3.65.2. Management of Wildlife in Support of the Bird/Wildlife Aircraft Strike Hazard (BASH) Plan. In support of the BASH Plan, the INRMP should evaluate both existing and potential wildlife hazards to aircraft operations. The AFSEC/SEFW and installation Flight Safety office are responsible for the overall Air Force BASH program. Natural resources and pest management personnel are also an integral part of every installation BASH program.

3.65.2.1. The INRMP should identify wildlife species that may pose a hazard to aircraft operations, and prescribe habitat management techniques for areas outside the controlled airfield that can be used to mitigate the threat. Installations must confer with the Air Force Safety Center and Federal Aviation Administration data on wildlife-related aircraft mishaps to identify those species that are most often involved in aircraft mishap incidents. **(T-1)**.

3.65.2.2. Airfield Wildlife Damage Control. The installation BASH Plan shall identify roles and responsibilities for control of wildlife hazards on the airfield, and shall designate the office responsible for maintaining federal and state depredation permits acquired in support of the BASH program, to include federal migratory bird depredation permits and state wildlife depredation permits.

3.65.2.2.1. Installations must obtain depredation permits from the USFWS pursuant to the Migratory Bird Treaty Act for intentional takes of migratory birds in support of the BASH program. Refer to **paragraph 3.34** for guidance on activities that may affect migratory birds.

3.65.2.2.2. For game animals under state jurisdiction, installations must coordinate wildlife depredation activities with the state wildlife management agency. **(T-2)**.

3.65.2.2.3. The Installation Management Flight, Environmental Element, is responsible for maintaining records for all wildlife depredation permits on an installation. If the BASH Plan designates a different OPR for maintaining federal and state depredation permits, that office must submit copies of all records and reports required by a permit to the Environmental Element. **(T-2)**.

3.65.2.3. If a federally protected species is present or suspected to be present on an active airfield, notify AFSEC/SEFW to identify risks to determine flight safety and mission capability risks, and to determine acceptable mitigation actions.

3.65.2.4. Coordinate INRMP updates with the installation Flight Safety Office, and AFSEC/SEFW as needed, to ensure wildlife control methods specified in a BASH Plan and the permits required are referenced in the installation INRMP.

3.65.3. Management of Wetlands in the Airfield Environment. Wetland areas near an airfield may create potential hazards to aircraft operations. Innovative techniques to manage wildlife in wetlands should be explored and implemented. Explore and pursue legally defensible actions to reduce or eliminate wetlands on the airfield to the maximum extent possible when their presence attracts wildlife that threatens the flight mission. While "no net loss" of wetlands is an important aspect of EO 11990, *Protection of Wetlands*, flight safety is an Air Force imperative that may require removal or modification of wetlands in accordance with regulatory procedures (see **Section 3C**).

3.65.4. Airfield Drainage Ditches. **Installations must m**anage drainage ditches to reduce their attractiveness to wildlife. Do not locate storm water runoff retention ponds beneath the airfield approach-departure clearance surfaces as defined in UFC 3-260-01. Coordinate with the appropriate regulatory authority to determine if maintenance of airfield drainage requires a permit in accordance with Section 404 of the Clean Water Act, or qualifies under a U.S. Army Corps of Engineers nationwide permit issued in accordance with 33 CFR Part 330, *Nationwide Permit Program*. **(T-0)**.

3.65.5. Landscaping Around Airfields. Installations must not use landscape plant material that attracts birds or animals on and around the airfield. Remove any landscape plants in the vicinity of the airfield that are known to attract birds or wildlife.

3.65.6. Managing Agricultural Outgrants in the Airfield Environment. Agricultural and grazing outgrants (see **Section 3I**) must be compatible with the installation BASH Plan and INRMP. Installations must coordinate proposals for outgrants with the installation Bird Hazard Working Group to ensure that proposed livestock grazing, crops grown, and the agricultural methods used do not negatively impact flight safety. Agricultural activities are not permitted within 500 feet of an aircraft movement area. Grain crops should never be grown near an airfield. Must ensure strict livestock control and proper fencing to prevent livestock access to the airfield. **(T-1)**.

Section 3M—NATURAL RESOUCES BUDGETING

3.66. Funding Sources. This chapter outlines the appropriate funding sources, funding priorities, and level of effort for Air Force conservation programs. Funding sources include the Operations and Maintenance (O&M) appropriation, Other Procurement appropriation, reimbursable conservation program accounts for forestry, agriculture, fish and wildlife and outdoor recreation management, the Department of Defense (DoD) Legacy Resource Management Program, and other sources such as those that may be obtained through grants or cooperative agreements executed under authority of the Sikes Act.

3.67. Air Force Natural Resources Program Funding. Conservation program requirements eligible for O&M funding are programmed as part of the Environmental Quality (EQ)

Programming and Budget process as described in AFI 32-7001. The Air Force Civil Engineer Center, Environmental Directorate (AFCEC/CZ) will provide additional information on programming and budgeting for EQ O&M requirements annually in the form of the EQ Programming Matrix and EQ Standard Titles Guidance. Program natural resources requirements for current year and outwears using the applicable AFCEC/CZ guidance. Use the EQ Programming Matrix provided by AFCEC/CZ to determine if the requirement is valid or not valid for EQ funding.

3.68. Reimbursable Conservation Program Funds. Funds generated from the sale of forest products, agricultural products, grazing and cropland outgrants, and the collection of fees for hunting, fishing, trapping and other outdoor recreation activities may be reimbursed to MAJCOMs, Field Operating Agencies and installations for support of natural resources programs under certain conditions set forth by law. AFCEC/CZ is responsible for the administration and management of Reimbursable Conservation Program funds.

3.68.1. Forest Management Program.

3.68.1.1. Forest Management Revenue Collection. Record revenues collected from forest product sales on a DoD Form 1131, *Cash Collection Voucher*. Deposit proceeds from forest product sales in accordance with Air Force Civil Engineer Center financial guidelines issued each fiscal year. Sale contracts may provide for scheduled payments by the buyer. If sales are made on a unit weight basis, use the weight tickets from certified government or commercial scales as a basis for collection. The Department of Treasury Pay.gov online collection system may be used to collect funds from the public for small-lot forest product sales within established Department of Treasury limits and policy. Do not deposit refundable security deposits received from a buyer with forest product sale collections. Instead, collect security deposit payments in a temporary suspense account 57X6501.SDEP until funds are either disbursed back to the buyer or converted to revenue collections.

3.68.1.2. Forest Management Reimbursements. 10 USC § 2665 authorizes reimbursement of costs directly related to the production of forest products with proceeds derived from the sale of the forest products. Eligible forestry program reimbursements include obligations funded by O&M (appropriation 3400) or Other Procurement (appropriation 3080) that are directly related to the economic production and sale of timber, logs, pulpwood, Christmas trees, posts and poles, pine straw, stump wood, bark and other mulch, cones, seeds, mistletoe, firewood, and wood chips. Reimbursement of forest management obligations may not exceed the limit set by funding authorization documents. AFCEC/CZ must monitor forestry proceeds and obligations within each fiscal year, and reduce the forestry program funding authorizations and reimbursements when necessary to avoid a program deficit. Additional budget guidance and procedures for the forest management program are located in AFMAN 65-605 V1, *Budget Guidance and Technical Procedures*. Forest management expenses authorized for reimbursement from forestry proceeds are:

3.68.1.2.1. Forest Improvement. Obligations incurred for the improvement of forest land, to include pre-commercial tree thinning, pruning, and the control of undesirable vegetation.

3.68.1.2.2. Reforestation. Obligations incurred for establishment and regeneration of forest stands, to include preparing sites, planting trees, and controlling insects, disease, and unwanted vegetation during the establishment period.

3.68.1.2.3. Forest Protection. Obligations incurred for the protection of forest land capable of the economic production of forest products, to include protection from fire, insects, diseases, animals, and erosion. Forest management program funds may only be used to reimburse costs of forest protection measures that are specifically conducted to protect and enhance a commercial forest resource. Obtain reimbursement from proponent activities for costs incurred in mission-related fire protection and suppression that supports military training, installation operations, range use, munitions testing and evaluation.

3.68.1.2.4. Forest Access Roads. Obligations incurred for construction, reconstruction, repair, and maintenance of forest access roads and trails used primarily for forest improvement operations and the harvest of forest products.

3.68.1.2.5. Sales of Forest Products. Obligations incurred in the preparation for sales of forest products, to include marking, surveying, mapping, appraisal, marketing, contract preparation, contract advertising, escorting prospective bidders, contract administration, and enforcing compliance of forest product sales contracts.

3.68.1.2.6. Administrative Expenses. Obligations incurred for administration of a commercial forest management program, to include supervising, planning, programming, conducting field surveys, inventories, training, and attending professional forestry meetings. Administrative expenses may include salary for Air Force civilian employees primarily engaged in commercial forestry operations.

3.68.1.2.7. Forest Management Vehicles and Equipment. Obligations incurred for the procurement of vehicles and equipment used exclusively in support of forest management on Air Force installations.

3.68.2. Department of Defense Forest Reserve Account. 10 USC § 2665 provides for the distribution of net proceeds (gross collections less the obligations incurred) from installation forest product sales between the state government and the DoD Forest Reserve Account. States in which the revenue was generated receive 40 percent of net proceeds for each installation that registers a net gain. The remaining net proceeds are deposited to the DoD Forest Reserve Account and managed by the Office of the Assistant Secretary of Defense (Sustainment) according to the guidelines in Department of Defense Financial Management Regulation DoD 7000.14-R, Volume 11A, Chapter 16. Forest Reserve Account funds can be used to fund forestry programs as well as other conservation programs and projects that implement the goals and objectives of an approved INRMP. AFCEC/CZ reviews proposals requesting Forest Reserve Account funding and recommends projects for approval to the Office of the Assistant Secretary of Defense (Sustainment). The AFCEC/CZ Natural Resources Subject Matter Expert serves as the Air Force representative on the Forestry Subcommittee of the DoD Conservation Committee as indicated in DoDI 4715.03. Forest Reserve account funds for approved Air Force projects are issued through AFCEC/CZ for further distribution and program oversight.

3.68.3. Agriculture Outgrant Program.

3.68.3.1. Agriculture Outgrant Program Revenue Collection. Record revenues collected from agricultural outgrants on a DD Form 1131, *Cash Collection Voucher*. Deposit proceeds from agricultural outgrants in accordance with AFCEC financial guidelines issued each fiscal year.

3.68.3.2. Agriculture Outgrant Program Reimbursements. 10 USC § 2667(e)(3) authorizes the use of proceeds from agricultural outgrants and sales of agricultural products to cover the administrative expenses of agricultural leasing, and to finance natural resources management activities that implement an approved INRMP. These obligations include costs of normal operations (appropriation 3400) or investment equipment (appropriation 3080). Authorized uses of cropland and grazing funds include:

3.68.3.2.1. Civilian Pay. Use of agricultural funds for civilian pay is limited to persons providing direct support of agriculture programs on Air Force installations.

3.68.3.2.2. Administrative Expenses. Agriculture program funds may be used for administrative oversight of agricultural outgrants, and for expenses related to travel, training, attendance at professional and scientific meetings, and supplies that are directly related to the management of natural resources on Air Force installations.

3.68.3.2.3. Land Improvements. Agriculture program funds may be used for land improvement expenses that increase the productivity and value of the land for outgrant purposes.

3.68.3.2.4. Agriculture Program Vehicles and Equipment. Vehicles and equipment purchased with agricultural funds may only be used in support of agriculture outgrant management, or in support of INRMP implementation.

3.68.4. Reimbursable Fish and Wildlife Management Program.

3.68.4.1. Fish and Wildlife Program Revenue Collection. Record revenues collected from hunting, fishing, trapping and other outdoor recreation on a DD Form 1131, *Cash Collection Voucher*. Alternatively, permit fees can be sold online over the internet if collected into the Air Force fish and wildlife account using the Department of Treasury Pay.gov application. Deposit Fish and Wildlife Program collections into the Air Force 57 5095 account in accordance with AFCEC financial guidelines issued each fiscal year. If the Air Force Personnel Center Directorate of Services, Force, or other organization assists the natural resources management program office with the collection of user fees, account for any administrative fees charged separately from fees collected into the 57 5095 account. In such case, the permit issued shall identify the portion of the fee payment that represents the seller's administrative charge. Administrative and management costs associated with hunting, fishing, trapping and the management of outdoor recreation access should be fully reimbursed by user fees.

3.68.4.2. Fish and Wildlife Management Reimbursements. The Sikes Act, 16 USC § 670a(b)(3)(B), allows hunting, fishing, trapping, and other outdoor recreation fees to be reimbursed back to the installation where they were generated. Fish and wildlife management fees are collected into the 57 5095 accounting classification citing the AFCEC Operating Agency Code 18, and the applicable assigned Operating Budget Account Number for the installation where the collection was made. AFCEC/CZ monitors collections and facilitates disbursement of collections back to the installation in the 57X5095 (Fund Code 74) appropriation. Only use these fees on the installation where they were collected, and use only for the protection, conservation, and management of fish and wildlife, to include habitat improvement and related activities. Authorized uses of 57X5095 funds include civilian pay, vehicle and equipment procurement, and other administrative

expense directly related to the management of the fish and wildlife program on the installation. Vehicles and equipment procured with 57X5095 funds may only be used to support fish and wildlife management activities that implement the INRMP. Installations must notify AFCEC/CZ if they terminate hunting, fishing, or trapping programs; so that the 57X5095 account can be closed. **(T-0)**.

3.68.5. Reimbursable Conservation Program Budget Process. AFCEC/CZ manages reimbursable conservation program budgets. The annual reimbursable conservation program budget process is as follows:

3.68.5.1. Installations prepare annual budget submissions for reimbursable conservation program funding by 31 July each year for the upcoming fiscal year. Ensure installation budgets identify projected revenue and requested reimbursements.

3.68.5.2. AFCEC/CZ reviews installation budgets, and approves the final budget by 1 October for the execution fiscal year.

3.68.5.3. AFCEC/CZ obtains program funds and issues an Operating Budget Authority Document to installations in accordance with the approved final budget, but limited by the availability of program collections. The Operating Budget Authority Document imposes ceiling limitations on the maximum amount of obligations that can be reimbursed from program proceeds.

3.68.5.4. AFCEC/CZ monitors expenditures during the execution fiscal year to ensure that total obligations for the fiscal year do not exceed program collections, and reduces operating budget authority as needed to prevent program deficits.

3.68.6. Procurement of Vehicles and Equipment with Reimbursable Conservation Program Funds. Other Procurement appropriation 3080 may be reimbursed with funds generated from the sale of forest products, agricultural products, and income from livestock grazing and cropland outgrants for the purpose of procuring vehicles and equipment. Additionally, fish and wildlife program vehicles are procured under appropriation 5095 with funds generated from the collection of hunting, fishing, trapping and other outdoor recreation fees. Vehicles and equipment purchased using the 5095 appropriation, and vehicles purchased with 3080 appropriation funds that were reimbursed from agricultural or forestry proceeds, are reimbursable program assets and may not be used for other purposes.

3.68.6.1. Installations shall identify reimbursable conservation program vehicle and equipment requirements, and submit requests to AFCEC/CZ for replacement or new procurement by 31 July each year for the upcoming fiscal year. **(T-2)**.

3.68.6.2. AFCEC/CZ reviews vehicle and equipment requests for technical sufficiency, determines whether excess equipment from another installation may be available to meet the need, and includes vehicle and equipment procurement requests in the consolidated program budget for the upcoming fiscal year.

3.68.6.3. AFCEC moves sufficient funds from the forestry and agriculture collection accounts into the 3080 Other Procurement appropriation as reimbursement for planned vehicle and equipment procurements.

3.68.6.4. Deputy Assistant Secretary for Budget Investment (SAF/FMBI) issues an Operating Budget Authority Document for reimbursable authority for the 3080 funds to

AFCEC equal to the amount transferred to 3080 from the forestry and agriculture collection accounts.

3.68.6.5. AFCEC/CZ oversees the procurement of reimbursable conservation program vehicles and equipment for delivery to the installations.

3.68.6.6. The installation squadron commander (or equivalent) shall appoint a Vehicle Control Officer and alternate for reimbursable conservation program vehicles and equipment. **(T-3)**.

3.68.6.7. When submitting a request for vehicle or equipment acquisition as approved on the installation annual budget request, the installation Vehicle Control Officer must include (1) a signed Non-Appropriated Fund (NAF) Vehicle Request Checklist, (2) vehicle or equipment specifications, and (3) vendor quotes (preferably three quotes). Additionally, the officer must ensure the installation Vehicle Control Officer appointment letter and inventory/maintenance records are up to date.

3.68.7. Reimbursable Conservation Program Vehicle and Equipment Management and Maintenance Procedures. The responsible installation natural resources program manager, in conjunction with the installation-appointed Vehicle Control Officer, accounts for, inventories, and documents all equipment maintenance costs for vehicles purchased with Reimbursable Conservation Program funds. Vehicles and equipment purchased with reimbursable conservation program funds are not accounted for on the Civil Engineer Vehicle Master Listing.

3.68.7.1. Account for Reimbursable Conservation Program vehicles using the Services Agency Information System Vehicle Management System application. Log vehicle maintenance operations and update vehicle mileage quarterly.

3.68.7.2. The installation natural resource manager will update inventory of vehicles and equipment during the first month of each fiscal year. **(T-2)**.

3.68.7.3. Notify AFCEC/CZ of any excess vehicles and equipment available for redistribution. Excess vehicles and equipment that were purchased with reimbursable conservation program funds are redistributed to other installations at the direction of AFCEC/CZ.

3.68.7.4. Turn in irreparable excess equipment to the nearest Defense Marketing and Reutilization Office. Use the Government Liquidators web site (Assetzone/NAFXcess) to sell usable reimbursable conservation program vehicles and equipment.

3.69. Department of Defense Legacy Resources Management Program. DoD Legacy Resources Management Program funds are managed by the Office of the Assistant Secretary of Defense (Sustainment). Submit pre-proposals and proposals for Legacy funds to the Office of the Assistant Secretary of Defense (Sustainment), which provides full instructions, schedules, criteria, and other guidance.

3.70. Strategic Environmental Research and Development Program (SERDP). SERDP is a joint program of the Departments of Defense and Energy, and the U.S. Environmental Protection Agency. The DoD SERDP program can be used to fund conservation research on DoD installations. SERDP can fund certain research and development projects that involve the development of new technologies for conservation management. Details for submitting

conservation proposals to the SERDP can be found at **http://www.serdp-estcp.org/Funding-Opportunities/SERDP-Solicitations**.

3.71. Environmental Security Technology Certification Program (ESTCP) . ESTCP is a counterpart to SERDP. The ESTCP program funds demonstrations and applied application of new technologies for conservation management. Details for submitting proposals to ESTCP can be found at **http://www.serdp-estcp.org/Funding-Opportunities/ESTCP-Solicitations**.

Section 3N—NATURAL RESOURCES PROGRAM PUBLIC OUTREACH

3.72. Natural Resources Program Public Outreach and Public Affairs. Air Force natural resources managers collaborate with their Public Affairs office representatives when conducting public outreach initiatives related to natural resources management on Air Force installations.

3.72.1. In collaboration with the installation Public Affairs office, establish the appropriate venues to satisfy public notice requirements for Integrated Natural Resources Management Plans (INRMPs) and other environmental documents made available for public review, and establish the appropriate timelines for receiving public comments.

3.72.2. Collaborate with the installation Public Affairs office to make final INRMPs available to the general public through an installation website or other appropriate outlets.

3.72.3. The INRMP should identify appropriate public awareness programs necessary to achieve INRMP goals and objectives, such as the need to protect sensitive species or avoid dangerous human-wildlife conflicts. Incorporate essential environmental and natural resources awareness into installation newcomer orientation briefings and other appropriate information forums. The INRMP may also identify the programs and events that would be used to heighten public awareness of natural resources conservation, such as National Hunting and Fishing Day, Earth Day, or National Arbor Day.

3.72.4. Submit news information for potential public distribution through the installation Public Affairs office using appropriate traditional and social media platforms to publicize installation natural resources management information and outdoor recreation opportunities.

3.72.5. Installations may develop environmental education and awareness programs in cooperation with the local educational institutions, conservation organizations, other public service agencies, or the installation Force Support Squadron Outdoor Recreation program.

3.73. Public Access to Air Force Land and Water Areas.

3.73.1. Public Access for Outdoor Recreation. The installation commander, in consultation with Security Forces, Safety Office, and Judge Advocate, determines the extent of access on all areas designated in the INRMP as suitable for outdoor recreation. Installations shall allow use of outdoor recreation resources by the general public when such use is deemed by the commander to be compatible with the military mission. Access determinations should address the permissible types of activities, season of access, mission sensitivities, and permissible category of user. Refer to **paragraph 3.32.3** for guidance on identifying access and participation categories used in INRMPs. **(T-1)**.

3.73.2. Public Access for Research on Natural Resources. The installation commander, or designated representative, may grant access to federal and state officials and academic researchers to provide technical assistance to the Air Force, or to conduct academic research

on installation natural resources. Access related to partnering efforts with other Federal agencies, state agencies, conservation organizations, and individuals can be permitted under conditions where such activities adhere to pertinent mission, security, safety, and legal restrictions. Researchers may collect plants, animals, mineral, or fossils on installation lands for valid scientific purposes when compatible with the INRMP, military operations requirements, and with the required federal or state permits.

3.74. Special Natural Areas. Areas on Air Force installations that contain natural resources that warrant special protection efforts may, where consistent with the military mission, be designated in the INRMP as a Special Natural Area. Special Natural Areas may include botanical areas, ecological reserves, geological areas, riparian zones, scenic areas, and zoological reserves. The INRMP should identify applicable access and land-use restrictions for each designated area. A Special Natural area designation in an INRMP is a temporary status that is applicable for the period covered by an approved INRMP, and can be rescinded by order of the installation commander at any time. The installation shall reassess such areas if the military mission requirements of the installation change, during any installation realignment or closure action involving the property, or if the property becomes excess and requires disposal.

3.75. Special Restrictions for Disclosing Natural Resources Information. An installation may determine that the disclosure of information on the location or character of sensitive natural resources may create a substantial risk of harm, theft, or destruction of such resources, an invasion of privacy, trespass on government property, or interfere with the military mission. In such cases, the installation ensures that documents and other data voluntarily provided to the public do not disclose this information. Denial of requests for information under the Freedom of Information Act, 5 USC § 552, as amended by Public Law 104-231, should meet the criteria for appropriate exemptions stated in DoDM 5400.7_AFMAN33-302.

Section 3O—NATURAL RESOURCES MANAGEMENT TRAINING

3.76. Natural Resources Training. The Integrated Natural Resources Management Plan (INRMP) identifies the appropriate natural resources training requirements for the installation conservation staff and other supporting staff. Natural resources program managers at installations that maintain an INRMP should take the *DoD Natural Resources Compliance* course endorsed by the Department of Defense (DoD) Interservice Environmental Education Review Board, and offered to all DoD components by the Navy Civil Engineer Corps Officers School. See **https://www.public.navy.mil/netc/centers/csfe/cecos/Default.aspx** for Navy Civil Engineer Corps Officers School course schedules and registration information. Other applicable environmental management courses are offered by the Air Force Institute of Technology (**http://www.afit.edu**) and the National Conservation Training Center, which is managed by the USFWS and the Bureau of Land Management Training Center.

3.76.1. Encourage natural resource management personnel to attain professional registration, certification, or licensing for their related fields, and allow them to attend appropriate national, regional, and state conferences and training courses, when feasible.

3.76.2. All individuals enforcing fish, wildlife and natural resources laws on Air Force lands require specialized, professional training on the enforcement of fish, wildlife and natural resources in compliance with the Sikes Act. This training may be obtained by successfully

completing the Land Management Police Training course at the Federal Law Enforcement Training Center (**http://www.fletc.gov/**).

3.76.3. Individuals participating in the capture and handling of sick, injured, or nuisance wildlife should receive appropriate training, to include training that is mandatory to attain any required permits.

3.76.4. Personnel supporting the Bird/Wildlife Aircraft Strike Hazard program should receive flight line drivers training, training in identification of bird species occurring on airfields, and specialized training in the use of firearms and pyrotechnics as appropriate for their expected level of involvement. The Federal Aviation Administration (FAA) certification as a Qualified Airport Wildlife Biologist, as specified in FAA Advisory Circular 150/5200-36A, can be attained through Embry-Riddle Aeronautical University; and required continuing education credits can be maintained by training offered by the U.S. Department of Agriculture, Wildlife Services, and by attending the annual Bird Strike Committee USA Meeting training events.

3.76.5. The DoD-supported publication *Conserving Biodiversity on Military Lands -- A Handbook for Natural Resources Managers* (**http://dodbiodiversity.org**) provides guidance, case studies and other information regarding the management of natural resources on DoD installations.

3.77. Natural Resources Management Guidance for Installation Commanders. The Executive Summary of the installation INRMP informs the installation commander, installation civil engineers, and other senior officers about how the natural resources management program supports mission objectives. The publication *Conserving Biodiversity on Military Lands: A Guide for Natural Resources Managers - The Commander's Guide* provides basic natural resources management guidance for installation commanders. (**http://www.dodnaturalresources.net/files/Conserving_Biodiversity_on_Military_Lands_The_Commanders_Guide.pdf**)

Section 3P—WILDLAND FIRE MANAGMENT

3.78. Wildland Fire Management Policy. The *Review and Update of the 1995 Federal Wildland Fire Management Policy* is the primary wildland fire policy document for federal agencies, and establishes the guiding principles, policies and implementation actions for wildland fire management on Department of Defense (DoD) lands. The National Wildfire Coordinating Group (NWCG); *Wildland Fire Qualification Subsystem Guide* (Publication Management System (PMS) 310-1/ National Fire Equipment System (NFES) 1414); Federal Wildland Fire Qualification Supplement, National Fire Protection Association (NFPA) Standard 295, *Standard for Wildfire Control;* NFPA Standard 1051, *Standard for Wildland Firefighter Professional Qualifications*; NFPA Standard 1143, *Standard for Wildland Fire Management*; NFPA Standard 1561, *Standard on Emergency Services Incident Management System and Command Safety*; NFPA Standard 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Career Fire Departments*; and NFPA Standard 1144, *Standard for Protection of Life and Property from Wildfire,* establish the accepted professional standards for the Air Force wildland fire program, and are the basis for training and certification by the Air Force Civil Engineer Center Environmental Management Directorate, Operations Division, Wildland Fire Branch

(AFCEC/CZOF) and Air Force Civil Engineer Center, Readiness Directorate, Fire Emergency Services (AFCEC/CXF). **(T-0)**.

3.79. Wildland Fire Program Standards.

3.79.1. Overview. Air Force wildland fire policy and guidance applies to operations on undeveloped lands that do not involve facilities and infrastructure. A wildland fire is any non-structure fire that occurs in the wildland and includes both: (1) wildfires, to include unplanned natural fires (e.g., lightning caused wildfires), munitions-caused fires, unauthorized human-caused fires, and escaped prescribed fire projects, and all other unplanned wildfires, and (2) prescribed fires purposely ignited by natural resource managers to meet specific land management objectives.

3.79.2. Wildland Fire Program Mission. The mission of the Air Force Wildland Fire Program is to ensure military mission capability and readiness through a strategic, cost-effective, wildland fire organizational structure that provides ecosystem management, promotes long-term range sustainment, leverages partnerships, and provides key fire related information to decision makers.

3.79.3. Wildland Fire Program Goals. The goals of the Air Force wildland fire program are:

3.79.3.1. Reduce wildfire threats to Air Force mission assets and personnel through fuel reduction treatments.

3.79.3.2. Provide guidance for execution of wildfire suppression, mitigation, prescribed fire, and hazardous fuel reduction on Air Force installations.

3.79.3.3. Provide strategic, logistical, and “boots on the ground” wildland fire support to ensure military preparedness.

3.79.3.4. Leverage interagency partnerships and technical expertise for long-term cost savings to the Air Force.

3.79.3.5. Train Air Force personnel to nationally recognized NWCG standards to prevent injury and loss of life and build response capability.

3.79.3.6. Collect, analyze, and communicate key wildland fire data to demonstrate ecological benefits and risk to mission.

3.80. Wildland Fire Management Plans. All Air Force installations with burnable acreage are required to have a current WFMP. Installations with unimproved lands that utilize prescribed burns as a land management tool and have potential for wildfires will develop and implement a WFMP. **(T-1)**. For the purposes of this manual, the term “wildland fire” refers to both wildfire and prescribed fire.

3.80.1. Purpose. The purpose of the installation WFMP is to reduce wildfire potential, protect and enhance valuable infrastructure and natural resources, and implement ecosystem resiliency goals and objectives on Air Force-managed properties. The WFMP will directly support the Air Force mission and be consistent with the installation INRMP.

3.80.2. Review and Coordination. The installation WFMP is developed in collaboration with installation Fire Emergency Services, AFCEC/CZOF, and the installation natural resources staff. The WFMP describes wildland fire management requirements, values at risk, policies, mutual assistance agreements, and protocols for prescribed fire implementation and for

wildfire suppression, to include initial attack, extended attack, and supplementation of local resources. A WFMP is required to be reviewed annually, and updated when necessary, as a response to changes in mission requirements, risk of wildfire or ecosystem conditions. A qualified wildland fire expert having at least NWCG Type 3 Incident Commander (ICT3) and Type 2 Burn Boss (RXB2) qualifications as defined in PMS 310-1/NFES 1414 must review the WFMP prior to approval by the installation commander or delegated authority. **(T-1)**. Installations may submit a draft WFMP for review and comment to AFCEC/CZOF by a qualified wildland fire expert.

3.80.3. Wildland Fire Management Plan (WFMP) Components. A WFMP shall include operational guidance specific to installation requirements. **(T-1)**. As a minimum, an installation WFMP will include the following components:

3.80.3.1. Purpose of the WFMP. State the reasons for developing the WFMP. Identify applicable laws, regulations and Air Force policy. Establish the relationship of the WFMP with the installation INRMP and higher-level Air Force planning documents.

3.80.3.2. Description of the Area Covered by the WFMP. Provide a general description of the location of the area covered by the WFMP with vicinity map.

3.80.3.3. Description of the Military Mission. Briefly describe the overall installation mission. Identify ecosystem and other landscape features deemed essential for mission operations.

3.80.3.4. WFMP Goals and Objectives. State the goals and objectives for the wildland fire management program on the installation.

3.80.3.5. Mission Impact Considerations. Identify the potential impacts to the installation mission that may occur as a result of implementation of the WFMP. Briefly describe the effects wildland fire activities would have to installation operations. Identify missions that could be affected, impaired, or cancelled due to wildfire activity. Describe how wildland fire management activities must be regulated to accommodate military testing and training activities. Consider limits on accessibility to controlled areas and required security clearance points for wildland fire personnel and equipment. Identify any unique, unusual, or special hazards to wildland fire staff, such as potential exposure to hazardous chemicals or unexploded ordnance.

3.80.3.6. Installation Wildland Fire Organizational Structure. Describe the installation wildland fire management organizational structure responsible for implementing the installation WFMP. Indicate positions within the installation command structure with authority and accountability for implementing the WFMP. Identify the role of Fire Emergency Services and AFCEC/CZOF assets as they pertain to wildland fire management activities on the installation. The Incident Command organizational structure for wildfire suppression response must be consistent with National Incident Management System standards.

3.80.3.7. Interagency Cooperation and Mutual Aid Agreements. Installations are encouraged to develop regional partnerships for wildland fire management support by means of reciprocal agreements with other federal, state, local and private entities to share human, logistical, and operational resources. Emergency assistance and mutual aid agreements should conform to the guidelines stated in DoDI 6055.06, *Fire and Emergency*

Services Program, and AFI 32-2001. Include interagency agreements and mutual assistance agreements in the WFMP as references or appendices.

3.80.3.8. Wildland Fire Management Partnerships. Identify any internal and external partnerships or planning teams involved in the development and implementation of the WFMP. Identify the level of wildland fire management cooperation and collaboration that occurs on and off the installation with other federal, state, local or non-governmental entities such as the USFWS, the U.S. Forest Service, the National Interagency Prescribed Fire Training Center, The Nature Conservancy, regional Prescribed Fire Councils, and other state and local partners.

3.80.3.9. Safety and Emergency Operations. The WFMP must emphasize that firefighter and public safety is the first priority in every wildland fire management activity. The WFMP shall identify installation-specific safety protocols and personal protective equipment required for wildland fire operations. The NFPA Standard 1977, *Standard on Protective Clothing and Equipment for Wildland Fire Fighting* establishes the requirements for personal protection clothing and equipment.

3.80.3.10. Risk Assessment/Decision Analysis Processes. Sound operational risk management is the foundation of a WFMP. Identify the indices and/or fire danger rating system used to assess wildfire risk and potential fire behavior. The indices and/or fire danger rating system should adequately describe fire hazard, severity, intensity, and other significant factors affecting the protection of life and property. Identify normal and unique weather patterns that affect fire behavior on the installation. Identify the environmental factors that are measured prior to igniting a prescribed fire.

3.80.3.11. Installation Wildland Fire History. Include in the WFMP an analysis of both recent and long-term wildland fire history on the installation and in the region.

3.80.3.12. Wildland Fuel Factors. Identify the effects of installation fuel types and fuel loads on fire behavior. Display data on fuel types and fuel loading by maps or other means. Conduct fuel surveys to collect wildland fire fuels data if necessary.

3.80.3.13. Smoke management and Air Quality. The WFMP should describe the mission, environmental, human health and safety factors specific to the installation and region that affect smoke management, and identify necessary mitigation practices for prescribed burns and wildfire response. Refer to NWCG publication PMS 420-2/NFES 1279, *Prescribed Fire Smoke Management Guide* for guidance on factors to consider.

3.80.3.14. Personnel Training and Certification Standards and Records. The installation WFMP shall identify the staffing requirements according to specific NWCG and/or NFPA standards. The WFMP will identify the appropriate amount, types and levels of trained and certified personnel required to specifically address installation wildland fire risks. To accommodate cooperation and integration with other federal and state wildland fire organizations across jurisdictional boundaries, personnel participating in wildland fire duties through mutual assistance agreements outside the installation boundaries must meet the standards of the NWCG *Wildland Fire Qualification Subsystem Guide* (PMS 310-1/NFES 1414).

3.80.3.15. Wildland Fire Management Unit Characteristics. Identify and map Wildland Fire Management Units within an installation when necessary based upon the unique

characteristics of a unit that would require distinct management prescriptions. Include information and management objectives unique to individual Fire Management Units.

3.80.3.16. Wildfire Response. Wildfires are defined as unplanned ignitions of flammable vegetation on an installation. The installation WFMP shall identify the installation organization responsible for initial response to a wildfire incident. Describe or reference installation procedures for dispatch or installation resources for initial attack to a wildfire, and how supplemental assets are dispatched to assist the first responders. Procedures to be included are dependent on installation-specific requirements.

3.80.3.17. Wildfire Prevention, Mitigation, and Education. The installation WFMP shall describe or reference wildfire prevention, education, and mitigation strategies applicable to the installation.

3.80.3.18. Management and Treatment of Flammable Fuels. The installation WFMP shall describe programs for hazardous fuels treatment by mechanical, chemical, biological, or prescribed fire methods. Procedures to be included are dependent on local needs.

3.80.3.19. Burned Area Rehabilitation. The installation WFMP shall include protocols to address revegetation and erosion control on burned areas when natural vegetation recovery is not likely to occur in a satisfactory manner.

3.80.3.20. Wildland Fire Monitoring Requirements. The installation WFMP shall identify the environmental factors that are monitored, and the frequency of monitoring required, for both a wildfire and prescribed fire. Identify post-fire assessment protocols for wildfires. For prescribed fires, describe programmatic long-term processes for data collection, storage, and analysis methodology to evaluate treatment effectiveness for meeting WFMP goals and objectives.

3.80.3.21. Cultural and Natural Resources Considerations. Provide a checklist in the WFMP that can be used to identify sensitive cultural and natural resources that should be given consideration before conducting any wildland fire management activity.

3.80.3.22. Public Notification. The WFMP must identify a protocol for notifying the media and affected persons for wildfire incidents and prescribed burning activities. This should include working with the state and/or local public health organization.

3.80.3.23. WFMP Funding Requirements. Identify the funding requirements to train and equip wildland fire management personnel to ensure safe, effective, and cost-efficient operations in support of the WFMP. Identify the appropriate sources of funding for wildland fire activities.

3.80.3.24. Environmental Impact Analysis Process for WFMP Implementation. Actions proposed in a WFMP may constitute a major federal action as defined in 40 CFR § 1508.18. Installations shall evaluate major federal actions for potential environmental effects in accordance with 32 CFR Part 989. **(T-0)**.

3.80.3.25. Effects of Climate Change on Wildland Fire Management. WFMPs and associated Environmental Impact Analysis Process documents should take into consideration agency policy and guidance concerning climatic effects on wildland fire risk, and how wildfire risk may be affected by changes in climate or extreme weather events.

3.80.3.26. Wildland Fire Management Plan Approval. Each WFMP shall include a Signature Page with the signature lines for the authorized officials that must approve the WFMP and subsequent revisions to the WFMP. The WFMP signature page may also include other designated signatories as requested by the installation commander.

3.80.3.27. WFMP Annual Review and Coordination. Following the Signature Page, a WFMP shall include documentation of annual review and coordination. A WFMP Annual Review Summary shall list the findings for each annual review conducted. The WFMP shall identify the appropriate persons to be involved in the development and coordination of the Annual Review Summary, and shall include signature blocks to document coordination signatures and dates by the designated installation and cooperating agency representatives. **(T-3)**. A cooperating agency representative may assert concurrence with the findings by signing the Annual WFMP Annual Review Summary.

3.81. Wildland Fire Operations.

3.81.1. Wildfire Incident Management. Wildfires occurring on Air Force-managed lands will have a response consistent with firefighter safety considerations, known and potential hazards, and resource values at risk. Acceptable response to a wildfire incident shall be consistent with the direction specified in the installation WFMP, and may incorporate the full range of suppression options, ranging from containment and monitoring to direct attack and full suppression.

3.81.1.1. Air Force Fire Emergency Services (FES) provides initial response to all fire emergencies including wildfires notified through the 911 dispatch system. Upon arrival, FES will assess the situation and attempt to extinguish the fire within the limits of their resources, training and capabilities. **(T-3)**. For situations beyond FES capability, FES will immediately contact mutual aid partners and/or AFCEC/CZOF for assistance as needed. **(T-3)**. When specialized wildland fire resources arrive, FES' role will then focus on providing incident support and infrastructure protection within the Wildland Urban Interface. **(T-3)**. The installation WFMP will provide additional clarification on wildfire response protocols and the roles and responsibilities of installation resources during a wildfire incident. **(T-3)**.

3.81.1.2. In accordance with Homeland Security Presidential Directive/HSPD-5, *Management of Domestic Incidents*, Air Force wildfire response will incorporate the National Incident Management System standards into the organizational structure to facilitate cooperation and integration with other federal and state wildland fire organizations across jurisdictional boundaries.

3.81.2. Prescribed Fire Operations. Prescribed fires may be used by Air Force installations to attain the goals and objectives of the INRMP; and shall be conducted in accordance with the specific operational protocols in the installation WFMP. Prescribed fire operations must adhere to the standards established in a pre-approved burn plan. The AFCEC/CZOF is the OPR for executing prescribed fires to achieve natural resources goals and objectives specified in installation INRMPs. Installation Chief of Fire Operations shall consult with AFCEC/CZOF and AFCEC/CXF on Air Force installation burn plans. **(T-3)**.

3.81.2.1. Prescribed Fire Burn Plans. Installations must develop a site-specific burn plan for each prescribed burn conducted on Air Force property. **(T-1)**. AFCEC/CZOF is

responsible for developing and maintaining recommended burn plan templates. At a minimum, burn plans will include the following components:

3.81.2.1.1. Prescription for acceptable weather and fuel moisture parameters. Weather parameters shall include the acceptable range of air temperature, humidity, wind speed, and wind direction.

3.81.2.1.2. Required personnel and equipment resources, to include the minimum NWCG certifications required for personnel participating in the prescribed burn based upon their expected roles and responsibilities.

3.81.2.1.3. Description of burn area including a map indicating burn area perimeter and a description of the topography and vegetation/fuels in the area to be burned.

3.81.2.1.4. Smoke management plan, including air quality considerations.

3.81.2.1.5. Safety considerations, including an evacuation plan for medical emergencies.

3.81.2.1.6. Pre-burn authorization/notification checklist.

3.81.2.1.7. Escape/Contingency plan.

3.81.2.1.8. Communications plan.

3.81.2.1.9. Description of cultural and natural resource features that require protection.

3.81.2.1.10. Pre-ignition briefing checklist

3.81.2.1.11. Ignition and holding plan

3.81.2.1.12. Pre-ignition Go/No Go checklist

3.81.2.2. Prescribed Fire Burn Plan Approval. Each burn plan for a prescribed fire must be approved and signed by a designated authority prior to ignition. The installation WFMP will designate the appropriate authority for burn plan approval, and will identify the required coordination process for draft burn plans. Installations must utilize NWCG-qualified personnel (RXB2 – Prescribed Burn Boss) to review or approve burn plans to assure that adequate safeguards are in place prior to burning. **(T-1)**.

3.81.2.3. Use of Fire Breaks. When planning for prescribed fires, and when suppressing wildfire, must utilize natural and existing man-made features as fire breaks whenever possible. **(T-3)**.

3.81.3. External Agency Coordination. Interagency cooperation is an essential component of a wildland fire management program. The AFCEC/CZOF, in collaboration with FES, will coordinate with federal, state, tribal, county, and municipal government officials to promote consistent wildland fire policies, goals, and management activities to higher headquarters. **(T-3)**. Coordination with the public health department should be included. Interagency agreements shall be established through Memoranda of Understanding, Partnership Agreements, Cooperative Work plans and Mutual Aid Agreements. **(T-3)**.

3.82. Wildland Fire Resources. This section discusses guidelines on wildland fire manpower, vehicles, and equipment.

3.82.1. Wildland Fire Manpower and Staffing. AFCEC/CZOF is responsible for determining locations and staffing levels of Air Force WSMs. The installation WFMP will indicate required personnel staffing based upon installation wildland fire history, complexity, and interagency tools such as the Interagency Fire Program Management Qualifications Standards and Guide maintained by the National Interagency Fire Center, Fire Management Board, Interagency Fire Program Management Group. Installations seeking additional manpower authorizations within FES to support wildland fire operations will contact AFCEC/CXF for assistance. **(T-1)**.

3.82.2. Wildland Fire Vehicles and Motorized Equipment. Vehicles and motorized equipment needed to support wildland fire operations will be authorized based upon installation requirements, and will follow established guidelines in the National Interagency Fire Center publication NFES 2724, *Interagency Standards and Fire and Fire Aviation Operations.* The installation WFMP shall identify the appropriate vehicle and equipment requirements for each installation. Installations seeking vehicle and equipment authorizations to support wildland fire operations will work with the installation Vehicle Support Chain Operations Squadron to attain new authorizations. **(T-3)**.

3.82.3. Wildland Fire Personal Protective Equipment and Duty Uniforms. Wildland Fire personal protective equipment must be compliant with the standards set forth in the National Interagency Fire Center publication NFES 2724, *Interagency Standards and Fire and Fire Aviation Operations.* AFCEC/CZOF will disseminate appropriate wildland fire personal protective equipment and duty uniforms to AFCEC/CZOF personnel. **(T-1)**.

3.82.4. Wildland Fire Tools and Equipment. Light tools and equipment such as hand tools, chain saws, and portable radios must be inventoried every six months as a minimum requirement. Inspection, maintenance and testing records for powered tools will be documented on AF Form 1071, *Inspection/Maintenance Record*. Heavy equipment such as utility vehicles, skid loaders, masticators, and dozers must be inspected before use in wildland fire operations. For Air Force-owned equipment, must annotate inspection on AF Form 1800, *Operator's Inspection Guide and Trouble Report*. **(T-3)**.

3.83. Wildland Fire Personnel Training, Certification and Fitness. The installation WFMP will specify the numbers and types of qualified staff required for the installation wildland fire management program based upon an installation-specific risk assessment. All military, civilian, cooperator, contractor and FES personnel involved in wildland fire activities must meet or exceed the training, certification and fitness standards appropriate for their expected level of involvement in wildland fire operations. **(T-1)**.

3.83.1. Wildland Fire Training and Certification Standards. In accordance with DoDI 6055.06, Air Force personnel that participate in prescribed fires and wildfire suppression will comply with the certification standards indicated in the NWCG Publication Management System (PMS) 310-1, *National Incident Management System: Wildland Fire Qualification System Guide*. **(T-0)**. For other wildland fire technical specialist positions not covered in PMS 310-1, utilize the NWCG *Federal Wildland Fire Qualifications Supplement* as a reference for how the technical specialist position is reflected in the IQCS. The NFPA provides FES personnel with basic wildland fire training as part of structure protection groups within the wildland urban interface. FES personnel in the GS-0081 Job Series or 3E7X1 career paths are qualified

to respond to wildfires on military installations by meeting the certification standards specified in National Fire Protection Association (NFPA) 1051 and NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*. FES wildland fire training is supplemented by Air Force-specific online training.

3.83.1.1. AFCEC/CZOF is responsible for issuing, certifying, maintaining and tracking NWCG certifications and qualifications for all Air Force personnel, to include FES personnel, civilians, contractors, cooperating agency personnel embedded at Air Force installations, and volunteers when appropriate. The designated installation WFPC will, at a minimum, annually provide the AFCEC/CZOF with updates of NWCG certifications, training and experience for applicable personnel. AFCEC/CZOF will maintain a centrally managed IQCS database for tracking NWCG qualifications for all Air Force personnel, and for contractors, cooperating agency personnel embedded at Air Force installations, and volunteers. **(T-1)**.

3.83.1.2. AFCEC/CXF is responsible for tracking NFPA certifications in accordance with DoD Manual 6055.06-M, *DoD Fire and Emergency Services Certification Program.* Personnel in the GS-0081 Job Series, 3E7X1 career paths, and contractors working with FES on Air Force-managed lands must meet the certification standards specified in DoDI 6055.06-M. FES personnel may also attain NWCG qualifications as specified in the installation WFMP. **(T-1)**.

3.83.1.3. NWCG Position Task Book (PTB) Management. NWCG PTBs for FES personnel shall be initiated/issued by the Installation Fire Chief (IFC). **(T-3)**. NWCG PTBs for personnel not employed in FES shall be initiated/issued by the AFCEC/CZOF Regional Fire Management Officer (RFMO, or a designee that meets the appropriate prerequisites specified in PMS 310-1, *National Incident Management System: Wildland Fire Qualification System Guide*. Once the PTB has been initiated, the IFC, RFMO or their designees will provide the appropriate documentation to the AFCEC/CZOF training manager for entry into IQCS database. When the required PTB training tasks have been completed, and a recommendation for agency certification has been made in the PTB (first signature) by the final evaluator (top portion of page), two additional signatures will be required for agency certification. The PTB will be forwarded for review and verification of compliance to the IFC or RFMO for the second signature (middle portion of page). The PTB will then be forwarded to the AFCEC/CZOF training manager for final signature/agency certification and updated in the IQCS database.

3.83.2. Wildland Fire Personnel Physical Fitness Standards. The installation WFMP will establish the NWCG fitness qualifications required for personnel that participate in wildland fire management activities. The fitness level will be based upon their expected level of participation, and will be in accordance with the NWCG PMS 310-1, *National Incident Management System: Wildland Fire Qualification System Guide,* and the NWCG *Federal Wildland Fire Qualifications Supplement*. NWCG publications NFES 1596 – *Fitness and Work Capacity* and NFES 2071 – *Fit to Work, Fatigue and the Firefighter* provide guidance for establishing physical fitness standards for various wildland fire management activities.

3.83.2.1. NWCG PMS 307/NFES 1109 - *Work Capacity Test Administrator's Guide* shall be the Air Force standard for assessing fitness for personnel that participate in wildland fire activities. The Work Capacity Test will be utilized to assess three levels of fitness for

personnel involved in wildland fire activities: (1) Arduous, (2) Moderate, and (3) Light. Medical screening for the Work Capacity Test will be conducted as described in the Guide.

3.83.2.2. Personnel in the natural resources Job Series whose job descriptions state that they are Primary Wildland Firefighters are required to meet the arduous fitness criteria annually. Secondary Wildland Firefighters will meet the fitness criteria based upon their expected level of involvement. **(T-1)**.

3.83.2.3. Air Force civilian personnel, to include FES, military, cooperating agency personnel embedded at Air Force installations, contractors and volunteers that serve as collateral duty wildland fire personnel must meet the fitness level commensurate with their expected level of participation in accordance with PMS 310-1 and the *Federal Wildland Fire Qualifications Supplement* in order to perform wildland fire activities on AF managed lands. **(T-1)**.

3.83.2.4. Medical Screening for Wildland Fire Personnel. Air Force personnel whose job description requires participation in wildland fire management activities as a primary or secondary firefighter on an Air Force installation must meet the pre-employment medical and physical examination criteria contained in Technical Guide 1582-18 for NFPA 1582 – *Standard on Comprehensive Occupational Medical Program for Fire Departments*, 2018 Edition. **(T-1)**.

3.83.3. Cardio-Pulmonary Resuscitation and Standard First-Aid Training. Air Force affiliated personnel who participate in wildland fire activities will be certified and current, as a minimum requirement, in cardiopulmonary resuscitation and Standard First-Aid by the American Red Cross or comparable certification authority. **(T-1)**.

3.83.4. IQCS Red Card Issuance. Air Force personnel that meet NWCG standards as described in the appropriate qualification standards document (PMS 310-1/ *Federal Wildland Fire Qualifications Supplement*) will be issued an Incident Qualification Card (i.e., Red Card) as appropriate. The IFC will submit a request to the AFCEC/CZOF training manager for FES personnel requesting an Incident Qualification Card. For non-FES personnel, the request shall come from the AFCEC/CZOF RFMO for WSM personnel, and from the installation WFPC for installation personnel. All personnel must meet NWCG standards, including work capacity test requirements, as described in the appropriate qualification standards document. **(T-1)**.

3.83.5. Wildland Fire Certification Currency Requirements. For FES personnel requiring Incident Qualification Cards, the IFC or their designee will submit a completed IQCS Individual Responder Update Form to the AFCEC/CZOF training manager at a minimum annually to ensure currency requirements are met. For non-FES personnel, the AF IQCS Individual Responder Update Form will be submitted by the RFMO for WSM personnel, and from the installation WFPC for installation personnel. This responsibility may be delegated by the IFC, RFMO or WFPC. The AFCEC/CZOF training manager will then update the IQCS record to reflect currency requirements. **(T-1)**.

3.83.6. Position Descriptions for Wildland Fire Program Personnel. Air Force Standard Core Personnel Document position descriptions for Air Force employees that are expected to participate in wildland fire activities will reflect the expected level of involvement and required certifications. Position descriptions for civilian personnel with wildland fire management duties must state if the position qualifies the position holder as a primary or secondary wildland

firefighter, as described in Chapter 46 of the Office of Personnel Management *Civil Service Retirement System (CSRS) and Federal Employees Retirement System (FERS) Handbook for Personnel and Payroll Offices*. **(T-0)**. Natural resources management personnel not classified as a primary or secondary wildland firefighter may perform collateral duty in wildland fire management activities as qualified.

3.84. Wildland Fire Program Reporting. The purpose of Air Force wildland fire program reporting is to report wildfires, prescribed fires, and mechanical or chemical fuels management activities that occur on lands under Air Force jurisdiction. AFCEC/CZOF will record all wildland fire activity data in the Air Force Fire Data Support System (FIREDSS). FIREDSS will provide a standardized, integrated system and database to track, summarize, manage, and report wildland fire activities to support installations wildland fire program management. **(T-2)**.

3.84.1. Wildfire Reports. Initial response reporting for all wildfires that occur on lands under Air Force jurisdiction is accomplished by FES through the Automated Civil Engineering System – Fire Department. If an AFCEC/CZOF WSM is dispatched to a wildfire, the WSM lead will retrieve the automated system's fire report and report the wildfire incident to AFCEC/CZOF through their RFMO along with additional required data for inclusion in the FIREDSS. Utilize AFCEC/CZOF Form 201, *Incident Organizer* (ICS 201) to record wildfire incidents. **(T-2)**. At a minimum, the post-fire report will include the incident date and time, fire name, fire location (latitude and longitude), fire size, fire injuries, number personnel and resources involved, and infrastructure damage. Report significant wildfire incidents on the installation as soon as practicable. A significant wildfire incident is any wildfire greater than 100 acres or that poses significant threat to installation infrastructure or resources, a major or extended impact upon Air Force mission(s), a loss of life, a negative impact to public health and safety, or a threat to threatened and endangered plant or animal species.

3.84.1.1. For uncontrolled wildfires lasting more than 24 hours, the WSM lead must provide AFCEC/CZOF a daily report on the potential for fire growth, current and expected weather, resource values at risk, multi-jurisdictional agency involvement, and information on additional resources needed. **(T-1)**.

3.84.1.2. The WSM lead must report wildfires greater in size than 100 acres in timber fuel types, or 300 acres in grass fuel types, to the local/state Interagency Coordination Center. **(T-1)**.

3.84.2. Prescribed Fire Reports. Installations will report prescribed fire activities to AFCEC/CZOF. WSMs must submit the prescribed fire reports to AFCEC/CZOF for inclusion in the FIREDSS within 10 days of treatment completion. The prescribed fire report will include: installation/range name, burn objective, prescribed burn unit name, treatment date, acres treated, start time, control time, Anderson fuel model type, equipment used, names of all personnel involved and their assigned organization and NWCG certification level. Prescribed Fire Report submittals must also include geospatial data indicating the prescribed fire treatment area perimeter. **(T-2)**.

3.84.3. Mechanical and Chemical Treatment Reporting. Mechanical and chemical treatments of flammable fuels will be reported to AFCEC/CZOF. The WSM for the installation shall submit a mechanical or chemical treatment report to AFCEC/CZOF within 10 days of treatment completion. The report will include: installation/range name, treatment objective,

treatment method, treatment date, acres treated, start time, end time, equipment used, names of all personnel involved and their assigned organization. **(T-2)**.

3.84.4. Wildland Fire Data Management. AFCEC/CZOF will be the authoritative source and have primary responsibility for all wildland fire data, serving as steward for data across mission domains to assure quality and safeguarding of data. **(T-1)**.

3.84.4.1. AFCEC/CZOF will develop and maintain geospatial data in accordance with DoD requirements developed and implemented by the Spatial Data Standards for Facilities, Infrastructure and the Environment, and in accordance with other Air Force information management policies. **(T-1)**.

3.84.4.2. AFCEC/CZOF will follow the Air Force Fire Management Handbook for guidance in the capture, manipulation, storage and presentation of all geospatial data, and will ensure that wildland fire data is captured, maintained, stored and made accessible in accordance with DoDI 8320.02, *Sharing Data, Information, and Information Technology (IT) Services in the Department of Defense.* **(T-1)**.

WARREN D. BERRY, Lieutenant General, USAF
DCS/Logistics, Engineering, and Force Protection

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

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ICS Form 201, *Incident Organizer*

USACE Engineer Form 4345, *Application for Department of the Army Permit*

Abbreviations and Acronyms

AF—Headquarters United States Air Force

AFCEC—Air Force Civil Engineer Center

AFI—Air Force Instruction

AFIMSC—Air Force Installation and Mission Support Center

AFLOA—Air Force Legal Operations Agency

AFMAN—Air Force Manual

AFPD—Air Force Policy Directive

AFRC—Air Force Reserve Command

AIRFA—**-**American Indian Religious Freedom Act of 1978

ANG—Air National Guard

ANG CRM—**--**Air National Guard Cultural Resources Manager

ARPA—**-**Archaeological Resources Protection Act of 1979

BASH—Bird/wildlife Aircraft Strike Hazard

BMPs—Best Management Practices

BRAC—Base Realignment and Closure

CA—**-**Comprehensive Agreement

CATEX—Categorical Exclusion

CFR—Code of Federal Regulations

CLEO—Conservation Law Enforcement Officer

CLEP—Conservation Law Enforcement Program

CRM—Cultural Resources Manager

DoD—Department of Defense

DoDI—Department of Defense Instruction

DoDM—Department of Defense Manual

EA—Environmental Assessment

EBS—Environmental Baseline Survey

EIAP—Environmental Impact Analysis Process

EIS—Environmental Impact Statement

EMS—Environmental Management System

EO—Executive Order

EQ—Environmental Quality

ESA—Endangered Species Act

ESTCP—Environmental Security Technology Certification Program

FACCODE—Facility Code

FES—Fire and Emergency Services

FIREDSS—Air Force Fire Data Support System

FOIA—Freedom of Information Act

FONPA—Finding of No Practicable Alternative

FONSI—Finding of No Significant Impact

FR—Federal Register

GIS—Geographic Information Systems

HAF—Headquarters U.S. Air Force

ICRMP—Integrated Cultural Resource Management Plan

IFC—Installation Fire Chief

INRMP—Integrated Natural Resources Management Plan

IPL—Integrated Priority List

IQCS—Incident Qualifications and Certification System

MOA—Memorandum of Agreement

MOU—Memorandum of Understanding

NAGPRA—Native American Graves Protection and Repatriation Act of 1990

NAR—Not Assessed Routinely

NEPA—National Environmental Policy Act

NFES—National Fire Equipment System

NFIP—National Flood Insurance Program

NFPA—National Fire Protection Association

NHO—Native Hawaiian Organization

NHPA—National Historic Preservation Act of 1966

NMUSAF—National Museum of the U.S. Air Force

NOAA Fisheries—National Oceanic and Atmospheric Administration, National Marine Fisheries Service

NWCG—National Wildfire Coordinating Group

O&M—Operations and Maintenance

OCR—Office of Coordinating Responsibility

OPR—Office of Primary Responsibility

OSD—Office of the Secretary of Defense

PA—Programmatic Agreement

PL—Public Law

PMS—Publication Management System

POM—Program Objective Memoranda

PPBE—Planning, Programming, Budgeting, and Execution

PTB—Position Task Book

RFMO—Regional Fire Management Officer

ROD—Record of Decision

RPA—Real Property Asset

SecAF—Secretary of the Air Force

SERDP—Strategic Environmental Research and Development Program

SHPO—State Historic Preservation Officer

T&E—Threatened and Endangered

THPO—Tribal Historic Preservation Officer

USACE—U.S. Army Corps of Engineers

USC—U.S. Code

USDA—U.S. Department of Agriculture

USFWS—U.S. Fish and Wildlife Service

WFMP—Wildland Fire Management Plan

WFPC—Wildland Fire Program Coordinator

WOTUS—Waters of the United States

WSM—Wildland Support Modules

WWII—World War II

Terms

Adaptive Ecosystem Management—A systematic process for continually improving natural resources management policy and practices by continually monitoring current operations and applying lessons learned to modify these programs as warranted

Adverse Effect—Reduction in the characteristics that make an historic property eligible for the National Register of Historic Places. The integrity of the location, design, setting, materials, workmanship, association, or other qualities that are important to defining the National Register eligibility of the historic property is diminished.

Advisory Council on Historic Preservation (Advisory Council)—The independent Federal agency created by the NHPA, as amended, to advise the President, Congress, and Federal agencies on all matters related to historic preservation. The Advisory Council also administers Section 106 of the NHPA through 36 CFR Part 800, *Protection of Historic Properties*.

Agricultural Outgrant—The use of DoD lands under a lease, license or permit to an agency, organization, or person for growing crops or grazing animals.

Agricultural Land Improvements—Improvements that add potential value to an agricultural outgrant such as irrigation features, fences, cattle guards, water developments, livestock enclosures and other structural improvements, as well as non-structural improvements such as seeding, fertilizing, and vegetation management.

Airfield—The area comprised of runways, taxiways, aprons and other adjacent land areas of an airport which are dedicated to aircraft operations

Alaska Native Entities—Alaska Native villages, tribes, communities, associations, and corporations are equivalent to federally recognized tribes for the purposes of consultations pursuant to NAGPRA and NHPA. Native Alaska villages and corporations include those groups or communities defined in, or established by, the Alaska Native Claims Settlement Act.

Alien Species—Any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to a respective ecosystem (definition from EO 13112, *Invasive Species)*.

Alternative or Creative Mitigation—Alternatives to archaeological data recovery or historic building recordation as mitigation for an undertaking's adverse effects. These approaches can be implemented as the only treatment option, or may be part of a package where different historic properties are subject to different kinds and levels of mitigation.

Archaeological Resources—Any material remains of past human life or activities that are of capable of providing scientific or humanistic understandings of past human behavior and cultural adaptation through the application of scientific or scholarly techniques. (See ARPA and 32 CFR § 229.3).

Area of Potential Effect—The land area an undertaking has the potential to effect. The Area of Potential Effect includes the footprint of the proposed project, and areas around the footprint that might be affected by visual, auditory, erosional, and other direct and indirect results of the undertaking. Region of Influence (or Interest) for NEPA documents may or may not align with NHPA Section 106 Area of Potential Effect, which, in any case, always should be defined independently of Region of Influence in NEPA documents.

Biodiversity—Also stated as 'Biological Diversity'. The variety of life forms, the ecological roles they perform, the genetic variability among them, and their interactions in the communities and ecosystems in which they live. Biodiversity Conservation is a land management practice whereby maintaining and establishing viable populations of all native species is a primary goal.

Business Data—Geographic Information System (GIS) specialists think of Business Data as metadata, i.e., information associated with geographic spatial data. Business data often describes, evaluates, interprets, associates, references, or clarifies spatial data. Business data also includes site files, curation data, laboratory analyses, records, photographs, and file information crucial to day-to-day operations in cultural resources management.

Candidate Species—Any species where there is sufficient information on the biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

Commercial Forest Land—Land under management capable of producing at least 20 cubic feet of merchantable timber per acre a year.

Compliant INRMP—An Integrated Natural Resources Management Plan that has been both reviewed and approved by signature or written correspondence within the past 5 years by authorized officials of the Department of Defense, Department of Interior, and appropriate state fish and wildlife agency.

Comprehensive Agreement—For Native American Graves Protection and Repatriation Act (NAGPRA), an agreement between a Federal agency and an Indian tribe concerning all agency land management activities that could result in the intentional excavation or inadvertent discovery of Native American human remains, funerary objects, sacred objects, or objects of cultural patrimony. The Comprehensive Agreement should establish procedures for consultation, treatment, and disposition of NAGPRA remains or cultural objects likely to be found during any undertaking or action on agency lands [per 43 CFR § 10.5(f)]. The signed agreement, or correspondence related to efforts to reach agreement, constitute proof of consultation. A Contingency Plan of Action (not used in NAGPRA or 43 CFR Part 10) is similar to a Comprehensive Agreement, but deals only with NAGPRA remains and objects likely to be discovered during a specific undertaking or action. Tribal officials AND the installation commander (or his/her delegated sub-commander) must sign Comprehensive Agreements, but only the installation commander or delegate signs Plans of Action [per 43 CFR § 10.5(e)].

Conservation Management—Consists of the planned management, use and protection of natural and cultural resources to provide sustainable use and continued benefit for present and future generations, and the prevention of exploitation, destruction, waste, and neglect.

Conservation Law Enforcement Program—Department of Defense program as described in DoDI 5525.17, *Conservation Law Enforcement Program (CLEP)*, which provides for the enforcement of laws for the protection of cultural and natural resources on military installations.

Cooperating Agency—In accordance with the Sikes Act, and for the purpose of Integrated Natural Resources Management Plan coordination, the cooperating agencies are the USFWS, state fish and wildlife agency, and the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) for installations that include or border marine environments.

Cooperative Agreement—A written agreement between an Air Force organization and one or more outside agencies (federal, state, or local), conservation organizations, or individual for the planning and implementation of natural resources program requirements.

Consensus versus Formal Determination of Eligibility—A "Formal Determination of Eligibility for Listing on the National Register" is made by the Keeper. A "consensus determination" is a written agreement between an installation and SHPO that a property is eligible for listing. Nomination to the Register is not necessary with either determination. The consensus process is not a lower threshold for significance than a formal determination of eligibility by the Keeper, or the National Register listing procedures. A consensus determination is a legally recognized finding that a property meets the criteria for listing in the National Register. Under

Section 110, properties that are eligible are given the same legal status as properties formally listed in the National Register.

Consultation—A reasonable and good faith effort to involve affected and interested parties in the findings, determinations, and decisions made during the Section 106 Process, and other processes required under NAGPRA, AIRFA, NEPA, ARPA, and other statutes and regulations. Consultations with tribes must be on a government-to-government level to respect tribal sovereignty and to recognize the unique legal relationship between the federal government and tribes set forth in the Constitution, treaties, statutes, and court decisions (See also Notification).

Consulting Parties—in accordance with 36 CFR § 800.2(c), parties with consulting roles in the Section 106 Process include SHPO and/or tribal government. Consulting parties might also include Indian Tribal governments; representatives of local governments; applicants for federal assistance, permits, licenses, and other approvals; and members of the Public with interests in the undertaking.

Criteria of Adverse Effect—Standards/guidelines used to determine whether the effects caused by an activity, project or program (i.e., an undertaking that has the potential to affect cultural resources) will be detrimental to historic properties, in accordance with the Advisory Council's regulations (36 CFR § 800.5). An adverse effect occurs when a project or program alters or destroys the characteristics of a property that qualify it for listing in the National Register of Historic Places. This may include diminishing the integrity of the property's location, design, setting, materials, workmanship, internal composition or association with past events or people. An adverse effect may include but is not limited to: 1) destruction or alteration of all or part of a property; 2) isolation from or alteration of the surrounding environment of the property; 3) introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting; 4) neglect of a property resulting in its deterioration or destruction; 5) transfer or sale of federally owned, leased or controlled property without adequate consultation on restrictions for the preservation and maintenance of the historic property.

Critical Habitat—Any air, land, or water area and constituents thereof that the USFWS or NOAA Fisheries has designated as critical habitat in accordance with the ESA. The ESA, Section 3, defines critical habitat as: (i) the specific area within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of Section 4 of this Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of this Act, upon a determination by the Secretary that such areas are essential for the conservation of the species.

Cropland—Land primarily suitable for producing farm crops, including grain, hay, and truck crops.

Cultural Resource—Any prehistoric or historic district, site, building, structure, or object as defined by 36 CFR Part 800 included in, or eligible for inclusion in, the National Register of Historic Places, whether or not such eligibility has been formally determined, including artifacts, records, and material remains related to such a property or resource; cultural items as defined in NAGPRA; American Indian, Eskimo, Aleut, or Native Hawaiian sacred sites as defined in EO 13007; archaeological resources as defined in NHPA; and, archaeological artifact collections and associated records as defined in 36 CFR Part 79.

Cultural Resources Manager—A qualified, trained cultural resources program manager who meets the Secretary of the Interior Standards and Guidelines for Federal Agency Historic Preservation Programs pursuant to NHPA Section 110, or who has sufficient historic preservation, archaeological, historical, or architectural training to successfully carry out the responsibilities of the Air Force Cultural Resources Program.

Curation—The process of managing and preserving an archaeological collection of artifacts and records according to professional museum and archival practices, as defined in 36 CFR Part 79. Refer to Legacy Resource Management Program Office, Legacy Project No. 98-1714, *Guidelines for the Field Collection of Archaeological Materials and Standard Operating Procedures for Curating Department of Defense Archaeological Collections*, available through the Department of Defense Energy, Environment, Safety & Occupational Health Network and Information Exchange and eDASH Cultural Resource Management websites.

Dispersed Outdoor Recreation—Outdoor recreation activities not related to a sports facility and conducted outside of a designated recreation area that provides built recreation facilities and services such as restrooms, potable water, camping pads, tables, fire pits, and garbage removal.

District—"A district is a geographically definable area, urban or rural, possessing a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united by past events or aesthetically by plan or physical development. A district may also comprise individual elements separated geographically but linked by association or history" (36 CFR § 60.3).

Economic Analysis—A comprehensive report that details the feasibility of preserving or rehabilitating a historic structure. The study must include the costs to prepare all necessary National Environmental Protection Act documentation, complete hazardous waste disposal, undertake any environmental remediation measures, complete a Historic American Building Survey Level I recordation of the property, prepare the site for new construction, and the cost to dispose of all demolition debris. The report must also detail the cost to undertake an in-kind replacement of the historic building. Economic Analyses also must cover all of the hidden costs of building demolition (hazardous waste disposal, recordation, recycling materials, etc.).

Ecosystem Management—An approach to natural resources management that focuses on the interrelationships of ecological processes linking soils, plants, animals, minerals, climate, water, and topography.

Effect—Any alteration to those characteristics of a historic or cultural property that qualify it for inclusion in the National Register of Historic Places (e.g. disturbing an archaeological site feature, such as a house ring or foundation). An effect, whether positive or negative, requires Section 106 review and consultation. See also Criteria of Adverse Effect.

Emergency or Disaster Situations—In effect when the President, a governor, or a tribal leader declares that an immediate threat to life or property exists.

Endangered Species—Any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to man [Endangered Species Act, Section 3]. For the purposes of this instruction, the term "endangered species" refers to a species that has been designated for special protection and management by the federal government pursuant to the ESA.

Evaluation—Application of the National Register eligibility criteria, 36 CFR § 60.4 and 36 CFR Part 63 to cultural resources. A professionally trained and qualified cultural resources specialist (e.g., historic architect; architectural historian; archaeologist) must complete this task for the installation following coordination with the applicable Air Force offices prior to initial consultation with the SHPO or the THPO.

Exotic Species—Any plant or animal not native or indigenous to a region, state, or country.

Floodplains—Lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year [EO 11988].

Forest Land—Land on which forest trees of various sizes constitute at least 10 percent of the area. This category includes open land that is capable of supporting trees and is planned for forest regeneration and management.

Forest Products—Plant materials in wooded areas that have commercial value, such as saw logs, veneer (peeler) logs, poles, pilings, pine needles, cordwood (for pulp, paper, or firewood), fence posts, mine timber, Christmas trees (from unsheared trees cut during intermediate harvests), and similar wood or chemical products.

Game—Any species of fish or wildlife for which state or federal laws and regulations prescribe hunting seasons and bag or creel limits.

Geographically Separated Unit—Air Force real property under the command and control of a parent installation that is geographically separated and non-contiguous with the supporting installation.

Geospatial Data—The concept for collection, information extraction, storage, dissemination, and exploitation of geodetic, geomagnetic, imagery, gravimetric, aeronautical, topographic, hydrographic, littoral, and cultural, data accurately referenced to a precise location on the earth's surface. These data are used for military planning, training, and operations including navigation, mission planning, mission rehearsal, modeling, simulation and precise targeting. Geospatial information provides the basic framework for visualizing the Earth’s surface. Geospatial data are information produced by multiple sources to common interoperable data standards, presented in the form of printed maps, charts, and publications; in digital simulation and modeling databases; in photographic form; or in the form of digitized maps and charts. Geospatial data are housed in GISs.

Government-to-Government—The relationship between federally-recognized tribes and the U.S. is one between sovereigns, i.e., between a government and a government.

Habitat—An area that provides the environmental elements of air, water, food, cover, and space necessary for a given species to survive and reproduce.

Heritage Asset—See Historic Property.

Historic Facilities—See Historic Property

Historic Property—“Any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion on the National Register of Historic Places, including artifacts, records, and material remains related to such a property or resource.” (NHPA Section 301(5)).

Title 36 CFR § 60.4 explains criteria for determining eligibility for listing to the National Register. This definition of Historic Property is equivalent to "Heritage Asset."

Historic Status Code—The official National Register of Historic Places status listed in the Real Property Inventory for each asset. The status codes are published and defined by DoD. The appropriate entries are determined by the installation or AFCEC CRM and reflect SHPO concurrence, or eligibility determinations by the Keeper. Each facility coded as an Historic Property (Heritage Asset) in the Inventory (e.g., ELPA; Contributing Element of a National Historic Landmark District; Individual National Historic Landmark; NREC; NREI; NRLC; NRLI) must be supported by appropriate documentation. Facilities coded as DNE must have documentation supporting the not-eligible determination

Identification of Historic Properties—A process using specific methods and techniques to locate and define the characteristics, nature, extent, and boundaries of cultural resources and historic properties. (See the Secretary of Interior's Standards and Guidelines for Identification). Identification is one of the first steps in the NHPA Section 110 process, which includes preliminary work, actual efforts to identify properties, and the evaluation of identified properties to determine if they qualify as historic properties. The standard is a "reasonable and good faith effort" for identification and evaluation.

Imaginary Surfaces—The area surrounding a runway that must be kept clear of objects that might damage an aircraft is bounded by imaginary surfaces that are defined in the manual.

Improved Grounds—A grounds maintenance land use category used to indicate scope and intensity of land management. Includes land occupied by buildings and other permanent structures as well as lawns and landscape plantings on which personnel annually plan and perform intensive maintenance activities. Improved Grounds include the cantonment area, parade grounds, drill fields, athletic areas, golf courses (excluding roughs), cemeteries, and housing areas. Grass in these areas is normally maintained by regular mowing during the growing season.

Incidental Take—Engaging in a lawful activity that was not intended to cause, but nevertheless causes, a "take" of wildlife. Under the Endangered Species, "take" is the death, injury, harassment of a Federally-listed threatened or endangered species. Under the Migratory Bird Treaty Act, "take" is the death or injury of a migratory bird.

Indian Lands or Tribal Lands—Defined in ARPA as: "…lands of Indian tribes, or Indian individuals, which are either held in trust by the U.S. or subject to a restriction against alienation imposed by the U.S., except for subsurface interests not owned or controlled by an Indian tribe or Indian individual." Indian Lands include tribal reservations, trust lands, and "Usual and Accustomed Places" for subsistence collecting, hunting, and fishing. The latter are often called "Treaty Lands."

Integrated Natural Resources Management Plan (INRMP)—A plan based on ecosystem management that describes and delineates the interrelationships of the individual natural resources elements in concert with the mission and land use activities affecting the basic land management plans. Defines the natural resources elements and the activities required to implement stated goals and objectives for those resources.

Integrated Pest Management—A planned program incorporating continuous monitoring, education, record-keeping, and communication to prevent pests and disease vectors from causing unacceptable damage to operations, people, property, materiel, or the environment. Integrated Pest

Management includes methods such as habitat modification, biological control, genetic control, cultural methods, mechanical control, physical control, regulatory control, and the judicious use of least-hazardous pesticides.

Interested Person or Party—In the NHPA Section 106 process, an individual, group or organization concerned with the effects of an undertaking on historic properties. These may request an opportunity to participate as consulting parties.

Invasive Species—An alien animal or plant species whose introduction does, or is likely to cause, economic or environmental harm, or harm to human health [EO 13112].

Land Management Unit—The smallest land management division that natural resources managers use in developing specific strategies to accomplish natural resources management goals. Land management units may correspond to grazing units on agricultural outgranted lands, stands or compartments on commercial forest lands, various types of improved grounds (for example, athletic fields, parks, yards in family housing, or landscaped areas around administrative buildings), or identifiable semi-improved grounds (for example, airfield areas, utility rights-of-way, or roadside areas).

Livestock—Domestic animals kept or raised for food, by-products, work, transportation, or recreation.

Material Remains—Physical evidence of human occupation or use. These are artifacts, ecofacts, and features, from or at the location, or in the context, in which the events occurred.

Mitigation—Actions or treatments that lessen, eliminate, or compensate for the adverse effects of undertakings to historic properties. These actions may include, but are not limited to: 1) moving the undertaking to avoid effects; 2) reducing the extent of the effects by redesigning the undertaking; 3) compensating for the effects by repairing, rehabilitating, or restoring the affected historic properties; 4) preservation and protection actions during actual implementation of the undertaking; and/or 5) compensating for the effect by documenting the historic property, moving the historic property to a protected area, or conducting data recovery. This Instruction encourages "Creative" or "Alternative" mitigation, which can include preserving, protecting, studying, or restoring non-affected properties substituted for the affected property. Creative mitigation may involve publishing detailed research, or publically-oriented documents on the archaeology or history of a region or locale, or creating a scale model or other representation of the affected property for a park or museum.

Native American Graves Protection and Repatriation Act (NAGPRA)—A federal law passed in 1990. NAGPRA provides a process for museums and federal agencies to return certain Native American cultural items -- human remains, funerary objects, sacred objects, or objects of cultural patrimony -- to lineal descendants, and culturally affiliated Indian tribes and Native Hawaiian Organizations (NHOs). NAGPRA includes provisions for unclaimed and culturally unidentifiable Native American cultural items, intentional and inadvertent discovery of Native American cultural items on federal and tribal lands, and penalties for noncompliance and illegal trafficking. In addition, NAGPRA authorizes federal grants to Indian tribes, NHOs, and museums to assist with the documentation and repatriation of Native American cultural items, and establishes the Native American Graves Protection and Repatriation Review Committee to monitor the NAGPRA process and facilitate the resolution of disputes that may arise concerning repatriation under NAGPRA. Implementing regulations for NAGPRA are at 43 CFR Part 10.

Native American—A person with origins in any of the original peoples of North America and who maintains cultural identification through tribal affiliation or has community recognition as an American Indian or Alaskan Native.

Native Hawaiian Organization (NHO)—Defined in accordance with NAGPRA Section 2(10) "A Native Hawaiian organization includes any organization that: (a) serves and represents the interests of Native Hawaiians, (b) has as a primary and stated purpose the provision of services to Native Hawaiians, and (c) has expertise in Native Hawaiian Affairs, and includes the Office of Hawaiian Affairs and Hui Malama I Na Kupuna `O Hawai`i Nei." The Department of the Interior has interpreted this definition to also include the Hawaiian island burial councils and various 'Ohanas (extended families). (See Consultation with Native Hawaiian Organizations in the Section 106 Process: A Handbook; and DoDI 4710.03, *Consultation with Native Hawaiian Organizations (NHOs)*).

National Historic Landmark—Historic property that meets the criteria of the National Register and has been designated by the Secretary of the Interior for its special national importance in the history of the U.S. Air Force examples include Randolph Field Historic District at Joint Base San Antonio-Randolph, Texas, and the Cadet Area of the U.S. Air Force Academy, Colorado. Historic Landmarks receive an elevated level of protection under 36 CFR § 800.10.

National Register of Historic Places (National Register)—The federal government's official list of buildings, structures, districts, sites, and objects that are significant in American history, architecture, archaeology, engineering, or culture, and are thereby considered for preservation. The National Register is administered by the Department of the Interior, National Park Service. Criteria for eligibility, and the procedures for nomination, making changes to listed properties, and for removing properties from the National Register are detailed in 36 CFR Part 60, *"National Register of Historic Places."*

Natural Resources Management Professional—A person with a bachelor's, master's, or doctoral degree in the natural sciences from an accredited college or university who manages natural resources and receives periodic training to maintain proficiency in that job.

Natural Resources Manager—The natural resources management professional who is delegated responsibility for the management of the natural resources program on an installation.

Notification—Written notification (vs. Consultation) is specifically required in various statutes. For example, affiliated federally recognized tribes must be notified 30 days before a federal agency may issue an ARPA permit if the proposed research might disturb or harm any Indian tribal or religious site on agency land [32 CFR § 229.7(a)]. Written notification also is required by NAGPRA for planned intentional excavation or inadvertent discovery of Native American human remains, and funerary or sacred objects, or objects of cultural patrimony. See 43 CFR § 10.5(b) for the list of people who must be notified under NAGPRA. NHPA regulation 36 CFR § 800.6(a)(1) requires notification of the Advisory Council that an undertaking will adversely affect a historic property.

Noxious Weed—Any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the U.S., the public health, or the environment.

Nuisance Wildlife—Wildlife that damages property, impedes installation operations, or endangers public health and safety to the point where control measures are necessary. This category excludes wildlife species protected under the auspice of the Endangered Species Act or Migratory Bird Treaty Act.

Outdoor Recreation—Recreation that relates directly to and occurs in natural, outdoor environments.

Outdoor Recreation Resources—Land and water areas and associated natural resources that provide, or have the potential to provide, opportunities for outdoor recreation for present and future generations.

Plan of Action—A written plan, prepared, approved, and signed by a federal agency official (e.g., the installation commander), in response to an inadvertent discovery or intentional excavation of Native American human remains, funerary objects, sacred objects, or objects of cultural patrimony on agency land. A Comprehensive Agreement (sometimes called a Contingency Plan of Action) is similar but is developed prior to a specific planned undertaking or set of actions likely to result in the discovery of NAGPRA remains or objects. Plans of Action are completed after consultation between the federal agency and a federally recognized tribe affiliated with the NAGPRA remains or cultural objects. The Plan of Action outlines consultation procedures, treatment, and disposition of the NAGPRA remains and objects. Signatures of Tribal officials are not required (43 CFR § 10.5(e)).

Program Comment and Nationwide PA—Programmatic alternatives to NHPA Section 106 review developed through negotiations between a federal agency and the Advisory Council to streamline Section 106 review for a category of possibly significant resources, in accordance with 36 CFR § 800.14(a)]. Currently in effect: 1. Advisory Council on Historic Preservation, PA with DoD, Demolition of World War II Temporary Buildings, 7 July 1986, amended 1 May 1991; 2. ACHP, Program Comment, Wherry and Capehart Era Family Housing at Air Force and Navy Bases, 18 November 2004; 3. Advisory Council on Historic Preservation, Program Comment, Ammunition and Explosives Storage for the Navy (1939-1989) and the Air Force (1946-1989), 18 August 2006; 4. Advisory Council on Historic Preservation, Program Comment, Air Force and Navy Unaccompanied Personnel Housing During the Cold War Era (1946-1989), 18 August 2006.

Proponent—The commander, commanding officer, or civilian director of a unit, activity, or organization, who initiates a proposal for an undertaking, who has command and control authority over the undertaking once it is authorized, or who has the legal and financial authority to commit the Air Force to agreements undertaken in compliance with cultural resource laws and regulations.

Reforestation—The renewal or regeneration of a forest by natural or artificial means.

Sacred site—Defined in EO 13007 as, "Any specific, discrete, narrowly delineated location on federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site" (see DoDI 4710.02 and DoDI 4710.03).

Secretary of the Interior's Standards and Guidelines for Federal Agency Historic Preservation Programs Pursuant to Section 110 of the NHPA—Published in Federal Register (24 April 1998) and in Archeology and Historic Preservation: Secretary of the Interior's Standards

and Guidelines (48 FR 44716). The Standards and Guidelines are a series of guidance documents created by the Secretary of the Interior under authority of the NHPA. The Standards and Guidelines do not set agency policy but assist in organizing information about historic preservation activities; in describing steps achieved by federal agencies, states, and others when planning for the identification, evaluation, registration, and treatment of historic properties, and in integrating the diverse efforts of the various entities to preserve the Nation's cultural heritage.

Section 106 Program Alternatives—36 CFR § 800.14 outlines a variety of methods available to federal agencies to meet their Section 106 obligations. Each of these alternatives allows federal agencies to tailor the Section 106 process to meet their needs. Alternate procedures include Alternate Procedures; PAs; Prototype PAs; Exempted Categories; Standard Treatments; and Program Comments.

Section 106, NHPA (54 USC § 306108—): "The head of any federal agency having direct or indirect jurisdiction over a proposed federal or federally assisted undertaking in any state and the head of any federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any federal funds on the undertaking or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. The head of any such federal agency shall afford the Advisory Council on Historic Preservation established under Title II of this Act a reasonable opportunity to comment with regard to such undertaking."

Section 106 Process—The series of actions (including consultation, background studies, surveys, resource identifications, assessments and treatments) that implement Section 106 of the National Historic Preservation Act (54 USC § 306108), which requires federal agencies to take into account the effects of their undertakings on any cultural resources or historic properties that meet the National Register criteria. Part of this process involves taking action to avoid or minimize harm to eligible resources (historic properties). The entire Section 106 process is outlined in 36 CFR Part 800). See **Consultation**.

Section 110 Inventories—Archaeological or historic building surveys and National Register evaluations completed in accordance with NHPA Section 110 (54 USC § 306102(a)(2)(A) requirements to identify historic properties on agency land to facilitate good planning and streamline later Section 106 (54 USC § 306108) consultations. Surveys and eligibility determinations for Section 110 (54 USC §§ 306101-306107) must be coordinated with SHPO/THPO and other appropriate parties for concurrence to ensure future applicability to Section 106 undertakings that occur in surveyed areas. Recordkeeping is a key component to successful Section 110 inventories.

Semi-Improved Grounds—A grounds maintenance category used to indicate scope and intensity of land management. Grounds where periodic maintenance is performed primarily for operational reasons (such as erosion and dust control, bird control, and visual clear zones). This land use classification includes areas adjacent to runways, taxiways, aprons, runway clear zones, lateral safety zones, rifle and pistol ranges, weapons firing and bombing ranges, picnic areas, ammunition storage areas, antenna facilities, and golf course roughs. Semi-improved grounds areas are mowed less often than the maintained turf grass on improved grounds.

Site—Location of an event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or removed, where the location itself maintains historical,

cultural, or archeological value and integrity. Examples are battlefields, historic campgrounds, ancient trails or gathering places, deposits of cultural debris (i.e. middens or trash dumps), and historic homesteads and farms.

State Historic Preservation Officer (SHPO)—The official appointed by the governor of each state and territory to carry out the functions defined in the NHPA, and to administer the State Historic Preservation Program. SHPOs provide advice and assistance to Federal agencies regarding their cultural resources management programs and historic preservation responsibilities. The NHPA has been amended over the years, with attendant changes to 36 CFR Part 800, resulting, for example, in Tribal Historic Preservation Officers (THPO) most often being consulted concurrently with SHPOs.

Stewardship—The management of a resources base with the goal of maintaining or increasing the resources' value indefinitely into the future.

Threatened Species—Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range [ESA, Section 3]. For the purposes of this instruction, the term threatened species refers to a species that has been designated for special protection and management by the federal government pursuant to the ESA.

Traditional Cultural Property—Sites, districts, buildings, structures, or objects associated with cultural practices or beliefs of a living community that are rooted in the history of the community, and are important in maintaining the continuing cultural identity of the community. Section 106 consultation with tribes is required to identify traditional cultural properties and to determine if any meet National Register eligibility criteria of 36 CFR § 60.4. may be determined eligible for the National Register of Historic Places, and as such, are considered under the Section 110 process as traditional cultural properties. Examples of traditional cultural properties include: 1) locations where Native American or other groups traditionally gather wild foods or medicines; 2) ethnic neighborhoods whose cultural character is important to those who live in them; 3) rural landscapes reflecting traditional patterns of agriculture or social interaction; and 4) landforms associated with Native American traditions and religious practices.

Tribal Historic Preservation Officer (THPO)—The official appointed by an Indian tribe in accordance with the NHPA to administer the Tribal Historic Preservation Program and assume duties and functions for tribal lands similar to those that the SHPO has for other lands. The Secretary of Interior designates tribes with THPO responsibilities. Air Force installations must consult with the THPO, instead of the SHPO, on undertakings on or over Indian tribal lands where a tribe has been granted THPO responsibilities by the Secretary of the Interior. A tribe also may designate its THPO to represent the tribe in consultations with the Air Force where an installation's historic properties are of traditional religious and cultural importance to a tribe, or otherwise potentially affected by Air Force.

Unanticipated Discovery—Identification of a historic property/cultural resource or of an unanticipated adverse effect to a cultural resource during implementation of an undertaking. These may occur with or without prior planning for such discoveries and after completion of comprehensive NHPA Section 106 (54 USC § 306108) consultation (including consultation with all appropriate parties). When this occurs, the finder will cease operations and notify the installation commander and the CRM who will follow the procedures defined in the ICRMP and in 36 CFR § 800.13 and 43 CFR § 10.4 for NAGPRA remains or cultural objects found as Inadvertent Discoveries.

Undertaking—36 CFR § 800.16(y) defines an undertaking as "a project, activity, or program in whole or in part funded under the direct or indirect jurisdiction of a federal agency." Includes projects and activities that are: (a) carried out by or on behalf of a federal agency; (b) federally funded; (c) require a federal permit, license or approval; or (d) are subject to state or local regulation administered through delegation or approval authority by a federal agency.

Unimproved Grounds—A grounds maintenance land use category used to indicate scope and intensity of land management. Unimproved grounds are areas not classified as 'improved' or 'semi-improved'. Unimproved grounds include forest lands, croplands and grazing lands, lakes, ponds, and wetlands, and any areas where natural vegetation is allowed to grow unimpeded by maintenance activities.

Urban Forests—Planted or remnant native tree species existing within urbanized areas such as parks, tree-lined residential streets, scattered tracts of undisturbed woodlands, and cantonment areas.

Watchable Wildlife Areas—Areas identified under the Watchable Wildlife Program as suitable for passive recreational uses such as bird watching, nature study, and other nonconsumptive uses of wildlife resources.

Waters of the U.S.—Waters subject to the regulatory jurisdiction of the U.S. under the Clean Water Act, and defined as traditional navigable waters, impoundments of traditional navigable waters, interstate waters, territorial seas, and adjacent waters; including adjacent wetlands.

Wetlands—Areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds [EO 11990].

Wildland Fire—Any non-structure fire that occurs in the wildland. Three distinct types of wildland fire have been defined and include wildfire, wildland fire use, and prescribed fire.

Wildlife Exclusion Zone—A locally defined, airfield specific area where a zero tolerance goal for hazardous wildlife is maintained. This area may encompass the Aircraft Movement Area and any additional habitat attractants (such as water treatment facilities, golf courses, and athletic fields) in proximity to the airfield and low-level flight corridors (such as final approach/departure).

BY ORDER OF THE SECRETARY OF THE AIR FORCE

AIR FORCE MANUAL 40-201

29 MARCH 2019

Medical Command

RADIOACTIVE MATERIALS (RAM) MANAGEMENT

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This manual implements Air Force Policy Directive (AFPD) 40-2, *Radioactive Materials (Non-Nuclear Weapons)* in accordance with and supports the conditions of the US Air Force Master Materials License (MML) issued by the US Nuclear Regulatory Commission (NRC) and managed by the United States Air Force Radioisotope Committee (RIC). It applies to all US Air Force (USAF) personnel including members of the Air Force Reserve and Air National Guard. It instructs personnel on procedures for the acquisition, receipt, security, use, storage, transfer, transport, distribution, and disposal of all radioactive material (RAM) in the USAF. Civilian USAF employees are subject to administrative disciplinary action, in addition to any applicable criminal or civil sanctions for the violation of requirements and prohibitions contained in this manual. This manual requires the collection and/or maintenance of information protected by Title 5 United States Code Section 552a, *Privacy Act of 1974*, authorized by Title 10 Code of Federal Regulations (CFR), Section 20.2106, *Records of Individual Monitoring Results* and Title 29 CFR Section 1910.1096(b), *Exposure of Individuals to Radiation in Restricted Areas*, Title 29 CFR Section 1910.1096(n), *Record*s, and Title 29 CFR Section 1910.1096(o), *Disclosure to Former Employee of Individual Employee's Record.* The applicable SORN F044 AF SG O, *United States Air Force Master Radiation Exposure Registry* (November 18, 2003, 68 FR 65042) is available at **http://dpclo.defense.gov/Privacy/SORNs.aspx**. Ensure that all records created because of processes prescribed in this publication are maintained in accordance with Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of in accordance with the Air Force Records Disposition Schedule in the Air Force Records Information Management System. Refer

recommended changes and questions about this publication to the Office of Primary Responsibility using the AF Form 847, *Recommendation for Change of Publication*, route AF Forms 847 from the field through the appropriate functional chain of command to the Air Force Medical Support Agency (AFMSA)/Bioenvironmental Engineering Division, 7700 Arlington Blvd., Falls Church, VA 22041. This publication may be supplemented at any level, but direct Supplements must not contain conflicting material or less restrictive guidance. The authorities to waive wing/unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See Air Force Instruction (AFI) 33-360, *Publications and Forms Management*, for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the publication Office of Primary Responsibility for non-tiered compliance items. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

SUMMARY OF CHANGES

Due to substantial revision, complete review of this document is required. The document is streamlined to remove non-directive content. Major changes include using Inspector General Management Evaluation System for radioactive material permit inspections and clarification or updates on: radioactive material remediation process, management of generally licensed devices, required use of the Radioactive Material Management Information System (RAMMIS), requirements for installation level radiation policy, and training requirements.

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Chapter 1

PROGRAM OVERVIEW

1.1. Overview.

1.1.1. This manual provides uniform instruction and guidance for the management and control of radioactive material (RAM) in the USAF. It sets forth how USAF personnel or units manage the utilization of all RAM not expressly excluded from the purview of this manual; this includes: acquisition, use, storage, security, receipt, transfer, transportation, distribution, and disposal. This manual also prescribes how non-USAF entities get approval to use, store, and transport RAM on USAF installations. Workers using radioactive material should focus on **paragraph 2.18** for their individual requirements.

1.1.2. Applicability. RAM covered by this manual includes, without limitation, any licensable RAM, as defined by Title 10 Code of Federal Regulations (CFR) Chapter I, *Nuclear Regulatory Commission*, which applies to the USAF and for other RAM as described in this manual.

1.1.3. Objectives. The objectives of this manual are to provide guidance to establish, implement, and ensure a unified approach for managing, safeguarding, and authorizing the utilization of RAM on USAF installations.

1.2. Regulatory Authority for Radioactive Materials (RAM). This manual implements NRC requirements across the USAF. It also sets requirements for USAF-owned RAM not under the jurisdiction of the US Nuclear Regulatory Commission (NRC).

1.2.1. US Nuclear Regulatory Commission (NRC) Regulatory Authority. The NRC is the primary regulatory authority for USAF utilization of RAM in the US. The Atomic Energy Act (AEA) of 1954 (42 United States Code Sections 2011-2021, 2022-2286i, and 2296a-2297h-13), as amended (including Public Law 109-58, *Energy Policy Act of 2005* and the Public Law 93-438, *Energy Reorganization Act of 1*974), grant the NRC the authority to regulate byproduct material, discrete naturally-occurring and accelerator-produced radioactive material (NARM), source material, and special nuclear material (SNM) for peaceful applications in accordance with Title 42 United States Code (U.S.C.) Section 2011, *Congressional Declaration of Policy*, et seq. This authority does not extend to material described in AEA Section 91, or Title 42 U.S.C. Section 2121, *Authority of Commission*.

1.2.1.1. NRC authority extends across the US, its possessions and territories. For regulations issued and enforced by the NRC, reference 10 CFR, Chapter I.

1.2.1.2. The NRC maintains regulatory authority over Federal agency licensees regardless of location within the United States.

1.2.2. USAF Regulatory Authority:

1.2.2.1. Authority for USAF receipt, storage, internal distribution, use, transfer, and disposal of byproduct, discrete NARM, source, and limited quantities of SNM is granted through a Master Materials License (MML) issued to the USAF by the NRC. This manual prescribes requirements for USAF compliance with the MML and other applicable regulatory requirements.

1.2.2.2. The USAF also maintains authority over the use of RAM by non-USAF organizations on USAF installations where exclusive Federal jurisdiction exists. This manual requires USAF personnel, usually the installation radiation safety officer (IRSO), to coordinate with tenant organizations operating under a non-USAF permit, NRC license, or Department of Energy (DOE) license exemption on legal documentation, location, quantity and movement onto and across USAF-occupied real estate for RAM exceeding NRC exempt quantities and not falling under the AEA.

1.2.2.3. This manual does not, unless specifically stated, apply to nuclear reactor programs, nuclear weapons systems or waste, or other RAM controlled under Section 91 of the AEA, or 42 U.S.C. §2121. These items are governed by AFPD 91-1, *Nuclear Weapons and Systems Surety*, AFI 91-108, A*ir Force Nuclear Weapons Intrinsic Radiation and 91(b) Radioactive Material Safety Program*, AFI 91-110, *Nuclear Safety Review and Launch Approval for Space or Missile Use of Radioactive Material and Nuclear Systems*, and subordinated instructions managed through the Air Force Safety Center (AFSEC).

1.2.3. Authority in locations outside of the US and its territories. The requirements in this manual apply for locations outside the US, so long as the requirements do not conflict with applicable requirements from any of the following: international agreements, the Overseas Environmental Baseline Guidance Document, country-specific Final Governing Standards, Geographic Combatant Command policy, and environmental annexes to operational orders, operational plans or other operational directive. International Atomic Energy Agency (IAEA) Safety Standards and other publications may be considered where appropriate. USAF RAM use and activities outside the US are detailed in **paragraph 3.1.10**.

1.2.4. Resource Conservation and Recovery Act (RCRA). RCRA authorizes the Environmental Protection Agency (EPA) to develop and enforce regulations governing the cradle to grave management of hazardous waste, to include Low-Level Mixed Waste (LLMW), Low-Level Radioactive Waste (LLRW), and Mixed Waste (MW). These regulations are found in Title 40 of the Code of Federal Regulations (40 CFR) Chapter I, *Environmental Protection Agency*. For purposes of RCRA, take note of the following definition: Low-Level Mixed Waste (LLMW) is waste that contains both low-level radioactive waste and RCRA hazardous waste. Low- Level Radioactive Waste (LLRW) is a radioactive waste which contains source, special nuclear, or byproduct material and is not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or byproduct material. Mixed Waste (MW) means waste that contains both RCRA hazardous waste and source, special nuclear, or byproduct material.

1.2.4.1. Conditional exemptions from RCRA for LLMW are provided under Title 40 CFR Part 266, Subpart N , *Conditional Exemption for Low-Level Mixed Waste Storage, Treatment, Transportation, and Disposal*.

1.2.4.2. Solid low level radioactive waste (LLRW) includes quantities of byproduct, source and SNM. They also may contain NARM, and they too may fall within the definition of hazardous waste as set out in Title 40 CFR Part 261, *Identification and Listing of Hazardous Waste*.

1.2.4.3. Waste that contains both AEA-regulated RAM and hazardous waste (as defined by 40 CFR Part 261) is termed mixed waste.

1.2.4.3.1. Mixed waste is subject to dual regulation under EPA and NRC rules.

1.2.4.3.2. Neither agency has exclusive jurisdiction over mixed waste under current Federal law.

1.2.5. Clean Air Act. The Clean Air Act gives the EPA authority over non-NRC regulated radionuclide emissions from Federal facilities in accordance with Title 40 CFR Part 61, Subpart I, *National Emission Standards for Radionuclide Emissions from Federal Facilities other than Nuclear Regulatory Commission Licensees Not Covered by Subpart H*. The NRC regulates air emissions from NRC licensed Federal facilities in accordance with Title 10 CFR Section 20.1101, *Radiation Protection Programs*. Organizations that generate emissions fall under the authority of both NRC and EPA rules. For guidance on complying with EPA air emission standards, refer to AFPD 32-70, *Environmental Quality*, and AFI 32-7040, *Air Quality Compliance and Resource Management*.

1.2.6. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The CERCLA, see Title 42 United States Code, Chapter 103, *Comprehensive Environmental Response, Compensation, and Liability*, establishes prohibitions and requirements, under the EPA, concerning closed and abandoned hazardous waste sites. The CERCLA also provides for liability of persons responsible for releases of hazardous waste at these sites, through the EPA.

1.2.7. Emergency Planning and Community-Right-To-Know-Act (EPCRA). EPCRA, see Title 42 United States Code, Chapter 116, *Emergency Planning and Community-Right-To-Know*, requires that whenever a reportable quantity of a CERCLA hazardous substance leaves installation boundaries, the State Emergency Response Commission and Local Emergency Planning Committee must be notified immediately (40 CFR Part 355, *Emergency Planning and Notification*). EPCRA is not applicable to federal facilities however, the USAF complies with EPCRA, as directed by Executive Order 13834 (May 22, 2018).

1.2.8. Transportation of Hazardous Material (HAZMAT). The Department of Transportation specifies requirements for marking, labeling, shipping documents, containers, and other requirements when shipping or transporting HAZMAT, including RAM, in accordance with 49 CFR, Subtitle B, Chapter I, *Pipeline and Hazardous Materials Safety Administration*. In the USAF, the logistics (A4) community ensures the appropriate handling, packaging and certification of RAM shipments in accordance with Defense Transportation Regulations (DTR) 4500.9-R-Part II, Chapter 204, *Hazardous Material*, and Chapter 208, *Packaging and Handling*; AFMAN 24-210, *Package of Hazardous Material*; Air Force Joint Instruction (AFJI) 23-504, *Radioactive Commodities in the DoD Supply System*; Air Force Joint Manual (AFJMAN) 23-209, *Storage and Handling of Hazardous Materials*; AFMAN 24-204, *Preparing Hazardous Materials for Military Air Shipments*; and International Air Transport Association (IATA), *Dangerous Goods Regulation*. IAEA Safety Standards, including *Regulations for the Safe Transport of Radioactive Material*, and other publications may be considered where appropriate.

1.3. Radioactive Material Licensing Categories.

1.3.1. Specifically Licensed RAM. NRC requires a specific license for possessions and use of byproduct, source, and SNM in accordance with 10 CFR Chapter I. All RAM utilized by the AF which would be subject to NRC licensing are required to be permitted under the MML.

1.3.2. Generally Licensed Devices (GLDs). The NRC provides a general license for the possession and use of byproduct material contained in certain devices in accordance with Title 10 CFR Part 31, *General Domestic Licenses for Byproduct Material*. Most GLDs utilized in the USAF do not require a permit to be issued under the MML.

1.3.3. Exempted RAM. Certain concentrations or quantities of RAM are exempt from specific and general licensing requirements of the NRC. USAF units/organizations have restrictions on the disposition of exempt quantities of RAM, as detailed in this manual and 10 CFR Part 30, *Rules for General Applicability to Domestic Licensing of Byproduct Material*.

Chapter 2

ROLES AND RESPONSIBILITIES

2.1. The Assistant Secretary of the Air Force for Installations, Environment and Energy (SAF/IE) shall:

2.1.1. Appoint one voting representative and one alternate from SAF/IEE to the USAF Radioisotope Committee (RIC).

2.1.2. Execute radiation safety and radioactive materials management duties as outlined in Headquarters Air Force Mission Directive 1-18, *Assistant Secretary of the Air Force (Installations, Environment and Energy).*

2.1.3. Provide financial assurance to the USAF RIC Secretariat (RICS) for submittal to the NRC on all applicable USAF decommissioning activities, in accordance with Title 10 CFR Sections: 30.35, *Financial Assurance and Recordkeeping for Decommissioning*, 30.36, *Expiration and Termination of Licenses and Decommissioning of Sites and Separate Buildings or Outdoor Areas*, 40.36, *Financial Assurance and Recordkeeping for Decommissioning* and 70.25, *Financial Assurance and Recordkeeping for Decommissioning*.

2.2. The Assistant Secretary of the Air Force for Acquisition (SAF/AQ) shall:

2.2.1. Appoint one voting representative, and one alternate, to the RIC, from the Systems Engineering Division, with expertise in environmental, safety, and occupational health and human systems integration.

2.2.2. Ensure Acquisition Program Managers coordinate approval with the RICS, prior to acquisition of new systems and upgrades that contain RAM prior to fielding in the USAF.

2.3. The Surgeon General of the Air Force (AF/SG) shall:

2.3.1. On behalf of the Department of the Air Force, manage the control of RAM within the purview of this manual and the MML.

2.3.2. Maintain and sustain the RIC and the RICS within the AFMSA Bioenvironmental Engineering (AFMSA/SG3PB) Radiation Health function, under the Assistant Surgeon General, Health Care Operations (AF/SG3/5), to provide oversight for use of RAM in the USAF as required by the MML.

2.3.3. Direct AF/SG3/5 to appoint to the RIC a Chair and alternate Chair from the AF Medical Support Agency's Aerospace Medicine Division (AFMSA/SG3P), the health physics and medical physics consultants, and a member and an alternate from the Occupational and Environmental Health function of AFMSA/SG3PB as voting representatives.

2.3.4. In coordination with the Air Force Inspection Agency (AFIA), provide for inspections prescribed by this manual to evaluate risk-based performance and compliance with permits issued by the RICS.

2.3.5. Authorize, empower, and provide required resources to the RIC and RICS to protect the interests of the MML and remain in compliance with applicable NRC and other Federal regulations, Department of Defense (DoD) instructions, and applicable guidance documents including taking enforcement action against RAM permittees, if needed.

2.3.6. **<u>The Assistant Surgeon General, Health Care Operations (AF/SG3/5), shall:</u>**

2.3.6.1. Provide operational control over the RICS, as a duty of the Radiation Health function of the AFMSA, to work on behalf of the RIC in providing functional oversight of non-nuclear weapons related RAM use in the USAF.

2.3.6.2. Chair, or delegate a chair and alternate chair to the RIC. Authorize the Chief of the RICS to act in the Chairperson's absence.

2.3.6.3. Appoint the health physics and medical physics consultants and alternates as a voting representatives from the Radiation Health function of AFMSA/SG3PB to the RIC.

2.3.6.4. Appoint one voting representative and one alternate from the Occupational and Environmental Health function of AFMSA/SG3PB to the RIC.

2.3.6.5. Ensure the delegation of authority for assuring RAM management in accordance with 10 CFR Chapter I and the MML, from the Secretary of the Air Force to AF/SG and the RIC, is fully and accurately reflected in AFPD 40-2 and Headquarters Air Force Mission Directive 1-48, *The Air Force Surgeon General*.

2.3.7. **The Air Force Radioisotope Committee (RIC) shall:**

2.3.7.1. Provide direction for USAF utilization of radioactive material (RAM) and shall grant to the RICS authority to conduct business consistent with applicable and relevant Federal, DoD and USAF policy, regulations, and guidance in accordance with the MML.

2.3.7.2. Serve, through the RICS, as the USAF single point of contact for the MML.

2.3.7.3. Recommend policies to AF/SG3/5 for keeping exposure from approved uses of RAM As Low As is Reasonably Achievable (ALARA) but always below regulatory limits as promulgated in Title 10 CFR Part 20, *Standards for Protection Against Radiation*.

2.3.7.4. Serve, through the RICS, as the USAF single point of contact with the Conference of Radiation Control Program Directors and its licensing states for issues pertinent to the MML. Similarly, serve as the single point of contact with Agreement States.

2.3.7.5. Direct and adjudicate enforcement actions when such actions are required to protect persons or property or maintain compliance with permit and MML conditions.

2.3.7.6. Identify new or special inspection needs and coordinate with AFIA/SG.

2.3.7.7. Review unique actions and permit requests referred by the RICS.

2.3.7.8. Review and advise on special situations involving RAM as requested by the RICS, Air Staff, or Major Commands.

2.3.7.9. Meet as agreed upon with the NRC. Convene ad hoc or emergency meetings to discuss matters requiring timely actions.

2.3.7.10. Publish and make available, minutes of meetings to all committee members, or others, as appropriate.

2.3.7.11. Provide final ruling on the interpretation of this manual and permits affecting compliance with the MML.

2.3.7.12. Provide final resolution for any allegations concerning the safe and regulatory compliant use of RAM in the USAF.

2.3.7.13. Periodically update RIC membership and business practices as identified in RIC standard operating procedures, RIC minutes, and this manual.

2.3.7.14. **The Chief, Air Force Radioisotope Committee Secretariat (RICS) shall:**

2.3.7.14.1. Serve as the single point of contact between the RIC, the NRC, and/or Agreement States for all issues associated with the MML. Assists, when requested, in any transactions involving installations outside of the US and overseas permitted activities that also entail attention to host nation requirements.

2.3.7.14.2. Develop and implement policy, in coordination with the RIC, to acquire, receive, possess, use, distribute, store, transport, transfer, and dispose of or otherwise manage RAM in the USAF, consistent with applicable Federal, DoD and USAF policy, regulations, and guidance and in accordance with with the MML.

2.3.7.14.3. Serve as the office of record for all documentation required to be maintained in accordance with 10 CFR Chapter I and the MML.

2.3.7.14.4. Review, for approval or denial, USAF permit applications, renewals, amendments and other requests for the possession and/or use of RAM under the authority of the RIC.

2.3.7.14.5. Certify individuals are qualified by training, education, and experience to serve as Permit Radiation Safety Officers, be designated an Authorized Users (in accordance with Title 10 CFR Part 35, *Medical Use of Byproduct Material*), or provide audit services for medical permits.

2.3.7.14.6. Regulate the remediation of all radioactive material sites containing RAM under the purview of this manual.

2.3.7.14.7. Coordinate with AFSEC/SEW on issues involving the licensing of certain RAM including aerospace and space power.

2.3.7.14.8. Provide permit documentation to AFIA/SG.

2.3.7.14.9. Provide interpretation of this manual and permits affecting compliance with the MML and USAF policy.

2.3.7.14.10. Conduct pre-permitting visits and direct investigations of RAM incidents and mishaps, as deemed necessary.

2.3.7.14.11. Implement RIC decisions. The Chief, RICS is the executive agent for all business associated with the MML. This includes providing interpretation and setting measures to ensure compliance with applicable NRC and Federal regulations, policy, and/or guidance.

2.3.7.14.12. Independently conduct USAF RAM permit reviews as deemed appropriate by the RICS.

2.3.7.14.13. Implement enforcement actions in accordance with **paragraph 6.3** of this manual. These may include Notices of Violations (NOVs), and revocation and termination orders to protect persons, property, or to maintain MML compliance.

2.3.7.14.14. Exercise the authority to temporarily exempt a Permittee from any requirement of this manual, provided the exemption does not conflict with NRC policy or Federal regulations.

2.3.7.14.15. Exercise the authority to impose policy or permit requirements more stringent than NRC policy or Federal regulations.

2.3.7.14.16. Submit the annual USAF inventory of NRC-regulated SNM to the Nuclear Material Management & Safeguards System in accordance with Title 10 CFR Section 74.13, *Material Status Reports*, before 31 March of each year.

2.3.7.14.17. Submit a SNM Transaction Report to the Nuclear Material Management & Safeguards System within timeframes required by Title 10 CFR Section 74.15, *Nuclear Material Transaction Reports*.

2.3.7.14.18. Submit the National Source Tracking Transaction Report to the National Source Tracking System within timeframes required Title 10 CFR Section 20.2207, *Reports of Transactions Involving Nationally Tracked Sources*.

2.3.7.14.19. Submit the USAF annual inventory of Category 1 and 2 nationally tracked sources to the National Source Tracking System, in accordance with 10 CFR §20.2207, by 31 January of each year.

2.3.7.14.20. Coordinate with SAF/IE for signature on financial assurances, related to all USAF decommissioning and permitted activities; and submit to the NRC in accordance with 10 CFR Part 30, Title 10 CFR Part 40, *Domestic Licensing of Source Material*, and Title 10 CFR Part 70, *Domestic Licensing of Special Nuclear Material*.

2.3.8. **The Commander, Air Force Medical Support Agency (AFMSA) shall:** provide administrative control and support for a Radiation Health function for the establishment and implementation of AF Medical Service policy on all RAM.

2.4. The Deputy Chief of Staff for Logistics, Engineering, and Force Protection (AF/A4) shall:

2.4.1. Appoint one voting representative and one alternate from among the staff of AF/A4L, AF/A4C or AF/A4S to the RIC who can represent civil engineering, logistics readiness, security forces, and aircraft and missile maintenance.

2.4.2. Coordinate on civil engineering, logistics readiness, security forces, and aircraft and missile maintenance policies dealing with RAM covered by this manual.

2.4.3. Provide guidance to Air Force Material Command on the logistical management of items containing RAM.

2.4.4. Maintain a USAF Radioactive Waste Site Registry.

2.4.5. Direct USAF-wide RAM transportation in accordance with, 49 CFR Chapter I, DTR 4500.9-R-Part II Chapters 204 and 208, AFMAN 24-210, AFJI 23-504, AFJMAN 23-209, AFMAN 24-204, IATA; and this manual.

2.4.6. Support the implementation of safety and security measures which in addition to general radiation protection shall include the timely reporting of defects and noncompliance in accordance with Title 10 CFR Part 21, *Reporting of Defects and Noncompliance*, as well as

the physical protection of NRC Category 1 and Category 2 sources, requiring increased controls and national tracking, and/or quantities of radioactive materials requiring an emergency plan for responding to a release (such as "toxic industrial radiologicals", as listed in Title 10 CFR Part 37 Appendix A, *Category 1 and Category 2 Radioactive Materials*, Title 10 CFR Part 20 Appendix E, *Nationally Tracked Source Thresholds*, and Title 10 CFR Section 30.72, Schedule C, *Quantities of Radioactive Materials Requiring Consideration of the Need for an Emergency Plan for Responding to a Release*, respectively).

2.4.7. Ensure local mission support, security, and maintenance personnel will work with Permit Radiation Safety Officer (PRSO) and the Installation Radiation Safety Officer (IRSO) who will in turn interface with the RICS which will in turn interface with the NRC as required.

2.5. The Commander, Air Force Inspection Agency (AFIA), on behalf of The Inspector General (SAF/IG), shall:

2.5.1. Appoint one voting representative to the RIC from AFIA/SG **(T-1)** and can appoint an alternate. Resources and prioritizes inspections according to this manual and in coordination with the RICS and NRC. **(T-1).**

2.5.2. Maintain a staff qualified health physicist (43E4G) with appropriate NRC training and security clearance, to conduct USAF RAM permit and Section 91(b) inspections. **(T-1).**

2.6. The Chief, Weapons Safety Division (AFSEC/SEW), on behalf of The Chief of Safety (AF/SE), shall appoint one voting representative and one alternate from AFSEC/SEW to the RIC to advise on RAM control issues relative to AEA Section 91 materials, for consistent control of RAM within the USAF, in accordance with AFPD 91-1, AFI 91-108 and AFI 91-110. **(T-1).**

2.7. The Commander, Air Force Legal Operations Agency (AFLOA), on behalf of The Judge Advocate General (AF/JA), shall:

2.7.1. Appoint one non-voting legal advisor and one alternate from AFLOA/JAC to the RIC. **(T-1).**

2.7.2. Coordinate on legal issues involving RAM, including internal and external enforcement matters, and acts as counsel to the RIC. **(T-1).**

2.8. Major Commands (MAJCOM):

2.8.1. **The Commander, Air Force Materiel Command (AFMC/CC), shall:**

2.8.1.1. Establish a radioactive waste program office to oversee all radioactive and mixed waste disposition activities in the USAF. **Note:** The Air Force Radioactive Recycling and Disposal (AFRRAD) Office satisfies this requirement, see **paragraph 2.8.1.7.3**.

2.8.1.2. Program and advocate funding for radioactive waste management.

2.8.1.3. Maintain the capability to oversee and coordinate USAF recycling of radioactive material (RAM) where appropriate and cost effective.

2.8.1.4. Ensure all RAM, including waste products, subject to 10 CFR Chapter I and/or 40 CFR Part 261, are identified as early as practical in the procurement and/or development process.

2.8.1.5. Coordinate with the RIC on unique conditions requiring variances to the MML involving the USAF radioactive waste program and recycling of USAF RAM.

2.8.1.6. **The Commander, 711th Human Performance Wing, shall:**

2.8.1.6.1. Appoint one voting representative and one alternate from USAF School of Aerospace Medicine (USAFSAM) to the RIC. **(T-1).**

2.8.1.6.2. Support Major Commands and installations by maintaining and providing National Voluntary Laboratory Accreditation Program-accredited radiation dosimetry services through the USAF Dosimetry Center, comprehensive radio-analytical capabilities, and health physics consultative services. **(T-1).**

2.8.1.6.3. Provide quarterly and annual summaries of occupational radiation exposure, from RAM, to the RIC. **(T-1).**

2.8.1.6.4. Provide technical and on-site health physics support to the RIC, RICS and AFSEC/SEW to prevent, investigate and mitigate human exposure or environmental contamination from RAM. **(T-1).**

2.8.1.7. **The Commander, 88th Air Base Wing (88 ABW/CC), shall:**

2.8.1.7.1. Appoint one voting representative and one alternate to the RIC from the Air Force Radioactive Recycling and Disposal (AFRRAD) Office. **(T-1).**

2.8.1.7.2. Appoint a member to the DoD Disposition Advisory Committee. **(T-1).**

2.8.1.7.3. Sustain the AFRRAD to support, and oversee as necessary, USAF radioactive and mixed waste disposition activities. **(T-1).** This office shall:

2.8.1.7.3.1. Provide technical consultation for all radioactive waste activities to include decommissioning and/or remediation of radiological waste burial sites or contaminated facilities. **(T-1).**

2.8.1.7.3.2. Coordinate radioactive waste disposal, other than decontamination and decommissioning projects; among USAF activities, the DoD Executive Agent, disposal contractors, and disposal site operators, in accordance with **Chapter 4**. **(T-1).**

2.8.1.7.3.3. Provide consultative support on package and transport of radioactive waste for disposal according to Title 10 CFR Part 71, *Packaging and Transportation of Radioactive Material*, 49 CFR Chapter I, Subchapter C, *Hazardous Materials Regulations*, 40 CFR Part 261 et seq., (for mixed waste) and all applicable disposal site rules. **(T-1).**

2.8.1.7.3.4. Provide quarterly summaries of radioactive waste disposal, waste specific issues for decontamination, and decommissioning activities to the RIC or AFSEC/SEW as appropriate. **(T-1).**

2.8.1.7.3.5. Maintain all records of radioactive waste transferred for disposal in accordance with guidance at **https://www.my.af.mil/afrims/afrims/afrims/rims.cfm** and 10 CFR Part 30. (T-1)

2.8.1.7.3.6. Implement billing procedures in accordance with AFI 65-601, Volume 1, *Budget Guidance and Procedures*, to allow funded activities to plan, program, and fund the cost of contracted services for the disposition of generated RAM and

waste. **(T-1).**

2.8.2. **Major Command Bioenvironmental Engineers shall:**

2.8.2.1. Receive, review and forward documents and reports as required by this and other AFIs/manuals in support of RAM management, security, environmental quality, safety and occupational health.

2.8.2.2. Advocate support for the installation bioenvironmental engineering and IRSO at the MAJCOM-level for the implementation of this and related AFIs/manuals.

2.8.2.3. Coordinate Environmental, Safety, and Occupational Health Council (ESOHC) functional support for AF permittees and IRSOs in the MAJCOM who do not have access to an ESOHC at their installation (e.g. Joint Base, forward operating base, geographically separated unit, etc.).

2.8.2.4. Coordinate, consult on, and/or fulfill IRSO responsibilities for AF permittees or other AF users of RAM in the MAJCOM when there is no IRSO because of Joint Basing, forward basing, geographical separation, etc.

2.9. The Installation Commander or AF Wing Commander (non-AF led Joint Base) shall:

2.9.1. Enforce compliance with this manual and all applicable federal regulations for permitted radioactive material (RAM) and Generally Licensed Devices (GLDs). **(T-0).**

2.9.2. Delegate authority in writing to the IRSO to suspend installation operations involving RAM that pose a significant health risk to personnel or the general public, present a clear violation of regulations or requirements, or present a high risk of negative impact to USAF operations, materiel, or real estate. **(T-1).**

2.9.2.1. If on a non-AF led Joint Base, overall IRSO responsibilities shall fall to the host unit per the host service's guidelines. **(T-0).**

2.9.2.2. The AF Wing Commander (non-AF led Joint Base), shall delegate this authority in writing to a Wing Radiation Safety Officer (RSO) for Wing personnel and operations. **(T-1).**

2.9.2.3. IRSO/Wing RSO appointments will be made in accordance with AFI 48-148, *Ionizing Radiation Protection*. **(T-1).**

2.9.3. Provide required resources and access to all activities governed by this manual to the IRSO to maintain compliance with this manual and applicable Federal, DoD, and AF regulations and/or directives. **(T-1).**

2.9.4. Establish specific written policies, through IRSO, for the execution of all applicable AFIs/manuals and federal regulations concerning the management and utilization of RAM on the installation (e.g. policy memos, instructions, AFI/AFMAN supplements, etc.). **(T-3).**

2.9.5. Prohibit the receipt or transfer of RAM (including RAM in classified operations) without prior coordination and/or approval by the IRSO. **(T-1).**

2.9.6. Ensure the IRSO is notified of all activities pertaining to radioactive waste or radioactive waste burial sites. **(T-1).**

2.9.7. Ensure the IRSO briefs the internal audit of all RAM permits annually at the Environment, Safety, and Occupational Health Council (ESOHC). **(T-1).**

2.9.8. Ensure personnel in the logistics readiness squadron, civil engineering squadron, and all other USAF personnel engaged in any aspect of the disposition, transportation, or shipment of HAZMAT, including RAM are fully trained for duties performed in accordance with DTR 4500.9-Part II Chapters 204 and 208, AFJI 23-504, and AFMAN 24-204. **(T-0).**

2.9.9. Ensure the implementation of safety and security measures at the installation level, which may be required for certain types of permitted RAM located on the installation; this may include response capabilities, surveillance, and monitoring. **(T-0).**

2.9.10. Ensure all NRC specifically licensed RAM, GLDs, RIC permitted RAM, and any other type of RAM specified by the RIC which is utilized by DoD activities and organizations or in facilities for which the installation commander is responsible is accurately inventoried in the Radioactive Material Management Information System (RAMMIS), unless otherwise stated in this manual. **(T-1).**

2.9.11. Sustain leases on properties where permitted RAM is located until such time as the RICS terminates the permit. **(T-0).**

2.9.12. **The Installation Radiation Safety Officer (IRSO) shall:**

2.9.12.1. Serve as approval authority for the utilization of all RAM on USAF installations, including those from non-USAF organizations and contractors. **(T-1).**

2.9.12.2. Serve as technical subject matter expert to commanders regarding RAM use on the installation as governed by all applicable local, state, federal regulations and guidance. **(T-1).**

2.9.12.3. Provide RAM identification, detection, and measurement capabilities to permittees and commanders as needed. **(T-3).**

2.9.12.4. Support host and tenant organizations requesting to utilize RAM which may require a permit to be issued under the MML. **(T-1).**

2.9.12.5. Develop and maintain specific written policies for the execution of all applicable AFIs/manuals and federal regulations concerning the management and utilization of RAM on the installation (e.g. installation-level policy memos, instructions, or AFI/AFMAN supplements, etc.). **(T-3).**

2.9.12.5.1. Annually review the installation policies regarding RAM. **(T-3).**

2.9.12.5.2. For an AF-led Joint Base or Joint Operation, the policies must be signed by each co-located service component commander in addition to the installation commander. **(T-1).**

2.9.12.6. Consult with and provide requiring activities with information necessary to develop a Performance Work Statement/Statement of Work for compliance with all applicable statutes, regulations and instructions for managing RAM in the USAF including **paragraph 2.19.2**., and provide contracting officers information necessary to ensure appropriate award selection criteria are included in the solicitation (based on guidance and information from the NRC, Sealed Source and Device Registry (SSDR), RICS, USAFSAM, etc.). **(T-3). Note:** requiring activities may have to request this consultation.

2.9.12.7. Conduct an annual audit of each RAM permit on the installation. **(T-1).**

2.9.12.8. Brief the ESOHC on the following items:

2.9.12.8.1. GLD inventories – semiannually; **(T-3).**

2.9.12.8.2. Utilization of RAM on the installation by non-USAF organizations and contractors – semiannually; **(T-3).**

2.9.12.8.3. Review any necessary changes to RAM policies on the installation – annually; **(T-3).**

2.9.12.8.4. Incidents/Accident investigations involving RAM – annually; **(T-3).**

2.9.12.8.5. Status of corrective actions associated with deficiencies identified during external RAM inspections or the annual IRSO permit audits – semiannually. **(T-3).**

2.9.12.9. For a Joint Base or geographically separated unit without an ESOHC, the aforementioned briefing items will be provided to the MAJCOM/SGPB to review (with courtesy copies to the Joint Base Safety and HAZMAT management/response functions). **(T-1).**

2.9.12.10. For a Joint Base or geographically separated unit without an IRSO or bioenvironmental engineer, PRSOs will forward signed/dated copies of the annual PRSO permit audit documentation directly to the MAJCOM/SGPB (with courtesy copies to Joint Base safety and hazardous materials management/response functions. **(T-1).**

2.9.12.11. Review all work orders prepared for installation-level actions involving potential to utilize RAM. **(T-3).**

2.9.12.12. Maintain and update, semiannually, RAM inventories in RAMMIS, to include NRC specifically licensed RAM, Generally Licensed Devices (GLDs), RIC permitted RAM, and any other type of RAM specified by the RIC which is utilized by DoD activities and organizations or in facilities for which the installation commander is responsible. **(T-1).**

2.9.12.12.1. RAMMIS is not required to be used to inventory targeting pods; however, the IRSO will obtain a copy of the Reliability, Availability, Maintainability Logistics Support System for Pods (commonly referred to as “RAMPOD”) inventory at an interval not to exceed 6 months. **(T-3).**

2.9.12.12.2. Weapon systems containing strategic SNM or tritium, and the associated waste streams, regulated by 42 U.S.C. § 2121, AFPD 91-1, AFI 91-101, *Air Force Nuclear Weapons Surety Program*, and AFI 91-108 are exempt from the RAMMIS inventory requirement.

2.9.12.12.3. Exempt consumer product uses of nuclear materials, certain unimportant quantities of source materials, and certain DOE activities are exempt from the RAMMIS inventory requirement.

2.9.12.13. Serve as the Approval Authority for the use of RAM during installation level military readiness training or exercises which may result in exposures to personnel or the general public. **(T-3).**

2.9.12.14. Assist the Range Operating Authority in the identification and permitting of RAM in targets or target materials. **(T-3).**

2.9.12.15. Coordinate with AFSEC and the RICS regarding the authority for the utilization of RAM on the installation by DOE or DOE prime contractors. **(T-1).**

2.9.12.16. Provide the installation's Fire Emergency Services, regardless of service lead, a list of physical locations, quantity, and forms for all non-exempt quantities of RAM on the installation. **(T-3).**

2.10. The Range Operating Authority shall:

2.10.1. Develop and implement procedures to identify all targets that potentially contain and/or are suspected to contain radioactive material (RAM). **(T-1).**

2.10.2. Ensure RAM is removed from targets or target materials that potentially contain RAM, unless authorized by a RAM permit, prior to placement on a range. **(T-1).**

2.10.3. Ensure use of targets or target material known to contain RAM is authorized by an AF RAM Permit. **(T-1).**

2.11. The Staff Judge Advocate shall:

2.11.1. Assist IRSO in interpreting DoD and AF policy/instructions governing RAM. **(T-3).**

2.11.2. When overseas, perform legal review(s) of translated copies of host nation laws governing control of RAM used on the installation at the request of the IRSO and determines whether the host nation requirements apply to a given overseas installation via treaty or status of forces agreement, as appropriate. **(T-2).**

2.11.3. Serve as the legal advisor for claims or potential regulatory violations brought against the installation by Federal agencies or civilian parties. **(T-2).**

2.12. Acquisition Program Managers shall:

2.12.1. Ensure RAM associated with AF weapons systems are utilized only after obtaining the appropriate authorization under a permit or general license, approval from the RICS, or as otherwise exempted from federal regulations governing RAM. **(T-0).**

2.12.2. Ensure any product being developed or acquired by the USAF do not contain radium. **(T-1).**

2.12.3. In coordination with the IRSO and the AFRRAD office, ensure devices containing radium are returned to the manufacturer with consultation, when feasible. **(T-1).**

2.12.4. Limit the use of RAM where feasible, consistent with USAF needs. **(T-1).** Justification shall be documented for deciding that non-RAM or less hazardous RAM are not feasible. **(T-1).** Justification should include an analysis of the disposal costs and life cycle costs (including handling, permitting, storage, shipment and disposal) in any decision to procure items containing RAM. **(T-1).** Documentation will be maintained by the program office for the duration the material remains in the USAF inventory. **(T-1).**

2.12.5. Ensure RAM specific environmental, safety, and occupational health considerations are integrated into the Systems Engineering process from the earliest stages of system design. (T- 1)

2.12.6. Ensure material hazards and risks, from RAM, in a developed or modified system is identified to testers, operators, and maintainers by specifying the radionuclide, form, and activity. **(T-0).**

2.12.7. Ensure any shipment or transfer of RAM, for which the project manager is responsible, is coordinated with the IRSO **(T-3)** and is prepared in accordance with the transportation requirements in this manual and all applicable state, federal, DoD, and AF regulations/guidance. **(T-0).**

2.12.8. Coordinate with the MAJCOM bioenvironmental engineering offices to include RAM safety and management requirements in all contracts for operating, changing, or repairing devices that contain RAM, as applicable. **(T-1).**

2.12.9. Ensure that contractors supporting the project manager coordinate with the IRSO prior to bringing RAM onto USAF installations. **(T-1).**

2.13. The Commander (or Director, or Chief), Installation Contracting, shall:

2.13.1. Ensure that all contracts involving RAM contain required contract clauses, see **paragraph 2.19.2**. **(T-0).**

2.13.2. Coordinate with the IRSO to ensure all solicitations for goods or services that may require the use of RAM contain appropriate award selection criteria. **(T-1).**

2.14. The Commander (or Director, or Chief), Installation Logistics Readiness, shall:

2.14.1. Oversee the disposition, transportation, and shipment of HAZMAT (including RAM) installation-wide in accordance with 49 CFR Chapter I Subchapter C, Title 10 CFR Part 71, *Packaging and Transportation of Radioactive Material*, DTR 4500.9-R-Part II Chapters 204 and 208, AFI 23-101, AFMAN 24-210, AFJI 23-504, AFJMAN 23-209, AFMAN 23-122, *Materiel Management Proce*dures, AFMAN 24-204, IATA, and this manual. **(T-0).**

2.14.2. Ensure personnel performing HAZMAT transportation operations comply with training requirements associated duties referenced in 2.14.1. **(T-0).**

2.14.3. Establish RAM specific HAZMAT transportation procedures, in coordination with IRSO, for the safe movement onto, off of, and around the installation. **(T-1).**

2.14.4. Take measures adequate to prevent transfer of RAM to units on the installation without prior coordination with the IRSO and/or affected PRSO(s). **(T-1).**

2.14.5. Develop and implement procedures to prevent the inadvertent transfer of RAM or items of supply known or suspected of containing RAM through the Defense Logistics Agency – Disposition Services system or Disposition Services Field Office. **(T-1).** Establish procedures to notify the IRSO in the event of an incident(s) or the need to perform radiological survey(s) of items that have been identified by Defense Logistics Agency – Disposition Services system or Disposition Services Field Office as having the potential to contain RAM and/or components. **(T-1).**

2.15. The Commander (or Director, or Chief), Installation Civil Engineering, shall:

2.15.1. Provide immediate notification to the IRSO of damage (e.g. fire, natural disaster, etc.) to buildings or waste sites where RAM is located, this includes any incident or event where these structures are potentially at risk because of proximity. **(T-1).**

2.15.2. Coordinate with the IRSO to ensure installation emergency response plans include procedures for the theft, loss, sabotage, or release of RAM. **(T-1).**

2.15.3. In coordination with the IRSO and Installation Commander, notify the State Emergency Response Commission and the Local Emergency Planning Committee when RAM incidents occur requiring execution of Emergency Planning and Community-Right-To-Know-Act (EPCRA) protocols. **(T-0).**

2.15.4. Provide a list of facilities on the installation, which contains radioluminescent exit signs, to the IRSO at least annually or when changes occur. **(T-3).**

2.15.5. Provide immediate notification to the IRSO upon discovering or disturbing potential radioactive waste sites on the installation, and prior to resuming any activities. **(T-1).**

2.16. The Commander (or Director, or Chief), Installation Security Forces, shall:

2.16.1. Provide immediate notification to the IRSO of suspected, attempted, or actual theft or sabotage of RAM, to include any situation where the potential for collateral damage exists due to threats in proximity to RAM. **(T-3).**

2.16.2. Ensure anyone transporting NRC licensed or permitted RAM onto the installation has a signed authorization from the IRSO prior to being granted access to the installation, excluding 91(b) material and RAM utilized/delivered to the medical treatment facility. **(T-3).**

2.16.3. Provide immediate notification to the IRSO of any attempted unauthorized transport of RAM onto the installation, excluding 91(b) material. **(T-3).**

2.17. The Permittee shall:

2.17.1. Be ultimately responsible for complying with all permit conditions, AFIs/manuals, and applicable federal regulations and also meet the following criteria, unless otherwise determined by the RICS: **(T-1).**

2.17.1.1. Is a supervisor in the organization in which RAM is used, with operational and administrative control (e.g., unit commander, director, department chair, division chief) over the PRSO and all users; and **(T-1).**

2.17.1.2. Is not the IRSO, the PRSO, a contractor, or user of the RAM authorized by the same permit. **(T-1).**

2.17.2. Designate a qualified PRSO to manage the permitted RAM; with the authority, in writing, to suspend any operations that poses a significant health risk to personnel or the general public, a clear violation of regulations, or a high risk of negative impact to USAF operations, material, or real estate. **(T-1).**

2.17.2.1. Submit their qualifications for approval by the RICS. **(T-1).** For Template Permits, this requirement is satisfied by signing page two of the Request for Template Permit Action form.

2.17.3. Appoint a chairperson to oversee the Permit Radiation Safety Committee, if required, when the Permittee chooses not to fill the position. **(T-1).** The chairperson cannot be the PRSO. **(T-1).**

2.17.4. Approve the Radiation Safety Committee (RSC) charter and membership, when required. **(T-1).**

2.17.5. Ensure RAM permit compliance with this manual and all responsibilities designated to a "licensee" in applicable NRC regulations not delegated to another organization/individual (e.g. not provide authority to the PRSO to sign documents authorizing any permit actions). **(T-1).**

2.17.6. Provide the PRSO and IRSO appropriate access to all activities associated with the utilization of permitted RAM. **(T-1).**

2.17.7. Ensure all correspondence with the NRC, concerning permitted and non-permitted RAM, flows through the RICS. **(T-1).**

2.17.8. Ensure all incident/investigation reports, regarding RAM exposures, are forwarded to the RICS in accordance with this manual. **(T-1).**

2.17.9. If applicable, submit an annual inventory of NRC-regulated SNM to the RICS by 1 March of each year for inclusion in the Nuclear Material Management & Safeguards System inventory. **(T-1).**

2.17.10. If applicable, submit a SNM Transaction Report to the RICS no later than one business day prior to shipping transactions and within 3 business days after a receiving transactions. **(T-1).**

2.17.11. If applicable, submit the annual inventory of Category 1 and 2 nationally tracked sources to the RICS by 1 January of each year for inclusion in the National Source Tracking System inventory. **(T-1).**

2.17.12. If applicable, submit a National Source Tracking System Transaction Report to the RICS no later than one business day prior to shipping transactions and within 3 business days after a receiving transactions. **(T-1). Note:** This only applies to a limited number of permittees; the RICS will contact permittees for which this applies.

2.17.13. Prepare and certify financial assurance plans or decommissioning plans, if required by the permit or applicable federal regulations. **(T-0).**

2.17.14. **The Permit Radiation Safety Committee (PRSC), if required by permit or federal regulations, shall:**

2.17.14.1. Develop procedures to execute the responsibilities of an RSC as prescribed by NUREG 1556 Volume 9, *Program-Specific Guidance About Medical Use Lice*nses and NUREG 1556 Volume 11, *Program-Specific Guidance about Licenses of Broad Scope*, as applicable, and any additional responsibilities listed in this manual. **(T-1).**

2.17.14.2. For medical permits, when applicable, review NRC required criteria for Authorized Users , Authorized Medical Physicists, and Authorized Nuclear Pharmacists and provide recommendations and all documentation to the RICS for final decision. **(T-1).**

2.17.14.3. For non-medical permits, when applicable, review training, experience, and other qualification factors and grant authorization for individuals to utilize RAM under the permit. **(T-1).**

2.17.14.4. Periodically review, at least annually, the list of individuals authorized to utilize RAM under the permit to verify accuracy of the information and roles for which individuals have been approved are current. **(T-1).**

2.17.14.5. Review and approve or deny requests to use RAM within the scope of their issued permit. **(T-1).** Approved uses must comply with this manual, permit conditions, and applicable Federal regulations. **(T-0).**

2.17.14.6. Deny or approve minor changes in radiation safety rules with the advice and consent of the PRSC Chairperson and PRSO, as applicable. **(T-1).** See 10 CFR Part 35 for medical specific guidance.

2.17.14.7. Establish specific requirements for special proposed uses of RAM (e.g., bioassays, physical examinations of users, and special survey methods). **(T-1).**

2.17.14.8. Review the annual permit audits, performed by the PRSO and IRSO, and implement any corrective actions necessary to address audit findings. **(T-3).**

2.17.14.9. Assists the PRSO in disseminating information to ensure permitted activities are performed safely and in compliance with applicable regulations. **(T-3).**

2.17.14.10. In coordination with the PRSO, review dosimetry data quarterly for adverse trends, adequacy of controls, and to establish/modify investigation action levels. **(T-3).**

2.17.15. **The Chair, Permit Radiation Safety Committee (PRSC) shall:**

2.17.15.1. Be the Permittee or an individual subordinate to Permittee, capable of making decisions on behalf the Permittee, and not the PRSO. **(T-1).**

2.17.15.2. Ensure membership is consistent with the scope of permitted activities and regulatory requirements. **(T-0).** The PRSC shall additionally include IRSO. **(T-1).**

2.17.15.3. Ensure a quorum is present and documented for each PRSC meeting. **(T-1).** A quorum consists of the Permittee (or designated chairperson), the PRSO, an IRSO, and at least half of the members of the PRSC. **(T-1).**

2.17.15.4. Establish frequency for PRSC meetings, unless otherwise dictated by the permit. **(T-3).**

2.17.15.5. Invite commanders whose resources and/or direct activities influence successful outcomes of permitted activities. **(T-1).** Invite ancillary personnel (e.g., safety, housekeeping, infection control, maintenance, security forces) as deemed necessary. **(T-3).**

2.17.16. **The Permit Radiation Safety Officer (PRSO) shall:**

2.17.16.1. Be a subordinate of the Permittee, have authorized access and/or utilization of permitted RAM and be an employee of the USAF, not a contractor, unless otherwise approved by the RICS. **(T-1).**

2.17.16.2. Coordinate with the Permittee on requests for an initial permit (as proposed PRSO), renewals, amendments to an existing permit, or termination of a permit. **(T-1).**

2.17.16.3. Assist the Permittee in RAM permit compliance with this manual and all responsibilities designated to a “licensee” in applicable NRC regulations not delegated to another organization/individual. **(T-1).**

2.17.16.4. Notify the IRSO of activities affecting the RAM permit, to include: new applications, permit amendments, renewals, or terminations. **(T-1).**

2.17.16.5. Notify the IRSO of activities affect the installation radiation safety program (e.g. changes in source-use locations, shipment of RAM, or methods of disposal, etc.). **(T-1).**

2.17.16.6. Assist Permittee and IRSO to determine, report, and promptly investigate incidents/accidents involving permitted RAM. **(T-1).**

2.17.16.7. Document and maintain records of RAM permit management required by NRC regulations and AFIs/manuals that apply to each permit, including the permit and permit application, amendments, and correspondence related to the permit **(T-0).**; in addition the PRSO will maintain:

2.17.16.7.1. Permit policies and procedures for implementing requirements of this manual, the permit, and applicable federal regulations; **(T-1).**

2.17.16.7.2. Communications with RICS; **(T-1).**

2.17.16.7.3. Responses and corrective actions to findings from external inspection (AF RAM Permit Inspection by AFIA or NRC); **(T-1).**

2.17.16.7.4. Permanent archival of permit termination documentation with the base civil engineer, the RICS, and the Air Force Civil Engineering Center (AFCEC). **(T-1). Note:** .these records include the decommissioning plan if applicable, the final status survey report if applicable, NRC or Agreement State memoranda documenting acceptance of the final status survey report and approval for permit termination as applicable, the NRC Form 314, *Certificate of Disposition of Materials* (with all applicable attachments), the signed termination permit amendment from the RICS, and RICS memoranda documenting any long-term alternate or additional instructions. Files shall be stored electronically for permanent archival storage after permit termination. **(T-1).**

2.17.16.8. Brief, at least annually, the Permittee and IRSO on the permit radiation safety program, including program regulatory compliance and the results of personnel exposures. **(T-1).** Documents the annual brief with a memo, staff summary sheet, or electronic staff summary sheet signed by the Permittee and maintains this with permit records. **(T-1).**

2.17.16.9. Ensure annual training is conducted in accordance with Title 10 CFR Section 19.12, *Instruction to Workers*, and is commensurate with the level of radiation risk represented by authorized permit activities. **(T-0).** Training of non-radiation workers that work in the area shall be conducted as well. **(T-0).** Implementation should follow guidance in NUREG 1556 guidance for the applicable permit type.

2.17.16.10. Ensure calibration of radiation instrumentation used for compliance monitoring according to American National Standards Institute guidance at intervals not to exceed one year unless otherwise specified by permit conditions, AF instruction, or Federal regulation. **(T-0).** Radiation survey meters shall be capable of detecting the appropriate radiation type, measuring the energies of interest, and operationally checked with an appropriate check source prior to use. **(T-0).** Retain calibration records in accordance with 10 CFR Chapter I (primarily 10 CFR Part 20). **(T-0).** Records of operational checks are recommended, not required.

2.17.16.11. Ensure authorized users performing disposition and transportation functions (e.g., receipt, shipment, disposal, and packaging) for radioactive material (RAM) comply with training and other requirements specified in 49 CFR Chapter I Subchapter C, 10 CFR Part 71, DTR 4500.9-R-Part II Chapters 204 and 208, AFI 23-101, AFMAN 24-210, AFJI 23-504, AFJMAN 23-209, AFMAN 23-122, AFMAN 24-204, IATA, and this manual. **(T-0).**

2.17.16.12. One month in advance of the shipment or receipt of one gram or more of SNM, coordinate with the Permittee, IRSO, and RICS, then submit a completed DOE/NRC Form 741, *Nuclear Material Transaction Report*, to the RICS. **(T-1).**

2.17.16.13. Ensure the implementation of safety and security measures which in addition to general radiation protection shall include the timely reporting of defects and noncompliance in accordance with 10 CFR Part 21 as well as the protection of NRC Category 1 and Category 2 sources, requiring increased controls and national tracking, and/or quantities of radioactive materials requiring an emergency plan for responding to a release (such as "toxic industrial radiologicals", as listed in 10 CFR Part 37 Appendix A, 10 CFR Part 20 Appendix E, and 10 CFR 30.72 Schedule C, respectively) in accordance with Title 10 CFR Part 37, *Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material*, 10 CFR Part 20, and 10 CFR Part 30, respectively. **(T-0).** Consider "aggregation" of several RAM sources when determining exceedance of thresholds. **(T-0). Note**: PRSOs will interface with the IRSO and the RICS which will in turn interface with the NRC. **(T-1).**

2.17.16.14. Ensure all RIC permitted RAM possessed, used, or stored by the unit are correctly listed in a current and accurate inventory in RAMMIS. **(T-1).** Contact the IRSO or RICS for information on RAMMIS.

2.17.16.15. Assist the Radiation Safety Committee (RSC), as applicable, in understanding the responsibilities of discharging their duties.

2.17.16.15.1. Generate minutes of the meeting including, but not limited to:

2.17.16.15.1.1. The date of the meeting; **(T-1).**

2.17.16.15.1.2. Members present and absent; **(T-1).**

2.17.16.15.1.3. A summary of deliberations and discussions, including the numerical results of all votes; **(T-1).**

2.17.16.15.1.4. Recommended actions, including identifying the Office of Primary Responsibility and whether the action is open or closed; **(T-1).**

2.17.16.15.1.5. Approvals granted for individuals, protocols, or other actions, and a copy of the credentials or other documents used as the basis for the approvals; **(T-1).**

2.17.16.15.1.6. Deviations from or violations of this manual, the permit or Federal regulations; **(T-1).**

2.17.16.15.1.7. Changes to permit conditions and inspection results; and **(T-1).**

2.17.16.15.1.8. Self-inspection results and As Low As is Reasonably Achievable (ALARA) program reviews including a summary report of the occupational

radiation exposure records of all workers including individuals or groups with higher than expected exposures and established metrics to compare trends over time. **(T-1).**

2.17.16.15.2. Ensure the RICS, all permittees and PRSC members receive a copy of meeting minutes signed by the PRSC Chair no later than 45 days after a meeting. **(T-1).**

2.17.16.15.3. Retain meeting minutes until permit termination. **(T-0).**

2.18. The Units, Supervisors and Workers using any type of RAM shall:

2.18.1. Comply with the license or permit authorizing materials, local instructions, DTR 4500.9-R-Part II Chapters 204 and 208, AFMAN 24-210, AFI 48-148, AFJI 23-504, AFJMAN 23-209, AFMAN 24-204, and IATA. **(T-0).** In addition, workers must:

2.18.1.1. Comply with the instruction of the IRSO and PRSO; **(T-3).**

2.18.1.2. Immediately report conditions that are of imminent danger to life or health, and those that may negatively affect USAF property, to either the IRSO or PRSO; **(T-0).**

2.18.1.3. Become familiar with NRC Form 3, *Notice to Employees* (if applicable); **(T-0).**

2.18.1.4. Perform all duties in a way that keeps radiation exposures ALARA; **(T-0).**

2.18.1.5. Wear dosimetry when required and store dosimetry in the designated control area when not in use. **(T-0).**

2.18.1.6. Take measures adequate to prevent override of engineering controls, modification of personal protective equipment or tampering with radiation dosimeters or purposely exposing radiation dosimeters to radiation or RAM; **(T-0).**

2.18.1.7. Bring observed violations to the attention of their supervisors. All workers will report allegations to the RICS or NRC using the procedures in Chapter 7. **(T-0).**

2.18.2. When hosted by, attached or assigned to a Joint Base/Unit or geographically separated unit (continental United States and outside the continental United States) without a base bioenvironmental engineer or IRSO, coordinate approval for the procurement, possession, use, storage, transportation, and disposition of RAM as well as responses and reports for incidents involving RAM through the Joint Base commander (or the commander's appointee/designee) and the AF unit's MAJCOM bioenvironmental engineer, who will in turn coordinate with the RICS. **(T-1).**

2.19. Requiring Activities (for contractor work), shall:

2.19.1. Coordinate with the IRSO to obtain information necessary to develop a Performance Work Statement/Statement of Work for compliance with all applicable statutes, regulations and instructions for managing RAM in the USAF. **(T-1).**

2.19.2. Ensure, as appropriate, the Performance Work Statement/Statement of Work includes the requirement for the contractor to submit: **(T-0).**

2.19.2.1. An NRC or Agreement State license. **(T-0).** For those areas of exclusive Federal jurisdiction, a copy of both the NRC Form 241, *Report of Proposed Activities in Non-Agreement States, Areas of Exclusive Jurisdiction or Offshore Waters,* and Agreement

State license must be submitted. **(T-0).** For those areas of concurrent or proprietary jurisdiction in an agreement state, the respective Agreement State license is a valid authorization; or

2.19.2.2. A valid NRC Master Materials License-issued RAM permit from the US Navy or Veterans Affairs **(T-0). Note:** The Navy, Veterans Affairs, and AF are the only entities that hold a NRC Master Materials License which can issue permits;

2.19.2.3. Written certification from DOE organizations or DOE prime contractors that they are exempt from NRC license requirements; and **(T-0).**

2.19.2.4. Written approval from the IRSO to transfer, transport, or use temporary storage areas for RAM on the installation. **(T-1).**

Chapter 3

GUIDANCE AND PROCEDURES FOR RADIOACTIVE MATERIAL USE AND PERMITTING

3.1. Prohibitions and Special Requirements for Accepting or Using RAM.

3.1.1. A USAF radioactive material (RAM) Permit shall not be cited as authority to receive RAM or devices that contain RAM unless specifically authorized on the permit. **(T-0).**

3.1.2. Individuals or organizations shall not physically accept custody of "permitable" RAM without first obtaining written approval via a permit or other authorization from the RICS or AFSEC/SEW, as appropriate. **(T-0).**

3.1.3. RAM shall not be collected as souvenirs or incorporated into souvenirs (e.g., 30 millimeter (mm) depleted uranium penetrators, dials and gauges containing radium paint, exit signs containing tritium). **(T-0).**

3.1.4. RAM shall not be applied to people or clothing and shall not be incorporated in any food, beverage, cosmetic, drug, or other commodity, product or item unless specifically licensed by the NRC or permitted by a USAF RAM Permit authorizing the activity. **(T-0).**

3.1.5. RAM shall not be included in displays open to the general public. **(T-1).** Exceptions: materials for displays that teach personnel how to operate a device that functions only if RAM is incorporated as a component of the item or device; materials used to train personnel how to identify an item or substance; materials authorized by the AF Museum (e.g., static display aircraft or other weapon system components having dials or gauges containing RAM); or a USAF RAM Permit authorizes the display. The exceptions apply provided displays are properly marked and labeled and procedures are implemented for control of access to ensure exposures to worker and public are below the limits in 10 CFR Part 20, and As Low As is Reasonably Achievable (ALARA). **(T-1).**

3.1.6. Targets used on operational ranges shall conform to **paragraph 2.10**. **(T-1).**

3.1.7. Only the RICS may cite the MML as authority to receive RAM or devices that have RAM into the USAF supply inventory. **(T-0).**

3.1.8. Installation Commanders and permittees will recognize the RIC and/or RICS as the interpretive authority on any AFIA/SG finding. **(T-1).** The AFIA/SG shall not be cited as authority to deviate from the permit, AFIs, or applicable Federal regulations. **(T-1).**

3.1.9. Individuals or organizations shall first consult and coordinate with the RICS prior to responding to civilian or other non-USAF entity requests for assistance involving potential USAF-owned RAM. **(T-1).**

3.1.10. Host nation laws and regulations concerning import, export, control, and/or disposal of RAM shall take precedence according to the terms of an applicable international agreement with the host nation if those laws and regulations are as, or more, stringent than the laws and regulations governing import, export, control, and/or disposal of RAM in the US; includes permits issued to USAF organizations. **(T-0).** Radiation safety standards and requirements followed by USAF organizations overseas will always be at least as stringent as those followed by USAF organizations within the US. **(T-1).** International Atomic Energy Agency (IAEA)

Safety Standards may be considered where applicable to avoid setting up separate requirements for USAF workers and local nationals.

3.1.11. USAF installations located within a host nation will honor contractor host nation licenses for using RAM in like manner as a NRC or Agreement State License (T- 0); the RICS may be consulted for assistance or further guidance in these cases.

3.1.12. Exempt Quantities. This manual requires the inventory of material covered by Title 10 CFR Sections: 30.15, *Certain Items Containing Byproduct Material*, 30.19, *Self-luminous Products Containing Tritium, Krypton-85, or Promethium-147*, 30.20, *Gas and Aerosol Detectors Containing Byproduct Material* and any discrete source in Title 10 CFR Section 30.18, *Exempt Quantities*, not otherwise excluded by the RICS. **(T-1).** These exempt sources inventories will be maintained by IRSO and are not required to be in RAMMIS; examples of these materials are electron tubes, wrist watches, gun sights, check sources and chemical agent detectors. RAM integral to in-service aerospace vehicles or weapons system (e.g., magnesium thorium, optics and electronics) is exempt from inventory until such time it is removed for disposal by Aerospace Maintenance and Regeneration Center or Air Force Radioactive Recycling and Disposal (AFRRAD). **(T-1).**

3.2. Procuring Radioactive Materials.

3.2.1. For guidelines on procuring items with RAM, follow AFJI 23-504 and this manual. **(T-1).**

3.2.2. Individuals or organizations:

3.2.2.1. Shall not procure RAM or accept RAM into the USAF supply inventory without a permit (Title 10 CFR Section 30.34, *Terms and Conditions of Licenses*), see **paragraph 3.4** on permitting process. **Exception:** Reference **paragraph 3.3.2**. **(T-0).**

3.2.2.2. Shall not procure facility radioluminescent exit signs (e.g., emergency exit signs containing tritium) and markers without RICS written approval. **(T-1).**

3.2.2.3. Shall coordinate procurement of RAM with IRSO in accordance with **paragraphs 2.9.5** and **2.9.12.1**. **(T-1).**

3.2.2.4. Shall not procure RAM through the Air Force Government-Wide Purchase Card Program. **(T-1).**

3.3. Requirements for a Permit issued under the USAF Master Materials License.

3.3.1. All USAF organizations must obtain a radioactive material (RAM) permit from the RICS prior to purchasing, receiving, storing, distributing, using, transferring, or disposing of:

3.3.1.1. Specifically licensed byproduct, source, NARM, and SNM, to include those materials covered by the expanded definition of byproduct material in the Energy Policy Act of 2005, other than those exempted in **paragraph 3.3.2**. **(T-0).**

3.3.1.2. Generally licensed devices (GLD) received by transfer **(T-0).**, see **paragraph 3.10.4**.

3.3.1.3. No other organization can issue a USAF RAM permit except for the RICS. **(T-0).**

3.3.2. USAF organizations may not require a permit for the following RAM (consult with RICS):

3.3.2.1. Certain concentrations or quantities of RAM, as detailed in 10 CFR Chapter I.

3.3.2.2. Nuclear weapons and certain radioactive parts of weapons systems classed as 91(a) and/or 91(b) material.

3.3.2.3. Reactor fuel elements and sources inherent to reactor operations (e.g., neutron start-up sources classed as 91(b) material).

3.3.2.4. Other material for which the RICS or AFSEC/SEW, as appropriate, waives the requirement for a permit.

3.3.2.5. Military operational use sources (e.g., Ra-226 dials and gauges) are exempt from NRC licensing requirements. **Note:** Military operational use is defined as activities such as warfare, combat, battlefield missions, training for battlefield missions, materials in stockpile storage, and materials that may be subject to decontamination and disposal. Other military possession and use of Ra-226, including medical or research activities, conducted by the DoD, or use in a manner similar to a commercial activity are subject to NRC regulatory authority, and may require a USAF RAM permit.

3.3.2.6. Exceeding 100 non-military operational use Ra-226 sources in the same location will require a USAF RAM permit (Title 10 CFR Section 31.12, *General License for Certain Items and Self-luminous Products Containing Radium-226*). **(T-0). Note:** Up to 100 non-military or 100 military non-operational use Ra-226 sources may be used or stored at any one time, in the same location (e.g., single building), under a general license and may not require a permit.

3.4. Requesting Permits, Amendments, and Other Authorizations for RAM Use.

3.4.1. Initial applications for permits (reference **paragraph 2.17.16.2**.) are prepared and submitted through the IRSO to the RICS with a courtesy copy to the MAJCOM bioenvironmental engineer **(T-3).** Contact the RICS if an immediate mission critical permit or amendment is required. **(T-1).**

3.4.1.1. The RICS can provide prescribed NRC forms, copies of regulatory guides, and additional guidance on the administrative aspects of permits. NRC forms and regulatory guides are also available through the Nuclear Regulatory Commission's website..

3.4.1.2. Permit applications require the signature of the Permittee on an NRC Form 313, *Application for Materials License*, and appointment of a PRSO and, if possible, an alternate PRSO. **(T-1).** This application must be sent to the RICS, not the NRC. **(T-1).**

3.4.1.3. Organizations planning new or unique applications, including NRC Category 1 and Category 2 sources, sources requiring national tracking, quantities of radioactive materials requiring an emergency plan for responding to a release, and/or unsealed RAM; must contact the RICS as early as possible to decide the scope of the permit, facility requirements, and the need for a site visit by the RICS staff. **(T-1).** Plans must include provisions for baseline surveys prior to initially storing RAM in a location. **(T-1).**

3.4.1.4. Category 1 and Category 2 safety and security controls shall be in place and inspected by AFIA/SG before the permit will be issued. (T- 0) Consider "aggregation" of several RAM sources when determining exceedance of Category 1 and Category 2 thresholds. (T- 0)

3.4.1.5. Applications for activities expected to have a significant environmental impact shall be evaluated in accordance with Title 32 CFR Part 989, *Environmental Impact Construction*. **(T-0).** Activity shall not begin until the environmental impact report has been submitted with the permit application, and found acceptable, pursuant to subpart A of Title 10 CFR Part 51, *Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions*. **(T-0).**

3.4.1.6. Pursuant to 10 CFR §30.35 and 10 CFR §30.36 (byproduct material), 10 CFR §40.36 (source material), and/or 10 CFR §70.25 (licensed source material), certain applications require a proposed decommissioning funding plan and/or a certification of financial assurance for decommissioning. **(T-0).**

3.4.1.7. Each application to possess RAM in unsealed form, on foils or plated sources, or sealed in glass in excess of the quantities in 10 CFR §30.72, Schedule C, requires either a dose assessment or an emergency plan pursuant to 10 CFR 30.32(i)(1)- (3). **(T-0).** The RICS should be contacted to coordinate development of these materials.

3.4.1.8. Applicants desiring to ship, transfer or transport RAM greater than a Type A quantity (reference 10 CFR Part 71, Appendix A) must have an NRC approved transportation quality assurance program in accordance with Title 10 CFR Part 71, Subpart H, *Quality Assurance*; this can be accomplished by:

3.4.1.8.1. Submitting an application to the RICS following guidelines in Title 10 CFR Part 71, Subpart G, *Operating Controls and Procedures,*10 CFR Part 71, Subpart H, and NRC Regulatory Guide 7.10, *Establishing Quality Assurance Programs for Packaging Used in Transport of Radioactive Material*. **(T-0). Note:** Contact the RICS for guidance if not using a commercial NRC approved package.

3.4.1.8.2. Alternately, utilizing a source vendor or other NRC or Agreement State licensee with a NRC approved transportation quality assurance program. **(T-0). Note:** Ensure that the contractor has jurisdictional authority to perform desired work, see **paragraph 3.4.4**. **(T-0).** Contact the RICS for guidance.

3.4.1.8.3. Applicants desiring to ship items falling under 10 CFR Part 37 must also implement additional security measures. **(T-0). Note:** Contact the RICS for guidance, if needed, at least six months prior to shipping date.

3.4.2. Renewal Permit Applications:

3.4.2.1. USAF RAM Permits are issued with expiration dates. Renewal applications for permits are prepared and submitted through the IRSO to the RICS with a courtesy copy to the MAJCOM bioenvironmental engineer. **(T-1).**

3.4.2.1.1. Renewal applications for non-template permits must be submitted at least three (3) months, but not greater than six (6) months, prior to the expiration date to allow time for the application to be reviewed and the new permit issued in a timely manner. **(T-2).**

3.4.2.1.2. Renewal applications for template permits must be submitted at least one (1) month, but not greater than three (3) months, prior to the set expiration date to allow time for the application to be reviewed and the new permit issued in a timely manner. **(T-2).**

3.4.2.1.3. The existing permit will continue in full force and effect beyond the expiration date, provided the renewal application was submitted in a timely manner prior to the expiration date, and a "Deemed Timely Filed" memorandum has been received from the RICS, or AFSEC/SEW as appropriate. Failure to renew the permit will result in a Cease and Desist enforcement action from the RICS and the permit will default to possession only status and use of RAM will no longer be authorized. **(T-0).** Failure to submit the renewal application in accordance with required timelines may result in RICS enforcement actions.

3.4.3. Permit Amendments: All requests must be submitted through the IRSO to the RICS with a courtesy copy to the MAJCOM bioenvironmental engineer. **(T-1).** Permittees must apply for a permit amendment for any changes needed on their existing permit conditions, original application, or existing commitments, known as "tie-down" letters. **(T-0).**

3.4.3.1. If a change must be initiated prior to permit amendment approval, then the Permittee must obtain verbal approval from the RICS, and maintain a record of each minor change until the permit amendment or renewal is granted. **(T-1).** Documentation shall include: **(T-1).**

3.4.3.1.1. The effective date of the change;

3.4.3.1.2. A copy of old and new radiation safety requirements;

3.4.3.1.3. The reason for the change;

3.4.3.1.4. A summary of radiation safety concerns to be considered before making the change;

3.4.3.1.5. The signature of the PRSO; and

3.4.3.1.6. The signatures of the authorized users affected by the change, the Permittee and the PRSC chairperson.

3.4.3.2. Permit amendments are not required for the following:

3.4.3.2.1. Editing radiation safety requirements or procedures for clarity or conformance with local publication formats or updating titles, business telephone numbers, and business mailing addresses;

3.4.3.2.2. Replacing permitted items with identical items;

3.4.3.2.3. Reassigning tasks among employees, unless permit involves identified Authorized Users; or

3.4.3.2.4. Assigning service contracts for services such as equipment repair or calibration, waste disposal, health physics or bioenvironmental engineering advisor.

3.4.3.3. Additionally, permittees must submit an amendment request to the RICS when personnel listed on the permit such as users or PRSOs permanently cease their duties or change their names. **(T-1).** Permittees shall notify the RICS through a memorandum signed by the Permittee whenever the Permittee's identity or email address changes as a result of change-of- command, deployment or for any other reason, within 30 calendar days of the change; the memo shall include the new email address for the Permittee and shall be maintained with the permit. **(T-1).**

3.4.3.4. RAM must be placed in storage if a qualified PRSO is not available for greater than 30 days (e.g., deployed, TDY). **(T-0).**

3.4.4. Do not allow non-USAF organizations to use RAM, including NARM, on USAF installations without prior written approval from the IRSO. **(T-2).** This applies to any civilian organization or other Federal agency that desires to transfer, transport, or temporarily store RAM on or conduct operations using RAM on a USAF installation.

3.4.4.1. The non-USAF organization must send a request to the IRSO at least 30 calendar days before bringing the RAM onto the installation. (T-2) For contractors, these requirements must be included in the statement of work. **(T-2).**

3.4.4.2. Requests must be in writing and include:

3.4.4.2.1. A brief description of the proposed activities; **(T-1).**

3.4.4.2.2. A copy of a current NRC or Agreement State license with current NRC Form 241 for areas of exclusive Federal jurisdiction, when applicable. **(T-1).** For those areas of concurrent or proprietary jurisdiction in an Agreement State, the respective Agreement State license is a valid authorization. The license must either specifically list the installation or authorize approval for work at temporary job sites anywhere in the US where the NRC or Agreement State has jurisdiction (NUREG 1556 Vol 20, *Guidance About Administrative Licensing Procedures*, and Title 10 CFR Section 150.20, *Recognition of Agreement State Licenses*). **(T-0).** Exception: Contractors using generally licensed materials (e.g., certain Niton® Lead Paint Analyzers) and DOE or DOE prime contractors operating in accordance with Title 10 CFR Part 835, *Occupational Radiation Protection*, do not require an NRC license or NRC Form 241. **(T-0).** DOE organizations and DOE prime contractors must certify, in writing, that they are exempt from NRC licensing requirements. **(T-2).**

3.4.4.2.3. The name, local address, and telephone number for the responsible local representative and the name, address, and telephone number of the RSO named on their license; **(T-3).**

3.4.4.2.4. For contractors, a copy of the performance work statement of the USAF contract describing work to be performed at the installation and the inclusive dates of the work; and **(T-3).**

3.4.4.2.5. For contractors, a copy of the safety plan ensuring compliance with NRC, AFI, AFMAN and other safety requirements referenced in the performance work statement/statement of work be incorporated and shall state that the IRSO can conduct periodic assessments to ensure contractor personnel are complying with radiation safety practices to prevent exposures to USAF personnel and avoid contamination of government property. The IRSO and contractor shall promptly report any issues to the Contracting Officer, Base Safety Office, and the Contracting Officer Representative. **(T-1).** In addition, the safety plan should specify the IRSO has the authority to suspend contractor operations believed to be unsafe and promptly notifying the Contracting Officer and Contracting Officer Representative. **(T-1).**

3.4.4.3. Agreement State licensees using NRC regulated materials in areas of exclusive Federal jurisdiction must provide a copy of the NRC Form 241 approved by either the

USAF installation's or contractor's NRC Region according to 10 CFR §150.20. **(T-0).** The form must specify the correct locations and dates of performance of licensed activities. **(T-0).** State licensees may not work on USAF or other installations of exclusive Federal jurisdiction, for more than 180 calendar days per calendar year, without first getting an NRC license. **(T-1).**

3.4.4.4. Non-USAF organizations that do not have an NRC or Agreement State License with current NRC Form 241 and who are not DOE or DOE prime contractors exempted from licensing must contact the RICS for guidance and approval to use RAM on an USAF installation. **(T-1).**

3.4.5. Permittees under new permits will notify AFIA/SG immediately upon first receipt of RAM. **(T-2).**

3.5. Posting Notices to Workers.

3.5.1. Each Permittee for NRC-licensed radioactive material (RAM) (continental United States and outside the continental United States) must prominently post the latest NRC Form 3, *Notice to Employees*, in the workplace(s) storing or using the licensed RAM. **(T-0).** Additionally, each Permittee shall prominently post a supplemental notice that briefly describes the nature of, and access to, current versions of the following: 1) regulations in 10 CFR Parts 19 and 20; 2) the permit, permit conditions, or documents incorporated into a permit by reference, and amendments thereto; 3) operating procedures applicable to permitted activities; 4) any notice of violation involving radiological working conditions, proposed imposition of civil penalty, or order issued pursuant to 10 CFR Part 2 Subpart B, and any response from the Permittee; and, 5) any other pertinent MML documentation, in accordance with Title 10 CFR Section 19.11, *Posting of Notices to Workers*. **(T-0). Note:** AF logistics personnel engaged in the transportation of RAM remain exempt to the extent that they transport or store RAM in the regular course of carriage for another or storage incident thereto, in accordance with Title 10 CFR Sections: 30.13, *Carriers*, 40.12, *Carriers*, and 70.12, *Carriers*. **(T-0).**

3.5.2. Permittees, in accordance with 10 CFR Part 21, must also post a copy of Section 206 of the Energy Reorganization Act of 1974 and a notice regarding the availability of the regulations and procedures adopted according to Title 10 CFR Section 21.6, *Posting Requirements*. **(T-0).**

3.6. Control of Radioactive Material, and Information Concerning Radioactive Material.

3.6.1. All exempt and non-exempt RAM (e.g., residual radioactive material from past nuclear weapon accidents, incidents, research, maintenance activities, and dismantled/decommissioned reactor 91(b) material still under USAF possession), must be secured from unauthorized removal or access. **(T-1).** Radioactive materials that are used in unrestricted areas must be under the constant surveillance of an individual authorized under a valid USAF permit or NRC/agreement state license when not in storage. **(T-0).**

3.6.2. All permitted and licensed radioactive sources and devices must be inventoried as follows: **(T-0).**

3.6.2.1. Permitted RAM or devices shall be inventoried at the frequency specified in the permit. **(T-0).**

3.6.2.2. Licensed RAM or devices not requiring a permit (e.g. Generally Licensed Devices) shall be inventoried in accordance with the applicable CFR, Technical Order or AFI/AFMAN. **(T-0).**

3.6.2.3. Unless otherwise specified, inventories of permitted or licensed materials SHALL be conducted at intervals not to exceed six (6) months. **(T-0).**

3.6.3. Inventory documentation must be retained in accordance with the applicable CFRs. **(T-0).** Documentation must include the following:

3.6.3.1. Date of the inventory; **(T-0).**

3.6.3.2. Model number and serial number of each source, if assigned; **(T-0).**

3.6.3.3. The identity of the radionuclide, manufacturer date, and source activity **(T-0).**;

3.6.3.4. The location of each source; **(T-0).**

3.6.3.5. The name of the individual conducting inventory; **(T-0).**

3.6.3.6. The signature of the PRSO endorsing the inventory **(T-3).**; and

3.6.3.7. NSN, if applicable. **(T-3).**

3.6.4. Information Security and Increased Controls for Certain Quantities of RAM: All RAM and information about this RAM shall be protected from unauthorized access/use. **(T-0).** Specific requirements are provided in 10 CFR Part 37, NRC Regulatory Issue Summary 2005-31, *Control of Security-related Sensitive Unclassified Nonsafeguards Information Handled by Individuals, Firms, and Entities Subject to NRC Regulation of the Use of Source, Byproduct, and Special Nuclear Material*, and any RIC directions. The thresholds for NRC Category 1 and Category 2 sources, requiring increased controls and national tracking, and Category 3 sources requiring sensitive unclassified non-safeguards information (SUNSI) protection, are listed in 10 CFR Part 37 Appendix A, 10 CFR Part 20 Appendix E, and NRC Regulatory Issue Summary 2005-31, respectively). Consider "aggregation" of several RAM sources when determining exceedance of thresholds. **(T-0).**

3.7. Transferring Permitted Radioactive Material.

3.7.1. Permitted or licensed RAM shall only be transferred to:

3.7.1.1. An organization or person authorized to receive the materials under the terms of a USAF, US Navy, or Veterans Affairs RAM permit; NRC license; or Agreement State License. **(T-0).**

3.7.1.2. USAF agencies with written authorization from the RICS or AFSEC/SEW, as appropriate. **(T-0).**

3.7.1.3. DOE and DOE prime contractors who certify, in writing, that they are authorized to receive the materials. **(T-0).**

3.7.1.4. Organizations or persons outside the US under an export license issued in accordance with Title 10 CFR Part 110, *Export and Import of Nuclear Equipment and Material*. **(T-0).** Permission to transfer USAF RAM between the USAF and a foreign government requires pre-coordination with the RICS and is determined on a case-by-case basis. **(T-1).**

3.7.1.5. Common and contract carriers, freight forwarders, and warehouse workers, for transporting or storing materials subject to 10 CFR §30.13, 10 CFR §40.12, and 10 CFR §70.12. **(T-0).** Package, label, and consign materials for shipment according to 10 CFR Part 71 and Title 49 CFR Part 173, *Shippers—General Requirements for Shipments and Packaging*. **(T- 0)**

3.7.2. Permittees shall ensure that any recipient has authority to receive the RAM before making the transfer by: **(T-0).**

3.7.2.1. Obtaining a copy of the recipient's NRC license, USAF, US Navy, or Veterans Affairs RAM permit, or Agreement State license giving authority to receive the RAM, or

3.7.2.2. Obtaining a letter from the recipient RSO or Permittee to receive the materials, to include the license or permit number, issuing agency, expiration date, type, form of RAM, and the authorized amount.

3.7.2.3. In emergencies, telephonic certification is authorized when followed up with a letter or message within 10 days.

3.7.3. Reports of Nuclear Material Transaction Reports, when required by Title 10 CFR Section 40.64, *Reports*, or 10 CFR §74.15 respectively, must be used for specific transfers **(T-0).**; see **paragraphs 2.17.10**, **2.17.12** and **2.17.16.12**.

3.7.4. When shipping NRC specifically licensed, generally licensed or permitted RAM, a RAM owning organization member (e.g. PRSO) will verify the RAM is received by the ship-to-address and/or the intended destination. **(T-0).** Verification of receipt, in writing, by the recipient is the preferred method; this includes the use of a receipt to show change of custody whenever transferring RAM from the permitted unit to a shipper/carrier, vendor, or another unit. If for some reason written verification cannot be accomplished, then telephonic confirmation may be used provided it is documented and includes name, number and title of the person verifying the receipt and date of the telephonic conversation. When receiving materials from another USAF organization or when requested by a non-USAF shipper, confirm receipt in writing. **(T-0).** For items shipped to and from Distribution Depots, documentation in Defense Logistics Agency's Defense Logistics Management System is acceptable. Transfer (turn-in/shipment and receipt at receiving end) documentation associated with termination of permitted activities must be provided to the RICS to document applicable permit amendments and permit termination requests. **(T-0).** Reference DTR 4500.9-R-Part II, *Cargo Movement*, and 49 CFR Chapter I, Subchapter C.

3.7.5. Report to the RICS the transfer of generally licensed material with the information required by the NRC in accordance with Title 10 CFR Section 31.5, *Certain Detecting, Measuring, Gauging, or Controlling Devices and Certain Devices for Producing Light or an Ionized Atmosphere*. **(T-0).**

3.7.6. Coordinate with the RICS (or AFSEC/SEW, as appropriate) at least six (6) months in advance, for transfer of NRC Category 1 and Category 2 sources, requiring increased controls and national tracking, in accordance with 10 CFR Part 37, Appendix A and 10 CFR Part 20 Appendix E, respectively). **(T-2).** Consider "aggregation" of several RAM sources when determining exceedance of thresholds. **(T-0).**

3.7.7. Keep records of all transfers in accordance with 10 CFR Chapter I, this manual, and any RIC directions. **(T-0).** The transfer receipt format shall at a minimum include the date of physical receipt of the item(s); serial number(s); description and quantity of the item(s); and, the name and signature of the recipient. **(T-1). Note:** Transfer of permitted radioactive material from office to office at an installation, including the logistics readiness squadron cargo movement section, should be documented. The AF Form 1297, *Temporary Issue Receipt*, or alternate form will be retained as a record of transfer. **(T-3).**

Note: Transfer of all RAM from one permit to another does not constitute termination or relieve the Permittee from notifying the RICS or AFSEC/SEW as appropriate and providing information on decommissioning. Accordingly, such permits are considered in full force and effect and subject to inspection by AFIA/SG until the conditions of **paragraph 3.11** are met.

3.8. Transporting Radioactive Material.

3.8.1. USAF organizations shipping or transporting RAM must comply with 49 CFR Chapter I Subchapter C, 10 CFR Part 71, DTR 4500.9-R-Part II Chapters 204 and 208, AFMAN 24-210, AFJI 23-504, AFJMAN 23-209, AFMAN 24-204, IATA, and this manual. **(T-0).**

3.8.2. Anyone desiring to ship or transport RAM shall contact the Transportation Officer within the logistics readiness squadron for information on transportation requirements. **(T-3).**

3.8.3. The generating activity must properly identify RAM and items containing RAM when sending to the logistics readiness squadron cargo movement section for packaging and shipping. **(T-0).** Identification of these items and/or RAM shall be in accordance with Title 49 CFR Section 172.202, *Description of Hazardous Material on Shipping Papers*, and shall include the following: **(T-0).**

3.8.3.1. Radionuclide(s);

3.8.3.2. Description and number of items;

3.8.3.3. Item nomenclature and, if applicable, NSN, proper shipping name and UN number;

3.8.3.4. Individual and total activity in units of Becquerel with Curies in parentheses; and

3.8.3.5. Chemical and physical form.

3.8.4. When shipping between or to outside the continental United States locations, compliance with applicable status of forces agreement, IATA and International Atomic Energy Agency (IAEA), *Regulations for the Safe Transport of Radioactive Material*, are required. **(T-0).**

3.8.5. Local AF installation logistics personnel (and AFRRAD personnel when applicable) will complete transportation/shipping discrepancy reports in accordance with the Defense Transportation Regulations upon receipt of an improperly shipped RAM package and will forward copies of submitted transportation/shipping discrepancy report information to the RICS and to the RIC members representing AF/A4. **(T-1).**

3.9. Minimum Training and Experience Required for PRSO and Permit Instructors of Manufacture's Device Training.

3.9.1. Required Training for PRSOs. PRSOs must have formal training, and for some permits experience, commensurate with the type and quantity of radioactive material (RAM) possessed. **(T-0).** General criteria used by the RICS includes the education, training and experience of the individual, regulatory requirements specified in 10 CFR Chapter I (if any) and guidance provided in the applicable NUREG 1556 volume for the type of permitted material. **Note:** Training for IRSOs and Unit Radiation Safety Officers is listed in AFI 48-148. All RSO training curricula must be approved by the RICS. **(T-0).** Specific requirements for a RICS approved 40 hour PRSO course are listed in **paragraph 3.9.3**. A summary of training requirements are listed in Table 1, *PRSO Training Requirements*.

3.9.2. Qualifications for Permit Instructors of Manufacturer's Device Training ("Train the Trainer" concept). Authorized users may provide the manufacturer's device training to others if they have the specific qualifications listed below. **(T-1).** All manufacturer's device instructor training curricula and permit device training instructors shall be approved by the RICS. **(T-1).** A summary of requirements is listed in **Table 3.2**, *Permit Instructor for Device Training*; for permit types not listed, instructor qualifications for all other permitted devices shall be approved by the RICS on a case-by-case basis. **(T-1).**

3.9.3. Radiation Safety Officer Course Curricula**:** An RSO course designed for training personnel to manage basic radiation safety programs involving non-template permits, shall, at a minimum, include:

3.9.3.1. Radiation safety topics: **(T-0).**

3.9.3.1.1. Radiation vs. contamination,

3.9.3.1.2. Internal vs. external exposure and dose equivalents,

3.9.3.1.3. Biological effects of radiation,

3.9.3.1.4. Types and hazards associated with RAM possessed,

3.9.3.1.5. As Low As is Reasonably Achievable (ALARA) concept,

3.9.3.1.6. Time, distance, and shielding to minimize exposure,

3.9.3.1.7. Sealed source location within the gauge,

3.9.3.1.8. "Lessons learned" from prior events involving permitted material, and

3.9.3.1.9. Inspection by regulatory agencies.

3.9.3.2. Regulatory requirements for the following topics: **(T-0).**

3.9.3.2.1. Applicable regulations,

3.9.3.2.2. License/Permit conditions, amendments, renewals,

3.9.3.2.3. Locations of use and storage of RAM,

3.9.3.2.4. Material control and accountability,

3.9.3.2.5. Annual audit of radiation safety program,

3.9.3.2.6. Transfer and disposal,

3.9.3.2.7. Record keeping,

3.9.3.2.8. Managing incidents/mishaps,

3.9.3.2.9. Recognition and assurance of radiation warning signs; visibility and legibility,

3.9.3.2.10. Requirement for complete and accurate information,

3.9.3.2.11. Employee protection, and

3.9.3.2.12. Deliberate misconduct.

3.9.3.3. The RICS may temporarily waive certain requirements for training (e.g., time of experience) based on mission need. However, the PRSO will work under a preceptor or limitations imposed by the RICS. **(T-1).**

Table 3.1. PRSO Training Requirements. (T-1).

PRSO Training Requirements						
Permit Type[4]	**Manufacturer's Training**	**RIC Approved Training Course[1]**	**Manufacturer's RSO Training[2]**	**RIC Approved 40-hr Training Course**	**Experience with permitted RAM; requirements in 10 CFR 33 and NUREG 1556 V 11**	**Requirements in 10 CFR 35 and NUREG 1156 V 9**
Template Permits (Depleted Uranium, IBIS, Niton, and AINS)		**X**				
Moisture Density Gauges (Non- Template)	**X**		**X**			
Fixed Gauges	**X**			**X**		
Cargo and Vehicle Inspection System	**X**			**X**		
Personal Security Screening System	**X**	**X**				
Limited Scope				**X**		
Broad Scope (A or B)					**X**	
Medical3						**X**
[1]The training course must be RICS-approved and must have an end of course test. Training materials will be provided by the IRSO.						
[2]Must have at least an 8-hr RICS-approved PRSO course.						
[3]Training programs for nuclear medicine technicians assigned as a medical PRSO must be reviewed and approved by their regional medical physics office.						

[4]Contact the RICS for the minimum training requirements for PRSOs responsible for multiple permit types.
Note: Permits with quantities pursuant to 10 CFR Part 37 will require RICS approved 10 CFR Part 37 training.

Table 3.2. Permit Instructor for Device Training. (T-1).

Permit Instructor for Device Training					
Permit Type	**One Year as a Full Time or 500 hrs Logged as an Authorized User**	**Manufacturer's RSO Course**	**RIC Approved Training Course[1]**	**RIC Approved 40-hr Training Course**	**Manufacturer's Instructor Training Course**
Moisture Density Gauges (Non-Template)	**X**	**X**			**X**
Vehicle and Cargo Inspection System	**X**			**X**	**X**
Personal Security Screening System	**X**		**X**		**X**
[1]The PRSO training course must be RICS approved.					

3.10. Managing Generally Licensed Devices.

3.10.1. Generally Licensed Devices (GLDs). The NRC or Agreement State issues a general license to acquire, receive, use, store or transfer certain devices that contain radioactive material (RAM) which have been manufactured, tested and labeled by the manufacturer in accordance with the specifications contained in a specific license issued to the manufacturer by the NRC or an Agreement State. 10 CFR Part 31 details requirements of GLDs. GLDS are not normally specifically permitted by the RICS, since they have a NRC general license regulating the device. This NRC license is held by the purchaser of the device normally the Sq/CC. However, RICS reserves the right to permit a GLD if needed. GLDs are subject to direct inspection by the NRC and is not part of the AF MML, or AFIA process.

3.10.2. Acquisition of GLDs. GLDs will be purchased using Defense Federal Acquisition Regulations, assigned an NSN and registered in the Federal Logistics Information System and Hazardous Material Information Resource System. GLDs shall be registered in the USAF logistics system and identified as radioactive and inventoried in RAMMIS. **(T-1).** Additionally, see **paragraph 3.2** requirements.

3.10.3. Requirements for Possession of GLDs under 10 CFR §31. 5. All USAF units will comply with Sealed Source and Device Registry (SSDR) requirements for each specific GLD device type. **(T-0).** In addition:

3.10.3.1. Unit responsibilities. Units with GLDs that do not possess a USAF RAM permit will appoint a responsible individual. **(T-1).** For units with issued permits, the PRSO will be the responsible individual. **(T-1).** The responsible individual shall:

3.10.3.1.1. Maintain a copy of the SSDR for the GLD on file. **(T-1).**

3.10.3.1.2. Ensure that the requirements of the SSDR are met. **(T-0).**

3.10.3.1.3. Provide the IRSO an updated inventory at least every six months so that the IRSO can input the data into RAMMIS. **(T-2).**

3.10.3.1.4. Preserve all labels affixed to the device and ensure all instructions are followed (10 CFR Part 31). **(T-0)..**

3.10.3.1.5. If required by the SSDR, the device shall be tested for leakage, and proper operation of any on-off mechanism or indicator, if any, tested at no longer than six month intervals, or as specified by the SSDR (10 CFR Part 31). **(T-0).** All leak tests will be coordinated with the IRSO so that appropriate protocols and materials are used. **(T-1).**

3.10.3.1.6. Units shall suspend operation of the device if there is damage/failure to the device's shielding, detection of removable contamination exceeding 0.005 microCuries, failure of its on/off mechanism or for any defects that could affect radiation safety. **(T-0).** Defects shall be reported to the RIC in accordance with 10 CFR Part 21, this manual, and any RIC directions. **(T-0).**

3.10.3.1.7. Report any incidents, thefts or loss of GLDs to the IRSO. **(T-1).** The IRSO will in turn comply with the reporting requirements of this manual and any RIC directions. **(T-1).**

3.10.3.2. IRSO responsibilities. Installation IRSO will assist units with GLD management to include: **(T-1).**

3.10.3.2.1. Maintain a copy of the SSDR for the GLD on file **(T-1).**

3.10.3.2.2. Assist and support units to maintain compliance with SSDR requirements, e.g. leak testing if required. **(T-1).**

3.10.3.2.3. Shall update in RAMMIS, all relevant GLD use information, including changes to the storage location, the responsible unit, and current address. **(T-1).**

3.10.3.2.4. Report any incidents, thefts or loss of GLDs in accordance with this manual any RIC directions. **(T-1).**

3.10.4. Transfer of GLDs. Units shall not transfer GLDs, unless the entity possesses a specific license or permit for the item(s) (10 CFR Part 31). **(T-0).**

3.10.4.1. All transfers of GLDs shall be coordinated through the IRSO. **(T-1).**

3.10.4.2. Inventories must be updated in RAMMIS to reflect the transfer or movement. **(T-1).** Report the transfer of generally licensed material to the RICS, with the information

required by the NRC in 10 CFR §31.5 and, provide a copy of the SSDR to the gaining unit. **(T-0).** The gaining unit shall provide verification of receipt, to include serial numbers, to the losing unit. **(T-1).**

3.10.4.3. A leak test and shutter test, if required by the SSDR, must be performed prior to transferring the device, and shipping procedures must be in accordance with 49 CFR Chapter I Subchapter C, DTR 4500.9-R-Part II, AFJI 23-504, AFMAN 24-204 and this manual. (T- 0)

3.10.4.4. If a GLD is transferred to another unit, a RIC permit is required; transfer will not be authorized until a RIC permit is in place **(T-0)..** **Note:** Air Force Radioactive Recycling and Disposal (AFRRAD) has a permit to accept GLDs for disposition.

3.10.4.5. IRSO will assist unit gaining a transferred GLD with RIC permit application. **(T-1).**

3.10.5. Disposition of GLDs. GLDs shall be properly disposed of in accordance with **Chapter 4** and AFJI 23-504. **(T-1).** Transfer of GLDs to any organization, including AFRRAD, AF will be coordinated with IRSOs and the RICS. **(T-1).** Disposition of GLDs in the AF will be coordinated with AFRRAD. **(T-1).** **Note:** GLDs will not be transferred the Defense Reutilization Management Office/system, or a Disposition Services Field Office. **(T-1).**

3.10.6. Work with the IRSO and RICS to know which parts apply to your RAM (as many will not apply to your situation). **(T-1).** You may consult the RICS with any questions. If a conflict exists, then maintain records with the more stringent retention period. **(T-0).**

3.11. Cessation of Operations and Terminating Permits.

3.11.1. If permitted operations cease, the Permittee must initiate decommissioning operations within two years of the date when use of the permitted operation stops. **(T-0).** For permits that are anticipated to be in a no-operations and/or storage only status for an extended period of time (greater than one year) the Permittee should request a permit amendment to place the permit in a no-operations and/or storage only status. **(T-2).** This also applies to permits in decommissioning status for which decommissioning actions are in abeyance for an extended duration.

3.11.2. An organization shall request termination of their permit within 30 days after appropriate disposal or transfer of all regulated RAM and conclusion of any required decommissioning operations. **(T-2).**

3.11.3. Permittees shall execute the RICS-approved decommissioning plan, and properly dispose of all RAM through AFRRAD or in accordance with the decommissioning plan. **(T-1).**

3.11.4. Permittees shall request an amendment to terminate a permit by submitting:

3.11.4.1. A completed NRC Form 314; **(T-0).**

3.11.4.2. The last inventory and confirmation that the RAM was transferred and received by another Permittee, or NRC or Agreement State licensee, or shipped to a licensed broker for disposal. **(T-0).** **Note:** Do not simply send documents showing stock listed items were turned into installation supply. Demonstrate that all materials received were either

disposed of, or transferred properly, and no permitted materials remain associated with the permit; **(T-0).**

3.11.4.3. Demonstrate, as applicable (e.g. final status survey), no RAM or residual contamination above limits for unrestricted release as prescribed in NUREG 1575, *Multi-Agency Radiation Survey and Site Investigation Manual*, NUREG 1757, *Consolidated Decommissioning Guidance, Volume II, Characterization, Survey, and Determination of Radiological Criteria*, and Title 10 CFR Section 20.1402, *Radiological Criteria for Unrestricted Use*; and **(T-0).**

3.11.4.4. For permits authorizing possession only sealed or plated sources, a final leak test demonstrating source integrity. **(T-0).**

3.11.5. Upon termination of the permit, the RICS will determine the records required for retention. Documents such as records of personnel exposure investigations, spills and contamination are of relevancy. Store the files electronically for permanent archival storage after permit termination. **(T-1).**

3.12. Retaining Records. Records shall be retained for the receipt, storage, distribution, use, transfer, disposal and incident involving permitted or licensed RAM in accordance with criteria in 10 CFR Parts: 19 (notices, instructions, and reports to workers), 20 (radiation protection standards), 21 (defects and noncompliance), 30 (byproduct material), 31 (general byproduct license), 32 (specific byproduct license), 33 (broad scope byproduct license), 34 (industrial radiography), 35 (medical use), 36 (irradiators), 37 (increased controls), 40 (source material license), 51 (environmental protection), 70 (special nuclear material license), 71 (transportation), and 74 (control/accounting of SNM); and, as implemented in **https://www.my.af.mil/afrims/afrims/afrims/rims.cfm**. **(T-0). Note:** You may consult the RICS with any questions**.**

Chapter 4

RADIOACTIVE MATERIAL REMEDIATION AND DISPOSAL

4.1. Managing and Remediating Radioactive Material.

4.1.1. Manage and remediate radioactive waste sites according to AFI 32-7020, *The Environmental Restoration Program*, and policies established by USAF/A4. **(T-2).**

4.1.2. Radioactive material remediation is a complex multi-phase, multi-agency process that is outlined in NUREG 1575. This chapter contains the major responsibilities for each agency and provides a chronological sequence of events, Figure 1, *Generalized Sequencing of Radiation Material Remediation Work*, that should be followed in order to ensure regulatory compliance.

4.1.3. USAF organizations are not authorized to possess radioactive investigation derived waste or radioactive remediation waste unless authorized by a specific permit. **(T-1).**

4.1.4. Any USAF organization, or agency acting on behalf of the USAF, performing intrusive characterization or site remediation involving radioactive material (RAM), must have:

4.1.4.1. An NRC RAM license, Agreement State RAM license, USAF RAM permit, Veterans Affairs, or US Navy RAM permit that authorizes site remediation activities; and **(T-0).**

4.1.4.2. Approval of the RICS or AFSEC/SEW, as appropriate; and **(T-1).**

4.1.4.3. Experience with site remediation. **(T-3).**

4.1.5. Remediating a site generates radioactive waste that must be controlled and properly disposed of in accordance with current AFCEC guidance. **(T-1).** Remediating a site may also release waste in quantities that dictate a prompt total exhumation.

4.1.6. Work and health and safety plans for remediation of radioactive sites, to include waste disposal procedures, must be coordinated as detailed in this chapter. **(T-2).** If, during the course of remediation, a site is found to contain RAM which was not anticipated, then work must be temporarily ceased and the IRSO must immediately notify the RICS or AFSEC/SEW as appropriate, to determine requirements for continuation of field activities. **(T-1).**

4.1.6.1. Plans for sites containing or suspected to contain only 91(a) or 91(b) materials shall be submitted to the Weapons Safety Division of the AFSEC/SEW. **(T-2).**

4.1.6.2. Plans for all other sites shall be submitted to the RICS for review. **(T-1).** Those sites containing or potentially containing byproduct, source, NARM, and SNM covered under the MML will be forwarded by the RICS to the NRC for their review. **(T-1).**

4.1.7. Final reports of remediation of all sites containing RAM shall be sent to the RICS or AFSEC/SEW, as appropriate, for archival purposes. **(T-1).** The Air Force Radioactive Recycling and Disposal (AFRRAD) office will maintain and archive all disposal records and manifests for radioactive waste generated from a remediation. **(T-1).**

4.1.8. The RICS will:

4.1.8.1. Conduct historical search of documents, maintained at AFMSA/SG3PB, pertaining to potential Radioactive Waste Sites (RWS) upon request.

4.1.8.2. Issue permits for those sites that are either confirmed to have material contamination or will require intrusive investigation to identify scope of contamination, with the exception of sites containing only 91(a) or 91(b) material. **Note:** the permit may be issued under the MML or this manual.

4.1.8.3. Act as an advisor for the AFCEC/Remedial Project Manager (RPM) for engaging with and addressing regulatory authority issues.

4.1.8.4. Review and approve decommissioning plans, final status surveys, and site-specific safety and health plans as appropriate.

4.1.8.5. Conduct site visits if needed before and during remediation and/or decommissioning to ensure compliance with RICS approved procedures.

4.1.8.6. Advise AFIA on inspection protocol for each USAF permitted remediation activities.

4.1.8.7. Terminate permits for those sites that satisfy unrestricted release criteria, in accordance with 10 CFR 20.1402.

4.1.8.8. Assist AF/A4C in maintaining site registry.

4.1.9. AFSEC/SEW will:

4.1.9.1. Conduct historical search of documents maintained by the AFSEC pertaining to potential RWS containing 91(a) or 91 (b) materials upon request.

4.1.9.2. Issue possession only permits for those registered sites that are either confirmed to have 91(a) or 91(b) material contamination or will require intrusive investigation to identify scope of contamination.

4.1.9.3. Provide weapons related information, as required, to assist AFCEC/Remedial Project Manager (RPM), USAFSAM, Air Force Radioactive Recycling and Disposal (AFRRAD), and AFMSA/SG3PB in determining the radionuclides present at a 91(b) site and act as an advisor for the AFCEC/RPM for engaging with and addressing regulatory authority issues.

4.1.9.4. Review and approve decommissioning plans, final status surveys, and site-specific safety and health plans as appropriate.

4.1.9.5. Conduct site visits before and during remediation and/or decommissioning to ensure compliance with AFSEC approved procedures.

4.1.9.6. Terminate possession only permits for those sites that satisfy unrestricted release criteria.

4.1.9.7. Assist AF/A4C in maintaining site registry.

4.1.10. AF/A4C will:

4.1.10.1. Maintain and manage the USAF Radioactive Waste Site Registry (RWS) that is an identification and tracking database of all suspected and confirmed USAF RWS.

4.1.10.1.1. Present RWS Area of Concern documentation to the RICS for review and validation.

4.1.10.1.2. Register RWS Area of Concern data, upon RICS approval, into the AF Radioactive Waste Registry. Provide an updated list of USAF RWS registry to the RICS before 31 December of each year.

4.1.10.2. AFCEC will: confirm with USAF/A4C or AFSEC/SEW the registration of the site in the AF Radioactive Waste Site Registry projects involving the remediation of known or suspected RWSs, and confirm with the RICS the status of permitting requirements. In the absence of an installation RPM, AFCEC will assume responsibilities of section 4.1.13.

4.1.11. USAFSAM will:

4.1.11.1. Consult with the RPM in evaluating information pertaining to a suspected impacted site. **(T-1).**

4.1.11.1.1. Search historical records and coordinate with the RICS and AFSEC/SEW for data collection and information validation. **(T-1).**

4.1.11.1.2. Assess potential source terms and conduct a preliminary risk assessment to assist with a relative risk determination. **(T-1).**

4.1.11.2. Provide technical consultation and expert remediation guidance to the RPM. **(T-1).**

4.1.11.3. Assist the RPM, installation staff judge advocate, and the RICS in determining cleanup levels and regulatory requirements. **(T-1).**

4.1.11.4. Conduct scoping surveys of suspected impacted sites as requested by the IRSO. **(T-1).**

4.1.11.5. Consult as requested on all installation level actions, analysis, reports and recommendations with the IRSO. **(T-1).**

4.1.11.6. Act as technical advisor to AFMSA/SG3PB, the RIC and AFSEC/SEW. **(T-1).**

4.1.11.6.1. Provide technical review for all remediation plans, decommissioning plans, and final status surveys, and provide recommendation of approval or disapproval to the RICS. **(T-1).**

4.1.11.6.2. Provide a quality assurance function to the Remedial Action and Final Status Survey process (e.g., review of plan requirements, data quality review, adequacy of work, and review of findings). **(T-1).**

4.1.11.6.2.1. Provide quality assurance sample analysis, (e.g., 10% splits, duplicates and spikes) and confirmatory survey analysis for any contracted remedial action at the request of the RICS. **(T-1).**

4.1.11.6.2.2. Perform a field confirmatory survey (e.g. 10% scan, in-situ and removable swipe samples) for any contracted remedial action at the request of the RICS. **(T-1).**

4.1.11.6.2.3. Coordinate funding of this requested work through RPM, if not a DHP supported activity. **(T-1).**

4.1.12. The Base Civil Engineer will:

4.1.12.1. Contact the IRSO upon the discovery or knowledge of a location that may contain radioactive waste. **(T-1).**

4.1.12.2. Ensure all areas of concern, to include permitted sites, are identified in Tab C-1 of the Installation Master Plan and that the site is not disturbed until a proper assessment is performed. **(T-1).**

4.1.12.3. Ensure that confirmed or suspected RWS that present a health or environmental risk have:

4.1.12.3.1. Site access limited with a strong physical barrier such as a chain link fence or other measures, to prevent exposure of individuals to radioactive material (RAM). An inspection of physical barriers shall be conducted, at a minimum, annually. **(T-1).**

4.1.12.3.2. Post site boundaries for each accessible side with RAM warning signs stating that the site contains buried RAM. Ensure the signs are properly maintained (condition, visibility and legibility). Inspection of signs shall be conducted, at a minimum, annually. Design and display shall be in accordance with Title 10 CFR Sections: 20.1901, *Caution Signs*, 20.1902, *Posting Requirements*, and 20.1903, *Exemptions to Posting Requirements*. **(T-0).**

4.1.12.3.3. Protect the soil surface against erosion using grasses or other ground covers (such as stone or gravel) to maintain site stability. **(T-2).** Keep the site clear of deep-rooted shrubs and trees. **(T-2).**

4.1.12.4. Ensure no RWS is removed from the Installation Master Plan, transferred, released, or disregarded as a RWS until approved by the RICS. (T-1) AFSEC/SEW and/or USAFSAM are available for assistance.

4.1.13. The Remedial Project Manager (RPM) will:

4.1.13.1. Serve as the responsible agent for the overall management, budgeting, and execution of a radioactive material remediation project. **(T-2).** The RPM will usually be a member of the installation environmental management office. **(T-2).** RPM will budget for USAFSAM verification survey if it is an environmental site. **(T-2).**

4.1.13.2. Ensure a suspected area of concern is registered through their chain of command with the RWS registry maintained by AF/A4C. **(T-1). Note:** radioactive waste may be discovered on an existing Installation Restoration Program (IRP) site.

4.1.13.3. Contact the IRSO to request assistance from USAFSAM in conducting a scoping survey of a suspected RWS area of concern. **(T-2).**

4.1.13.4. Develop and submit an application for a permit to the IRSO once a registered site is identified as positive for radioactive waste or before intrusive investigation commences. **(T-1). Note:** classified sites or material will require special procedures.

4.1.13.5. In conjunction with the IRSO:

4.1.13.5.1. Consult with AFCEC, as appropriate, for assistance in selecting a qualified contractor. **(T-2).**

4.1.13.5.2. Consult with USAFSAM, the RICS, and regulatory agencies in selecting appropriate cleanup levels for remediation. **(T-1).**

4.1.13.5.3. Request technical assistance from USAFSAM and the RICS in developing and executing decommissioning plans, site safety and health plans, and final status surveys. **(T-2).**

4.1.13.6. Apply Multi-Agency Radiation Survey and Site Investigation Manual, and Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual survey methodologies (see NUREG-1575, *Multi-Agency Radiation Survey and Site Investigation Manual*, including *Supplement 1*) in developing all investigation and remediation work plans. **(T-1).**

4.1.13.7. Submit for review and approval, decommissioning plans, site safety and health plans, and final status surveys to the IRSO who in turn submits them to the RICS. **(T-1).**

4.1.14. The Installation Radiation Safety Officer (IRSO) will**:**

4.1.14.1. Advise the Civil Engineer, RPM, commanders, and other base personnel on identification and remediation of potential public and occupational health risks associated with suspected or confirmed contaminated sites. **(T-1).**

4.1.14.2. Serve as the interface between the installation and the RICS, AFSEC/SEW and USAFSAM for all radiation related issues. **(T-2).** When requested by the RPM, contacts USAFSAM and the RICS for technical assistance in developing decommissioning plans, remediation work site safety and health plans, and final status surveys. **(T-2).**

4.1.14.3. Submit an application for a permit to the RICS once a radioactive material impacted site is identified as positive or before intrusive investigation commences. **(T- 1).**

4.1.14.4. Consult with AFCEC for assistance in selecting a qualified contractor. **(T-2).**

4.1.14.5. Review decommissioning plans, remediation work site safety and health plans, and final status surveys for the installation and submit them to the RICS for approval. **(T-1).** Assures appropriate health physics oversight of the effort. **(T-1).**

4.1.14.6. Conduct annual surveys of radioactive waste sites to include:

4.1.14.6.1. Visual inspection of the integrity of pipe caps or other closure devices that extend above ground. **(T-2).**

4.1.14.6.2. Conduct radiation surveys if there is an indication of intrusion or damage to the site. **(T-2).**

4.1.14.6.3. Ensure that fencing, security devices, and signage are in good order. **(T-2).**

4.1.14.7. Report to the RIC a release or exposure to RAM in accordance with 10 CFR Chapter I, this manual, and any RIC directions. **(T-0).**

4.1.15. The Air Force Inspection Agency will:

4.1.15.1. Inspect, as appropriate, sites permitted under this chapter.

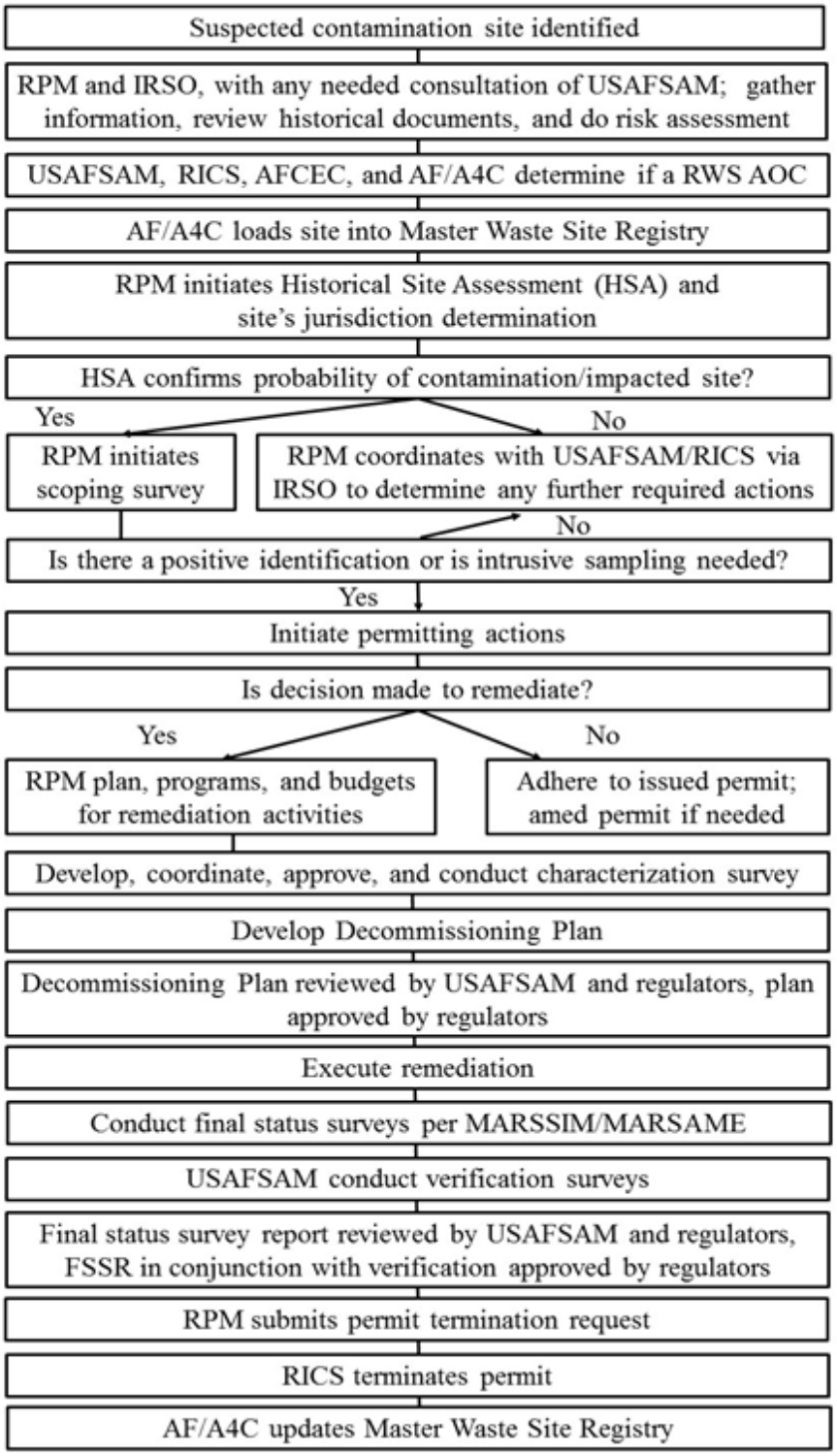
4.1.15.2. Only inspect sites permitted by AFSEC upon their request.

4.1.16. The installation staff judge advocate will:

4.1.16.1. Assist the RPM and the RICS in determining the legislative jurisdiction of contaminated sites where contractors will be performing work under their own (e.g., NRC or Agreement State) license. **(T-2).**

4.1.16.2. Assist the RPM, USAFSAM, and the RICS in identifying applicable statutory and regulatory requirements and determining appropriate cleanup levels. **(T-2).**

Figure 4.1. Generalized Sequencing of Radiation Material Remediation Work.



4.2. Managing and Disposal of Radioactive Materials.

4.2.1. IRSO and PRSOs jointly prepare requirements for waste management by considering local conditions such as quantities and types of waste produced, where waste is generated, and the location and configuration of available storage. **(T-2).**

4.2.1.1. The base Civil Engineer provides environmental consultation to generating units, the IRSO, and the Air Force Radioactive Recycling and Disposal (AFRRAD) office on the RCRA hazardous waste requirements of 91(b) mixed waste as related to the proper identification, handling, segregation, and storage of such waste. **(T-2).**

4.2.1.2. The base Civil Engineer oversees compliance with installation RCRA permits, if applicable, and/or RCRA requirements for storage, treatment, and disposal of mixed waste in accordance with applicable Federal, state, and local requirements, AFI 32-7042, *Waste Management*, and in coordination with the IRSO and the AFRRAD office. **(T-1).**

4.2.1.3. Installation generators will coordinate the disposal of radioactive waste and mixed waste with the IRSO, who will in turn, coordinate with the AFRRAD office. **(T-1).**

4.2.2. A USAF RAM permit is required for all radioactive waste storage areas used for permitted or licensed quantities of NRC regulated waste. **(T-1).**

4.2.2.1. Radioactive waste storage from more than one permit at a single location or otherwise co-mingling radioactive waste from more than one permit is prohibited unless specifically authorized by the RICS or AFSEC/SEW, as appropriate. **(T-1).**

4.2.2.2. Mixed waste from nuclear munitions maintenance shall not be commingled or stored with waste from a permit issued by the RICS unless approved by the RICS and AFSEC/SEW. **(T-1).**

4.2.3. Permittees shall ensure an inventory is maintained and all RAM and items containing or contaminated with RAM is secured pending disposal or transfer. **(T-0).**

4.2.4. Permittees shall also comply with all other applicable Federal, state, and local regulations and instructions regulating all hazardous and mixed waste at the site. **(T-0).** Coordinate with the base Civil Engineer to determine local requirements for managing and staging mixed waste. **(T-1).**

4.2.5. Radioactive waste shall be disposed of as soon as practical. **(T-3).** Under no condition shall mixed waste be staged for longer than 90 calendar days unless a RCRA permit authorizing storage for a longer period has been secured through the base Civil Engineer. **(T-1).** Do not collect or store radioactive waste for a period longer than 365 days. **(T-1).** Coordinate promptly with the AFRRAD office via the PRSO and IRSO. **(T-3).**

4.2.6. Dispose of RAM using one of the following methods:

4.2.6.1. Transfer to an authorized recipient (reference **paragraph 3.7**), subject to the restrictions of Title 10 CFR Section 20.2001, *General Requirements*; **(T-0).**

4.2.6.2. Decay in storage (for RAM having a physical half-life less than 120 days) provided:

4.2.6.2.1. Prior to disposal as ordinary trash, the container's surface and contents shall be surveyed with the appropriate survey instrument set on its most sensitive scale and with no interposed shielding to determine that its radioactivity cannot be distinguished from natural background; and **(T-0).**

4.2.6.2.2. All radiation labels and markings shall be removed or obliterated; and (T- 0)

4.2.6.2.3. A record of each disposal shall be retained for 3 years. **(T-0).**

4.2.6.2.3.1. The record must include the date of disposal, the date on which the byproduct material was placed in storage, the radionuclides disposed, the survey instrument used, the background dose rate, the dose rate measured at the surface of each waste container, and the name of the individual who performed the disposal. **(T-0).**

4.2.6.2.3.2. Medical permittees must adhere to Title 10 CFR Section 35.92, *Decay-in-storage*. **(T-0).**

4.2.6.2.4. Permittees authorized to dispose by decay-in-storage will comply with the record keeping requirements prescribed in 10 CFR §35.92. **(T-0).**

4.2.6.3. Release to effluents in accordance with 10 CFR §20.2001, if authorized by the RICS. **(T-0).**

4.2.6.4. Release to the sanitary sewer in accordance with Title 10 CFR Section 20.2003, *Disposal by Release Into Sanitary Sewerage*, only if doing so has been determined by the base Civil Engineer to be permissible under the terms of the Clean Water Act permit and other applicable Federal, state, or local regulations **(T-0).**; disposal by sanitary sewer, as described in 10 CFR §20.2003, applies only to circumstances where an installation is discharging effluent to a publicly owned treatment facility. Installations with their own sewage treatment facility must apply to the RICS for authorization to dispose of RAM in effluents in accordance with 10 CFR §20.2003; **(T-0).** or

4.2.6.5. Release Carbon-14 and Hydrogen-3 as non-RAM if it meets the requirements of Title 10 CFR Section 20.2005, *Disposal of Specific Wastes*, or other more stringent applicable Federal, state, or local regulations. **(T-0).**

4.2.7. Disposal by land-burial must be authorized by the AFRRAD office in accordance with **Chapter 4**, to include adherence to Title 10 CFR Section 20.2006, *Transfer for Disposal and Manifests*. **(T-0).** Do not ship radioactive waste from an USAF installation without coordinating with AFRRAD and determining any required written instructions from AFRRAD. **(T-1).**

4.2.8. Permittees may propose alternative disposal procedures, in accordance with Title 10 CFR Section 20.2002, *Method for Obtaining Approval of Proposed Disposal Procedures*, to the RICS for approval.

4.2.9. PRSOs shall maintain RAM disposal records in accordance with Title 10 CFR Section 20.2108, *Records of Waste Disposal*, and as required in any RIC directions **(T-0)**; IRSOs will assist PRSOs in the archival of disposal records with civil engineering, the RICS, etc. as appropriate. **(T-3).**

4.2.10. Organizations must be specifically permitted/licensed to receive waste containing RAM for (10 CFR 20.2108):

4.2.10.1. Treatment prior to disposal; **(T-0).**

4.2.10.2. Treatment or disposal by incineration; **(T-0).**

4.2.10.3. Decay in storage; **(T-0).**

4.2.10.4. Disposal at a land disposal facility licensed under Title 10 CFR Part 61, *Licensing Requirement for Land Disposal of Radioactive Waste*; or **(T-0).**

4.2.10.5. Disposal at a geologic repository under Title 10 CFR Part 60, *Disposal of High-level Radioactive Waste in Geologic Repositories*, or Title 10 CFR Part 63, *Disposal of High-level Radioactive Waste in a Geologic Repository at Yucca Mountain, Nevad*a. **(T-0).**

4.2.11. Requirements for Waste Generating Activities.

4.2.11.1. The PRSO will control access to laboratories or rooms where radioactive waste is generated or stored (storage area must provide sufficient protection to prevent degradation of packaging or the waste) when they are vacant or unattended. **(T-1).**

4.2.11.2. The PRSO will maintain a log for information about radioactive material (RAM) placed into radioactive waste containers and record radiation levels. **(T-0).** The log shall include: **(T-0).**

4.2.11.2.1. Name of the installation;

4.2.11.2.2. The building and number of the room containing radioactive waste containers;

4.2.11.2.3. The types of containers and the identification number assigned to each container;

4.2.11.2.4. The date items were placed in the container;

4.2.11.2.5. A description of items placed in each container. Stock listed items shall contain a record each item's name and stock number. Sealed sources shall contain a record of the manufacturer; date manufactured, model, and serial number, if available. Identify other articles by their common names, for example, contaminated gloves, rags, and paper chucks;

4.2.11.2.6. The radionuclide(s) contained in the item;

4.2.11.2.7. The known or estimated radioactivity in curie or becquerel units. Do not abbreviate unit or prefixes;

4.2.11.2.8. The physical form of each radionuclide, for example, gas, solid, or liquid. **Note:** Do not treat radioactive waste by absorption of liquids, solidification of liquids or any other procedures that is designated for burial unless approval is obtained from the Air Force Radioactive Recycling and Disposal (AFRRAD) (reference **paragraph 4.2.13**);

4.2.11.2.9. The chemical form of each radionuclide, for example, oxide, chloride, and the chemical name of the labeled compound;

4.2.11.2.10. The name and initials of the individual making the entry;

4.2.11.2.11. Meter readings in millirem or milliSievert per hour (mrem/hr or mSv/hr) measured outside the containers;

4.2.11.2.12. The name and initials of the individual conducting the survey; and

4.2.11.2.13. Evidence of PRSO and IRSO coordination, as applicable.

4.2.11.3. T he PRSO will survey radioactive waste storage areas periodically to ensure compliance with 10 CFR Part 20 and document the results. **(T-0)..**

4.2.11.4. The PRSO will maintain records of all disposals of radioactive waste for the duration of the permit. **(T-0).**

4.2.11.5. Before sealing a waste container, the PRSO must: **(T-1).**

4.2.11.5.1. Verify for each waste container, the legibility and completeness of each waste entry, and visually inspect the containerized waste. To prevent contamination of personnel or the area, do not physically remove or handle the waste from the container.

4.2.11.5.2. Survey the container to ensure that detected radiation levels correspond to the entries recorded in the waste log. **Note:** A container storing a low-energy beta emitters or small quantities of a low-energy gamma emitter (e.g., Iodine-125) would not have high levels of x-ray or gamma radiation. Gamma surveys shall be conducted on these containers to ensure that high energy gamma emitting sources were not improperly placed in the container or that Bremsstrahlung radiation is not being produced at significant levels to cause a potential hazard.

4.2.11.5.3. The PRSO must secure the waste and records and investigate to resolve discrepancies if observations or measurements give unusual results.

4.2.11.6. Close and seal the plastic bag or container for transfer and disposal after the PRSO's audit. **(T-2).**

4.2.12. Requirements and Rules for Storage of Radioactive Waste Containers.

4.2.12.1. Long-term storage is not encouraged and should be avoided. In general, store radioactive waste for no longer than one (1) year. **(T-1).**

4.2.12.2. PRSOs must maintain a listing of all sealed radioactive waste storage containers and account for and inspect semiannually the integrity of each container. **(T-0).** A record of the inspection shall be maintained for three (3) years. **(T-0).**

4.2.12.3. A copy of the waste inventory sheet must be attached to each waste container held in long-term storage. **(T-1).**

4.2.12.4. Do not open waste containers to conduct periodic inspections. **(T-1).**

4.2.12.5. Ensure storage areas are properly ventilated prior to survey. **(T-1).**

4.2.12.6. The PRSO shall conduct a final inspection of radioactive waste containers for integrity of the container and container seal; accuracy and completeness of log entries; proper markings and labels; and perform required surveys prior to removing the containers for transfer or disposal. **(T-1).**

4.2.12.7. The PRSO will file inventory sheets and waste logs in the PRSO’s permanent records of the permit authorizing long-term storage of the waste after disposal or transfer of each waste container. **(T-0).**

4.2.12.8. Do not store liquid waste more than one (1) year. **(T-1).** Solidify the waste with the help of AFRRAD. **(T-1).**

4.2.13. Disposal by Burial or Recycling.

4.2.13.1. Radioactive sources no longer needed by the Permittee, and not authorized for decay-in-storage, may be disposed by burial or recycling. All requests for disposal by burial or recycling will be made, in writing, to AFRRAD. **(T-1).** Written requests shall include the following information: **(T-1).**

4.2.13.1.1. NSN or part number and manufacturer's name or code of the radioactive source, if applicable;

4.2.13.1.2. Nomenclature (e.g., lensatic/military compass, tube assembly, test sample);

4.2.13.1.3. Quantity of each item or amount of waste in terms of cubic feet;

4.2.13.1.4. Radionuclide(s);

4.2.13.1.5. Physical Form (e.g., solid, liquid, gas) to include any known hazardous waste constituents;

4.2.13.1.6. Chemical form;

4.2.13.1.7. Estimated radioactivity per item, and total radioactivity in milliCuries, and in becquerels, for each container; and

4.2.13.1.8. Radiation exposure rate in millirem per hour (milliSievert per hour) at 4 inches from surface of unpackaged item (for items only).

4.2.13.2. Installations located overseas are authorized to dispose of waste in the host country where they are geographically located to the extent that such disposal is in compliance with applicable host nation regulations and agreements and has been approved by the responsible (cognizant) host nation authority, approved by the RICS, and determined to be consistent with applicable Geographic Combatant Command policy, and environmental annexes to operational orders, operational plans or other operational directive.

4.2.14. Exempt Quantity Item Disposal. Electron tubes and spark gaps containing RAM can be disposed of as normal trash providing the following conditions are satisfied:

4.2.14.1. Store electron tubes or spark gaps in a way that will prevent breakage. Each tube or spark gap must contain less than the quantities listed in 10 CFR 30.15 (do not accumulate exempt quantities) or does not contain more than the exempt quantity of NARM materials specified in **paragraph 3.10**; **(T-0).** and

4.2.14.2. The levels of radiation from each electron tube or spark gap does not exceed one (1) milliRoentgen per hour on contact when measured with a proper radiation detection instrument; **(T-1).** and

4.2.14.3. Disposal is authorized by applicable host nation, state or country statutes and regulations. In overseas locations make the further determination that burial is determined to be consistent with applicable Geographic Combatant Command policy, and environmental annexes to operational orders, operational plans or other operational directive. **(T-0).**

Chapter 5

RADIOACTIVE MATERIAL INCIDENTS AND MISHAPS

5.1. Reporting Radioactive Material Incidents and Mishaps.

5.1.1. Follow reporting criteria and time limits in 10 CFR Parts 19 (notices, instructions, and reports to workers), 20 (radiation protection standards), 21 (defects and noncompliance), 30 (byproduct material), 31 (general byproduct license), 32 (specific byproduct license), 33 (broad scope byproduct license), 34 (industrial radiography), 35 (medical use), 36 (irradiators), 37 (increased controls), 40 (source material license), 51 (environmental protection), 70 (special nuclear material license), 71 (transportation), and 74 (control/accounting of SNM). **(T-0).** Make reports to the RICS, not the NRC. **(T-1). Note:** You may consult the the IRSO and/or RICS to know which parts apply to your RAM.

5.1.2. The Permittee, the PRSO, and the IRSO must reinforce each other to ensure the RICS receives reports required by 10 CFR Chapter I. **(T-1).** Report an incident if you have any reservations about whether reporting is required. **(T-1).**

5.1.3. Report incidents initially by telephone (installations outside the US may report by message/email) and confirm by fax or message. **(T-1).** Report to AFMSA/SG3PB (RICS). **(T-1).**

5.1.3.1. To report after normal duty hours, call the Andrews Regional Command Post, DSN 858-5058, or (301) 981-5058. **(T-1).** Give your name, organization, DSN and commercial phone numbers. **(T-1).** State that you are calling with a "radioactive material incident report" and ask for the AFMSA/SG3PB (RICS) duty officer. **(T-1).**

5.1.3.2. Inform the Installation Chief of Safety, MAJCOM/SEW, and IRSO of any INRAD or 91(b) material mishaps in accordance with AFI 91-204, *Safety Investigations and Reports*. **(T-2).**

5.1.3.3. The Unit Radiation Safety Officer or Weapons Safety Officer, in accordance with AFI 91-108, will inform HQ AFSEC/SEW through AF Safety Automated System of any abnormal exposures and/or suspected overexposures to personnel or the public from a mishap involving INRAD or 91(b) material. **(T-2).**

5.1.4. Time limits for reports begin when the event occurs or is first discovered. Incidents requiring an immediate report must be forwarded within three (3) hours. **(T-1).** Realize the RICS must contact the NRC in turn and the Air Force has a total of four (4) hours to make an immediate report notification to the NRC **(T-0).**—make every effort to report well before the stated reporting suspense. **(T-1).** Include as much of the information as possible, but do not delay reporting if you have not collected all the pertinent information. **(T-0).**

5.1.5. The RICS directs follow-on written reports or information needed to comply with NRC regulations.

5.1.6. A copy of all written reports must be forwarded to the IRSO, Installation Commander, MAJCOM bioenvironmental engineer, and AFIA/SG. **(T-2).**

5.1.7. The requirements in **paragraphs 5.1.1** through **5.1.6** are separate from the reporting requirements of AFMAN 10-206, *Operational Reporting*, and AFI 91-204. This manual does

not prescribe the reporting requirements of incidents or mishaps involving only nuclear weapons, nuclear weapons parts, reactors and fuel assemblies, and space systems exempted from NRC regulatory authority under AEA, Section 91(b).

5.1.8. EPA regulations require reporting releases of RAM characterized as hazardous substances under 40 CFR Part 302, *Designation, Reportable Quantities, and Notification*. **(T-0)** The EPA lists some of the chemical forms of radionuclides and many of the non- radioactive chemical constituents that may be part of the release with radionuclides as a result of an industrial process. Report spills of radionuclides or mixed hazardous materials to the environment in accordance with AFI 10-2501, *Air Force Emergency Management (EM) Program Planning and Operations*. **(T-2).** These reports will typically be separate from the reporting requirements described in this manual.

5.1.9. Radiological incidents that could potentially expose members of the general public or accidental releases of RAM to the environment must be reported to civilian authorities (Emergency Planning and Community Right-to-Know Act). **(T-0).** The IRSO provides information, approved by the installation commander, and released through the installation public affairs office, of these types of incidents. **(T-2).** Security restrictions on classified or sensitive information shall be adhered to except in cases of immediate risk to health and/or significant environmental impact. **(T-0).**

5.1.10. Safeguard classified information when making reports. **(T-0).** Special care shall be taken when reporting and investigating an incident or mishap under AFI 91-204 to ensure that reports forwarded to the RICS do not contain classified or sensitive unclassified information. All information will be properly marked and secured from unauthorized access, as applicable. **(T-0).** All reports involving RAM exceeding NRC quantities of concern shall be handled as sensitive information and transmitted as directed by the RICS per NRC requirements of 10 CFR Part 37. **(T-0).**

5.1.11. By Federal law, the USAF must give the NRC certain types of information normally protected from public release, to include personally identifiable information and exact locations of RAM. **(T-0).** When investigating the cause of an incident or mishap and the involvement of persons for reports under this manual, maintain confidentiality of information. **(T-0).**

5.2. Investigating Radioactive Materials Incidents and Mishaps.

5.2.1. The Permittee is responsible for investigating, performing a root cause analysis in accordance with accepted AF methodologies, and preparing a report on events, such as overexposure or loss of material, exact requirements are dependent on RAM and referenced **paragraph 5.1.1**, in accordance with 10 CFR Chapter I, this manual, and any RIC directions. **(T-0).**

5.2.2. The Commander of the permit holding organization is responsible for the investigation and report for reportable events involving non-permitted radioactive material (RAM). **(T-1).** The PRSO, assisted by the IRSO, normally performs the investigation. **(T-3).**

5.2.3. Investigating a mishap or incident according to AFI 91-204 may generate information requiring a separate report that can be forwarded to the NRC. Reference **paragraphs 5.1.10** and **5.1.11**. about protecting classified information. Installations may consult with the RICS as needed.

5.2.4. Forward reports to organizations listed in **paragraph 5.1.6**. **(T-1).**

5.2.5. The RICS will decide when an investigation of an event involving RAM governed by this manual is complete.

5.2.6. The NRC, AFIA/SG, or the RICS reserves the right to independently investigate an incident or mishap involving permitted or NRC-licensed RAM to confirm USAF reports or to decide whether the installation violated permit conditions, this manual or Federal regulations.

Chapter 6

INSPECTION AND ENFORCEMENT

6.1. Inspecting Permit Holders and Enforcing Compliance.

6.1.1. Inspections: Inspections of permittees' issued USAF radioactive material (RAM) permits shall be conducted by AFIA/SG, the RICS, and/or the NRC. Unannounced inspections are routinely conducted to assess compliance with permit conditions, AF instructions, and Federal regulations. Detailed inspection policy for permits is provided in **paragraph 6.2**.

6.1.1.1. The permit type and scope sets the frequency and content of routine AFIA/SG inspections.

6.1.1.2. An inspection category is assigned to each permit along with the corresponding inspection frequency, which is stated on the cover letter issued with the permit, or its amendment or renewal. More frequent inspections may be made based on scale of economies during travel, to enforce compliance, evaluate a specific problem or follow-up to determine if corrective actions have been taken.

6.1.1.3. Copies of USAF inspection reports are forwarded to:

6.1.1.3.1. The Permittee and PRSO;

6.1.1.3.2. The owning MAJCOM bioenvironmental engineer;

6.1.1.3.3. The RICS (AFMSA/SG3PB); and

6.1.1.3.4. The NRC, if the permit is issued under the MML.

6.1.1.4. Mark, handle and safeguard these reports according to AFI 90-201.

6.1.1.5. Permittees must report corrective actions for noncompliance in accordance with this manual and AFIA/SG. **(T-1).**

6.1.1.6. The NRC regional offices conduct permit compliance inspections without notice as part of the NRC's continual assessment of the USAF's permitting and inspection program.

6.1.1.6.1. NRC inspections may be concurrent with, or separate from, the USAF's permit compliance inspections.

6.1.1.6.2. The NRC will send a formal inspection report to the RICS with a Notice of Violation (NOV) for any areas of non-compliance noted during an NRC inspection.

6.1.1.6.3. The RICS will subsequently send a copy of the inspection to the Permittee, and when required, request a written response detailing any corrective actions for NOVs noted.

6.1.1.6.4. The RICS will provide copies of both the NRC inspection report and any written response from the Permittee to AFIA/SG.

6.1.2. Enforcement: The RICS may take enforcement action as a result of reported incidents, inspection findings, or identified violations. Enforcement details are provided in **paragraph 6.3**.

6.1.2.1. The RICS takes administrative enforcement actions including:

6.1.2.1.1. Issuances of NOVs;

6.1.2.1.2. Adjusting AFIA/SG findings and NOVs;

6.1.2.1.3. Suspending or rescinding authority to possess or use RAM;

6.1.2.1.4. Implementing additional control measures to permits; and/or

6.1.2.1.5. Rescinding a person's authority to use or supervise use of RAM.

6.1.2.2. Commanders retain responsibility for the discipline of individuals according to the Uniform Code of Military Justice. **(T-3).**

6.1.2.3. The NRC can also enforce regulatory compliance in accordance with Title 10 CFR Part 2, *Agency Rules of Practice and Procedure*. The NRC's enforcement policy and enforcement procedures can be found on the NRC's website.. **Note:** The NRC also issues press releases on enforcement actions.

6.1.2.4. Approval and acceptance of Permittee corrective actions are completed by the RICS.

6.2. Inspection Policy.

6.2.1. Introduction. The inspection program for permitted and generally licensed radioactive material (RAM) serves to assess compliance with permit conditions and Federal regulations (e.g., NRC and Department of Transportation). The frequency and duration of the inspection shall be based on the inspection category assigned by the RICS, complexity of the permit, overall risks of the permitted activity, and opportunity to witness infrequent or unique procedures. In addition to AFI 90-201, *The Air Force Inspection System*, requirements:

6.2.2. Inspection Protocol.

6.2.2.1. The U.S. Nuclear Regulatory Commission (NRC) shall have identification and, as necessary, be able to demonstrate appropriate clearance. The Permittee has a right and duty to challenge unknown individuals presenting themselves as inspectors.

6.2.2.2. Inspections are conducted in accordance with AFI 90-201. Inspections may be conducted at times outside of normal duty hours; specifically, when the use or receipt of permitted material is outside of normal duty hours.

6.2.2.3. A unit that has deployed the PRSO and does not have an available alternate PRSO is still subject to inspection. The permit shall be revised to possession only during the PRSO deployment and an administrative officer should be named to the permit. **(T-1).** Failure to comply with the conditions of the permit, this manual or applicable Federal regulations may result in a violation for non-compliance; particularly, if permitted material is not properly secured and controlled.

6.2.2.4. The RICS will receive and forward all NRC inspection reports as appropriate. The RICS will ensure NRC violations get loaded into Inspector General Management Evaluation System for appropriate tracking and closure.

6.2.3. Inspection Types.

6.2.3.1. New Permit Inspections (Announced) shall be conducted approximately six months after permitted materials are received. Permittees are required to immediately notify AFIA/SG when permitted materials have been received.

6.2.3.2. Routine Permit Inspections (Unannounced) shall be conducted at intervals established by the permit. Inspection frequency may be changed based on Permittee performance.

6.2.3.3. Follow-up Permit Inspections (Announced) shall be conducted when permittees receive Severity Level I-III violations as the result of an AF or NRC inspection. Inspections of this type will be requested by the RICS and conducted by AFIA/SG. They will occur no later than six months following closure of corrective actions. In addition, RICS and AFIA staff will review like permits with the potential for similar violations and may direct off cycle inspection or staff assistance visits.

6.2.3.4. Collaborative Permit Inspections: AFIA/SG may choose to accompany the NRC during an inspection. NRC inspections may occur at any time and are not bound by the intervals established by the permit or recentness of the last AFIA/SG inspection. Normally AFIA will accompany the NRC during their inspections; however if they are unavailable, a member from the RICS may accompany the NRC inspector. Conversely, the NRC may choose to accompany AFIA/SG during an inspection. Typically, the NRC does not issue a report under these conditions.

6.2.3.5. Incident Inspections (Announced) may be conducted based on concern expressed by the RICS, the NRC or following a significant event (e.g., personnel health and safety violations, loss of control of RAM, radiation exposure exceeding regulatory guidelines, natural disaster or equipment failures). In these instances, AFIA/SG or AFMSA/SG3PB may conduct an off- cycle visit or inspection either unannounced or scheduled. This type of inspection is generally not rated but a report may be generated.

6.2.3.6. Consultancy Inspections (Announced), upon request of the Permittee, AFIA/SG or AFMSA/SG3PB, may conduct a scheduled visit to identify areas where assistance and improvements can be made. Furthermore, AFIA/SG or AFMSA/SG3PB may conduct a scheduled visit to advise the Permittee on how to implement new AFIs or Federal regulations. Consultancy visits, requested by the Permittee, are generally funded by the requesting organization. This type of visit shall not be rated but a report should be generated.

6.2.3.7. Permit Termination Audits (Announced): a termination audit may be scheduled and conducted during or following the termination of a broad scope permit, remediation activity or permitted activity involving significant amounts of unsealed RAM, to assure the criteria of 10 CFR 20, Subpart E are met. This type of audit shall not be rated but a report may be generated. **Note:** auditable records include the decommissioning plan if applicable, the final status survey report if applicable, NRC or Agreement State memoranda documenting acceptance of the final status survey report and approval for permit termination as applicable, the NRC Form 314, *Certificate of Disposition of Materials* (with all applicable attachments), the signed termination permit amendment from the RICS, and RICS memoranda documenting any long-term alternate or additional instructions.

6.2.3.8. Special Emphasis Inspections (Announced/Unannounced): certain topics to be researched, as requested by the RICS are conducted by AFIA/SG. These Special Emphasis Item (SEI) studies are conducted according to AFI 90-201. SEIs are normally terminated within 6-12 months, and the results are briefed at the IG-SG Annual Review.

6.2.4. Severity Levels of Violations.

6.2.4.1. AF-issued violations will be consistent with the categories defined in the NRC Enforcement Manual and NRC Enforcement Policy: Minor, Non-Cited, and Severity Levels I through IV.

6.2.4.2. Comparisons of severity between disparate activities (e.g., nuclear medicine vs. gauges) will not be made. Severity is assigned on a case-by-case basis. Repeat violations, willfulness and false representations will influence the severity of a violation.

6.2.5. Inspection Violations and Actions.

6.2.5.1. Minor and Non-cited. Permittees have no follow-up actions resulting from minor and non-cited violations.

6.2.5.2. Severity Level IV. Permittees shall have five (5) duty days from the receipt of the report to respond in writing to the RICS, AFIA/SG and their respective MAJCOM. **(T-1).** The RICS reserves the right to accelerate the time of the response. The RICS may take enforcement against a Permittee who doesn't demonstrate timeliness or sufficiency of corrective actions.

6.2.5.3. Severity Level I-III. Permittees shall have five (5) duty days from the receipt of the report to respond in writing to the RICS, AFIA/SG and their respective MAJCOM. **(T-1).** Permittees shall respond by email or in writing, within 24 hours upon verbal notification to the RICS; the Permittee shall provide immediate actions taken to mitigate the violation. **(T-1).** The RICS will coordinate/seek concurrence with the NRC on mitigation actions and timelines. The RICS reserves the right to accelerate the time of the response. The RICS may take enforcement against a Permittee who doesn't demonstrate timeliness or sufficiency of corrective actions.

6.2.5.4. The Permittee must initiate corrective actions in advance of any report. **(T-1).**

6.2.6. Ratings. AFIA/SG will issue either a rating of "Compliant" or "Not Fully Compliant" in the final report.

6.2.7. Corrective Actions. Permittees shall respond to the violations according to the provisions of this chapter. **(T-1).** Response to violations shall contain, at a minimum, the following:

6.2.7.1. Reference to the violation(s). **(T-1).**

6.2.7.2. Complete description of how the violations(s) were or will be corrected to include: **(T-1).**

6.2.7.2.1. The root cause for the violation(s) or, if contested, the basis for disputing it,

6.2.7.2.2. Corrective actions that have been taken and the results achieved,

6.2.7.2.3. Corrective actions that will be taken to avoid future violations, and

6.2.7.2.4. Timeline, with milestones, for corrective actions and date when full compliance was or will be achieved.

6.2.7.3. Designation of an office for monitoring corrective measures, to include a point of contact. **(T-1).**

6.2.8. Disposition.

6.2.8.1. Closure: upon receipt of a response to the violation from the Permittee, the RICS shall consider the merit of the corrective actions and, if satisfied, close out the deficiency in Inspector General Management Evaluation System.

6.2.8.2. Non-Closure: if the RICS determines corrective actions are not acceptable to close the violations, enforcement actions may be taken according to **paragraph 6.3**. Enforcement actions shall be submitted to the Permittee and copied, at a minimum, to their MAJCOM/SG and AFIA/SG.

6.3. Enforcement Actions.

6.3.1. Introduction and Basic Enforcement Actions. This section describes the enforcement actions available to the RICS in the administration of the USAF MML, and specifies the conditions under which each may be used. The basic enforcement actions are Notices of Violation and Orders of various types. Enforcement action is usually taken whenever a violation of permit requirements or regulations of more than a minor concern is identified. The nature and extent of the enforcement action is intended to reflect the seriousness of the violation involved. For the vast majority of violations, a Notice of Violation (NOV) is the usual action. NOVs are sent to the Permittee, with copies to AFIA/SG (when not issued by AFIA), and MAJCOM Bioenvironmental Engineer. They specify the nature of the violation(s) (e.g., permit condition, this manual, or Federal regulations) and require a response for corrective action by a set date. The RICS shall, in the administration of the MML, keep the assigned NRC Program Manager informed regarding enforcement actions.

6.3.2. Escalated Enforcement Actions, RIC and RIC Secretariat Directives. Whenever inspections identify conditions or violations that result in significant regulatory concern, escalated enforcement action through an issued order is considered. As authorized by this manual and AFPD 40-2, a directive order is a mandatory written order to modify, suspend, or to cease and desist from a given practice or activity; or to take additional action as deemed appropriate. Orders may be issued in lieu of, or in addition to NOVs, generally for Severity Level I, II, or III violations or other conditions that cause significant regulatory concern. Orders are mandatory and made effective immediately. Orders may be executed without prior notice or consultation with the Permittee whenever it is determined that the public health, interest, or safety requires, or when the order is responding to a violation involving willful negligence. For other cases, the Permittee shall be afforded an opportunity to demonstrate why the order should not be issued. Orders may be issued as follows:

6.3.2.1. Permit Modification Orders are issued by the RICS when a change in Permittee equipment, procedures, personnel, or management controls is necessary.

6.3.2.2. Suspension Orders are issued by the RICS and signed by AFMSA/SG3P and may apply to all or part of the permitted activity. Ordinarily, a permitted activity is not suspended (nor is a suspension prolonged) for failure to comply with requirements where

such failure is not of willful intent and adequate corrective action has been taken. Suspension Orders may be used to remove a threat to the public health and safety, or the environment:

6.3.2.2.1. When the Permittee has not responded adequately to other enforcement action;

6.3.2.2.2. When the Permittee interferes with the conduct of an inspection or investigation; or

6.3.2.2.3. For any reason not mentioned above for which permit activity suspension is authorized by the RICS in coordination with AFMSA/SG3P.

6.3.2.3. Revocation/Termination Orders are issued by RICS and signed by AFMSA/SG3P:

6.3.2.3.1. When a Permittee is unable or unwilling to comply with permit requirements;

6.3.2.3.2. When a Permittee refuses to correct a violation;

6.3.2.3.3. When a Permittee does not respond to a NOV when a response was required by the RICS; or

6.3.2.3.4. For any other reason for which revocation is authorized by the RICS in coordination with AF/SG3P (i.e., any condition that would warrant refusal of a permit on an original application).

6.3.2.4. Cease and Desist Orders are issued by the RICS and may be used to stop an unauthorized activity that continues after being notified by the RICS that the activity has been deemed unauthorized.

6.3.2.5. Confirmatory Action Letters are issued by the RICS confirming a Permittee's agreement to take certain actions to eliminate significant concerns about health and safety, safeguards, or the environment.

6.3.2.6. Demands for Information are mandated requests of information from permittees or other persons for the purpose of enabling the RICS to determine whether an order or other enforcement action should be issued. Demands for Information may be issued by either the RIC or the RICS.

6.3.2.7. Other Orders: in addition to the Orders describe above, Orders may be issued to permittees that include but are not limited to:

6.3.2.7.1. Divert facility financial resources to purchase, replace, or excess and dispose of certain equipment;

6.3.2.7.2. Increase the frequency of facility safety committee meetings;

6.3.2.7.3. Implement meetings between the facility executive management and the RSO on a frequent and routine basis;

6.3.2.7.4. Perform additional or supplemental training to Permittee staff;

6.3.2.7.5. Increase frequencies of facility internal audits or other internal surveillance; and/or

6.3.2.7.6. Appear before the RIC to present corrective actions and associated implementation timelines.

6.3.3. Factors Impacting Escalated Enforcement Actions.

6.3.3.1. Initial Escalated Action: When the RICS is made aware of conditions or violations where escalated enforcement action may be necessary, deliberations are held to determine the severity level of the findings and factors that may affect that level. Serious findings will often include deliberations with the NRC. If it is established that a willful Severity Level III violation or problem has occurred, and the Permittee has not had any previous escalated actions (regardless of the activity area) during the past to (2) years or two (2) inspection cycles, whichever is longer, the RICS will consider whether the Permittee's corrective action for the noted violation or problem is reasonably prompt and comprehensive. The starting point of this period shall be considered the date when the Permittee was put on notice to take corrective action.

6.3.3.2. Credit for Actions Related to Identification: If a Severity Level I or II violation or a willful Severity Level III violation has occurred, or if, during the past two (2) years or two (2) inspection cycles, whichever is longer, and the Permittee has been issued at least one other escalated action, the escalated enforcement actions shall consider the factor of identification in addition to corrective action. The decision on identification requires considering all the circumstances of identification including:

6.3.3.2.1. Whether the problem requiring corrective action was AFIA/SG-identified, RICS-identified, Permittee-identified, or discovered through an event;

6.3.3.2.2. Whether prior opportunities existed to identify the problem requiring corrective action and if so, the age and number of those opportunities;

6.3.3.2.3. Whether the problem was discovered as the result of a Permittee's self-monitoring effort, such as conducting an audit, a test, a surveillance, a design review, or troubleshooting;

6.3.3.2.4. For a problem discovered through an event, the ease of discovery, and the degree of Permittee initiative in identifying the root cause of the problem and any associated violations;

6.3.3.2.5. For AFIA/SG identified issues, whether the Permittee would have likely identified the issue in the same time-period if the Agency had not been involved;

6.3.3.2.6. For AFIA/SG identified issues, whether the Permittee should have identified the issue (and taken action) earlier; and

6.3.3.2.7. For cases in which AFIA/SG identifies the overall problem requiring corrective action (i.e., a programmatic issue), the degree of Permittee initiative or lack of initiative in identifying the problem or problems requiring corrective action.

6.3.3.3. Prompt and Comprehensive Corrective Action is required for all MML violations. **(T-0).** In most cases, the RICS does not propose escalated enforcement actions where the Permittee promptly identifies and comprehensively corrects violations. However, a Severity Level III violation or higher will almost always result in escalated enforcement actions if a Permittee does not take prompt and comprehensive corrective actions to address the violation. The following factors are considered:

6.3.3.3.1. Timeliness and Extent of Corrective Action.

6.3.3.3.1.1. Consideration will be given to the:

6.3.3.3.1.1.1. Timeliness of the corrective action (including the promptness in developing the schedule for long term corrective action);

6.3.3.3.1.1.2. Adequacy of the Permittee's root cause analysis for the violation; and

6.3.3.3.1.1.3. Comprehensive nature of the corrective action (i.e., whether the action is focused narrowly to the specific violation or broadly to the general area of concern).

6.3.3.3.1.2. Whether or not the Permittee has taken immediate actions necessary, upon discovery of a violation, that will restore safety, and return the permit to full compliance; and

6.3.3.3.1.3. Whether or not the Permittee has developed and implemented lasting actions that will not only prevent recurrence of the violation, but will be comprehensive enough, given the significance and complexity of the violation, to prevent occurrence of violations with similar root causes.

6.3.3.3.2. Adequacy of Corrective Actions: AFIA/SG will assist the RICS to determine adequacy of correction actions to violations. The RICS shall determine the adequacy of corrective actions to violations that are self-identified, result from an event, or are MML identified. The judgment of the adequacy of corrective actions may also occur at the time of an enforcement conference (i.e., by outlining substantive additional areas where corrective action is needed).

6.3.3.3.3. Corrective Action Process: the following shall be used for developing and implementing corrective actions. Corrective action shall be comprehensive enough to not only prevent recurrence of the violation at issue, but also to prevent occurrence of similar violations. These items should help in focusing broad corrective actions to the general area of concern rather than to specific violations. The actions that need to be taken are dependent on the facts and circumstances of the particular case. The corrective action process should involve the following steps:

6.3.3.3.3.1. Conduct a complete and thorough review of the circumstances that led to the violation;

6.3.3.3.3.2. Identify the root cause of the violation; and

6.3.3.3.3.3. Take prompt and comprehensive corrective action that will address the immediate concerns and prevent recurrence of the violation.

6.3.4. Enforcement Conferences.

6.3.4.1. When a Permittee has been issued an NOV and fails to conform to effective corrective actions, the RICS may decide to initiate an enforcement conference with the Permittee to define the actions necessary to begin effective corrective measures to the violation. The RICS will issue official correspondence to the Permittee informing them of the enforcement conference. The enforcement conference can be implemented by any necessary means to affect a productive dialogue between the Permittee and the RICS.

6.3.4.2. The purpose of the conference is for the RICS to gather the necessary facts and information from the Permittee in order to make an informed decision about the violation. Objectives of the conference will include determining:

6.3.4.2.1. The root cause and analysis of the violation(s);

6.3.4.2.2. That a Permittee's response is deemed timely and appropriate; and

6.3.4.2.3. That corrective actions to prevent similar recurrence of the violation(s) have been taken.

6.3.4.3. Results of the enforcement conference will be formalized by the RICS with correspondence to the Permittee describing the actions the Permittee must perform to resolve the violation(s).

6.3.5. Appealing Enforcement Actions. The Permittee or any other person adversely affected by an NOV or Order may appeal said action. The Permittee may submit an appeal via official correspondence to the RICS for the violations and findings. The Permittee must provide ample regulatory justification in the correspondence to warrant an appeal of the violations. **(T-1).** The RICS shall review the appeal by the Permittee and decide actions to be taken based on the merit of the request, corrective actions taken by the Permittee, and the severity levels of the violations. The RICS may at its option, initiate a review of Permittee program operations concerning the enforcement action, grant the appeal to mitigate the severity level of the violation and/or enforcement actions, or deny the appeal.

6.3.6. NRC Related Administrative Actions. In addition to the enforcement actions by the RICS, the NRC also uses administrative actions, such as Notices of Violation, Notice of Deviation, Notices of Nonconformance, Confirmatory Action Letters, Letters of Reprimand, and Demands for Information to supplement its enforcement program. The NRC may issue orders and impose civil penalties for violations of NRC regulations and MML conditions. Note that any notice of violation involving radiological working conditions, proposed imposition of civil penalty, or order issued and any response must be posted by the Permittee in accordance with 10 CFR §19.11.

6.3.6.1. Civil Penalty: only the NRC may impose civil penalties. A civil penalty is a monetary penalty that may be imposed by the NRC for violation of certain specified licensing provisions of the Atomic Energy Act or supplementary NRC rules or orders, any requirement for which a MML permit or NRC license may be revoked, reporting requirements under Section 206 of the Energy Reorganization Act, and NRC Regulations and MML program conditions. If the application of the normal guidance in this policy does not result in an appropriate sanction, as warranted, then the NRC may apply its full enforcement authority where the action is warranted. NRC action may include civil penalties, issuing appropriate orders, and assessing civil penalties for continuing violations on a per day basis, up to the NRC limit per violation.

6.3.6.2. Mitigation of Enforcement Actions: the NRC may exercise discretion and refrain from enforcement action, if the outcome of the normal process described in this policy does not result in a sanction consistent with an appropriate regulatory message. In addition, even if the NRC exercises this discretion, when the Permittee failed to make a required report to AFIA/SG or the RICS, a separate enforcement action may be issued for the Permittee's failure to make a required report.

6.3.7. Enforcement Actions Involving Individuals. An enforcement action against an individual will be taken only when the RICS is satisfied that the individual fully understood, or should have understood, his or her responsibility; knew, or should have known, the required actions; and knowingly, or with careless disregard (i.e., with more than mere negligence) failed to take required actions which have actual or potential safety significance. Transgressions of individuals at the level of Severity Level III or IV violations will be handled by citing the facility Permittee with a requirement that specific actions concerning the individual be taken.

6.3.7.1. Management Failures: action against an individual will not be taken if it demonstrates that the improper action by the individual was caused by management failures. The following are examples of situations to illustrate this concept but do not represent all potential cases:

6.3.7.1.1. Inadvertent individual mistakes resulting from inadequate training or guidance provided by the Permittee;

6.3.7.1.2. Inadvertently missing an insignificant procedural requirement when the action is routine, fairly uncomplicated, and there is no unusual circumstance indicating that the procedures should be referred to and followed step-by-step;

6.3.7.1.3. Compliance with an express direction of management that resulted in a violation unless the individual did not express his or her concern or objection to the direction; or

6.3.7.1.4. Individual error directly resulting from following the technical advice of an expert (e.g., advisor or subcontractor) unless the advice was clearly unreasonable and the permitted individual should have recognized it as such.

6.3.8. Willful Violations and Actions of Individuals. This paragraph applies if the actions described in these examples are taken by Permittee authorized individuals or otherwise taken deliberately by an individual working under permitted activities. The RICS will promptly report all suspected deliberate violations of NRC requirements to NRC Region IV office. RIC enforcement action may consist of requiring actions be taken directly toward the individual. The RIC may address immediate and ongoing safety issues as well as initiate an investigation into suspected deliberate violations unless directed otherwise by the NRC. In addition, the Permittee or other personnel may report willful violations to AF investigative or legal agencies. Listed below are examples of situations that could result in enforcement actions against individuals.

6.3.8.1. The situations include, but are not limited to, violations that involve:

6.3.8.1.1. Willfully causing a Permittee to be in violation of permit requirements;

6.3.8.1.2. Willfully taking action that would have caused a Permittee to be in violation of requirements but the consequence(s) of the action did not occur because it was detected and corrective action was taken;

6.3.8.1.3. Recognizing a violation of procedural requirements and willfully not taking corrective action.

6.3.8.1.4. Willfully defeating alarms and/or interlocks that have safety significance;

6.3.8.1.5. Dereliction of duty;

6.3.8.1.6. Falsifying records required by MML requirements or by the Permittee;

6.3.8.1.7. Willfully providing, or causing a Permittee to provide, an Inspection Agency inspector with inaccurate or incomplete information on a matter material to the radiation protection program; or

6.3.8.1.8. Willfully withholding safety significant information rather than making such information known and available to appropriate supervisory or technical personnel in the Permittee's organization.

6.3.8.2. Factors in Deciding Enforcement Actions: In its determination of whether to issue requirements that actions be taken concerning an individual, the following factors will be considered:

6.3.8.2.1. The level of the individual within the organization;

6.3.8.2.2. The individual's training and experience as well as knowledge of the potential consequences of the misconduct;

6.3.8.2.3. The safety consequences of the misconduct;

6.3.8.2.4. The degree of supervision of the individual, i.e., how closely is the individual monitored or audited and the likelihood of detection;

6.3.8.2.5. The employer's response, (e.g., disciplinary action taken);

6.3.8.2.6. The attitude of the offender (e.g., admission of misconduct, acceptance of responsibility);

6.3.8.2.7. The degree of management responsibility or culpability; and

6.3.8.2.8. Who identified the misconduct.

6.3.8.3. Types of Enforcement Actions: any proposed enforcement action against individuals must be issued by the RICS. The particular sanction to be used should be determined on a case-by-case basis. Notices of Violation and Orders are examples of enforcement actions that may be appropriate involving individuals. Orders involving individuals might include provisions that would:

6.3.8.3.1. Prohibit involvement in MML permitted activities for a specified period of time (normally the period of suspension would not exceed five (5) years) or indefinitely until certain conditions are satisfied (e.g., completing specified training or meeting certain qualifications); or

6.3.8.3.2. Require retraining, additional oversight or independent verification of activities performed by the person, if the person is to be involved in permitted activities.

6.3.8.4. Disciplinary Enforcement: adverse personnel actions and other disciplinary actions are the responsibility of the organization to which the individual to be disciplined belongs. Discretion may be exercised by either escalating or mitigating enforcement action to ensure that the proposed enforcement action reflects the Inspection Agency and the RICS concerns regarding the violation(s) at issue and that it conveys the appropriate message to the Permittee.

6.3.9. Violations of Reporting Requirements or Submitting False Information.

6.3.9.1. Reporting: permittees are expected to provide complete, accurate, and timely information and reports when required. **(T-1).** A Permittee will not usually be cited for a failure to report a condition or event unless the Permittee was actually aware of the condition or event that it failed to report. A Permittee will, on the other hand, usually be cited for a failure to report a condition or event if the Permittee knew of the information to be reported, but did not recognize the reporting requirements.

6.3.9.2. Inaccurate and Incomplete Information: a violation of MML requirements involving submittal of incomplete and/or inaccurate information can result in the full range of enforcement actions.

6.3.9.2.1. Identification of false information. The labeling of a communication failure as a material false statement will be made on a case-by-case basis and will be reserved for egregious violations. Violations involving inaccurate or incomplete information or the failure to provide significant information identified by a Permittee will be categorized based on:

6.3.9.2.1.1. The degree of knowledge that the communicator should have had, regarding the matter, in view of his or her position, training, and experience;

6.3.9.2.1.2. The opportunity and time available prior to the communication to assure the accuracy or completeness of the information;

6.3.9.2.1.3. The degree of intent or negligence, if any, involved;

6.3.9.2.1.4. The formality of the communication;

6.3.9.2.1.5. The importance of the information which was wrong or not provided;

6.3.9.2.1.6. The rationale of the explanation for not providing complete and accurate information;

6.3.9.2.1.7. Efforts taken to correct information that is later identified as false or incomplete; and/or

6.3.9.2.1.8. Failures to correct false or incomplete information.

Chapter 7

MANAGING ALLEGATIONS

7.1. Introduction. All Permittee employees are required to be aware of NRC Form 3, *Notice to Employees*, which must be posted for all employees to view, and their right to make an allegation (10 CFR Part 19). **(T-0).** Allegations will be investigated and reported in accordance with NRC Management Directive 8.8, *Management of Allegations*. It is the responsibility of employees to immediately identify conditions contrary to this and to work within an organization's resources to obtain corrective action. **(T-1).** If such cannot be accomplished due to a threatening environment, limitation of resources or unwillingness of management, an allegation can be made at any level, anytime, among the following hierarchy:

7.1.1. Supervisors;

7.1.2. PRSOs or IRSOs;

7.1.3. Commanders;

7.1.4. Inspector General;

7.1.5. USAF Radioisotope Committee Secretariat;

7.1.6. USAF Radioisotope Committee;

7.1.7. US Nuclear Regulatory Commission: although it is customary, and encouraged, for employees to use their supervisory chain to seek expedient resolution of problems at the lowest level, this is not mandatory. Anonymous allegations can be made; however, resolution may be impacted by quality of information received.

7.2. Reporting Allegations. Allegations containing the following information can be processed most effectively.

7.2.1. Name, occupation and contact information of person making the allegation;

7.2.2. Date and description of issue;

7.2.3. Individuals involved and witnesses;

7.2.4. Outcome and Consequences;

7.2.5. Details of previous reports, including who received them;

7.2.6. Any corrective actions to date; and

7.2.7. Expectations.

7.3. RICS Handling of Allegations.

7.3.1. In the event the RICS receives an allegation, the following measures will be taken:

7.3.1.1. If the allegation is against the RICS, it will be immediately referred to the appropriate NRC Regional Office for disposition and AF/SG3/5 shall be informed.

7.3.1.2. If the allegation is not against the RICS, the appropriate NRC Regional Office will be notified. A brief written report, provided by the individual making the allegation will be forwarded to AFMSA/SG3PB for review and determination of the main merits of

investigating the allegation. The allegation will then be presented to the Chief, RICS, and, if deemed necessary, an Allegation Review Board (ARB) will be formed to conduct an investigation. (MML)

7.3.2. The ARB will be comprised of the following representatives:

7.3.2.1. Chair, RIC (will serve as the Chair, ARB);

7.3.2.2. Chief, RICS (RIC member);

7.3.2.3. Member of the affected MAJCOM, Senior Health Physicist or Bioenvironmental Engineer;

7.3.2.4. AFIA/SGI (RIC member);

7.3.2.5. Officer within the affected unit; and

7.3.2.6. AFLOA/JAC (RIC member).

7.3.3. The ARB should document the allegation investigation in an inspection report. It is important that the inspection reports protect the identity of the individual(s) making the allegation(s) and not provide any information in the report that may reveal his/her identity. The inspection report should not contain any detailed information of the inspection that would correlate the inspection to an allegation. The inspection report findings should be included in the allegation file for the respective allegation case for final resolution by the RIC.

7.3.4. Once determined adequate by the RIC/JA, the ARB will provide a final allegation investigation report and recommended course(s) of action to the RIC. An allegation involving a health or safety issue will have a higher priority.

7.3.5. All suspected deliberate violations of NRC requirements involving immediate and ongoing safety issues will be reported to the appropriate NRC Regional Office for disposition by the RIC. Concurrently, an immediate investigation may be conducted by the supervisors; PRSOs or IRSOs; Commanders; Inspector General; RICS; RIC; or ARB, as appropriate.

7.4. Protecting the Identity of Individuals Making Allegations. The name of the individual(s) making the allegation(s) and other identifying information which could potentially identify the individual(s) will not be used in discussions of allegations or documents released to the Permittee or members of the public related to the allegation. The identity of the individual(s) will be protected, and the Inspection Agency will not advise a Permittee that an inspection is based on an allegation. Exceptions to this policy include:

7.4.1. The circumstance where the individual has no objection to the release of his/her identity and is documented in the allegation file;

7.4.2. Communications within and between the RIC, RIC Secretariat, the NRC, the AF Inspection Agency, and other parties that require knowledge of this identity to properly manage the allegation; or

7.4.3. The circumstance where such protection would impact worker health and safety.

7.5. Maintenance of Allegation Files. The RICS maintains the official file of all information pertaining to each allegation. It is important that the RICS and RIC members assure there is no unauthorized reproduction of information related to an allegation. Copies of allegation files may

be made following approval by the AFMSA/SG3P case representative and maintained appropriately. All copies made of an allegation file must be returned to the file or destroyed.

7.6. Allegation Information in Inspection Reports. The investigation into the allegation should be documented in an inspection report. It is important that the inspection reports protect the identity of the individual(s) making the allegation(s) and not provide any information in the report that may reveal his/her identity. The inspection report should not contain any detailed information of the inspection that would correlate the inspection to an allegation. The inspection report findings should be included in the allegation file for the respective allegation case for final resolution by the RIC.

7.7. Resolution of Allegations. The RIC will review all allegations received. Once all of the necessary information related to the allegation has been collected, the RIC will review the allegation file to determine if any further actions are required before a final decision is made. If any findings of an allegation investigation are in violation of the regulations, then the severity level of the violation will determine the response by the RIC to the command as described in the Enforcement Policy, **paragraph 6.3**.

7.8. Allegation Close-Out Report. Once the final disposition of an allegation is approved by the RIC, a formal response and close-out report of the RIC findings will be forwarded to the individual(s) who made the allegation by the RICS. If the individual(s) does/do not agree with the findings of the RIC, then the individual(s) may appeal the findings of the RIC with any additional information necessary to support the appeal of the final allegation findings.

7.9. Allegation to the NRC. Nothing in this manual prevents an individual from making an allegation directly to the NRC, particularly as it pertains to allegations levied against the RICS. The AF IG can provide assistance.

Chapter 8

RADIOISOTOPE COMMITTEE PROTOCOL

8.1. USAF Radioisotope Committee (RIC) Charter. The RIC is responsible for providing regulatory oversight for the use of radioactive material (RAM) by USAF organizations except weapons related materials falling under AEA Section 91. The RIC approves controls for acquiring, receiving, storing, distributing, using, transferring, and disposing of RAM to ensure compliance with the USAF Master Materials License, NRC policy and guidance, other applicable regulatory requirements, and DoD and USAF directives, instructions, and manuals.

8.2. RIC Committee Members, Organization, and Responsibilities.

8.2.1. **Chapter 2** of this manual specifies the membership and general roles for each member of the RIC. At the request of the RICS or the RIC Chairman, additional advisors can be invited.

8.2.2. RIC Secretariat (RICS): Organization, scheduling and planning of the RIC meeting, and generation of meeting minutes.

8.2.3. RIC Chair: Open RIC meetings, and preside over their proceedings. Assist in maintaining the discussion focus of the agenda items, and resolve disagreements. Adjourn meeting once completed.

8.2.4. RIC Members: Ensure either they or their alternates attend scheduled RIC meetings and are prepared to address agenda items.

8.3. Business Practices.

8.3.1. The RIC Chair and the RICS will establish the detailed procedures for RIC meetings. In all cases, the meetings will meet the requirements of the USAF MML and other USAF requirements for meetings of this type.

8.3.1.1. In accordance with MML requirements, a formal RIC meeting shall occur as represented to and agreed upon by the AF and NRC. RIC meetings are schedule by the RICS.

8.3.1.2. Ad hoc meetings can be called by the RIC Chair on an as needed basis. These meetings are called to address emergent issues that require timely action by the RIC.

8.3.1.3. Rapid staffing of an action can be approved by the RIC Chair to address emergent issues for which an ad hoc meeting cannot be convened. For a rapid staffing the RICS will prepare a staffing package that addresses the issue and provides the voting members of the RIC the ability to vote without meeting. All rapid staffing actions will be discussed at the next RIC meeting.

8.3.1.4. A quorum for a meeting is established by having at least one-half of the voting members present.

8.3.2. Meetings will be conducted in accordance with all applicable policies and procedures. The RIC Chair and the RICS will establish the specific procedures for the conduct of routine meetings, ad hoc meetings and rapid-staffing actions.

8.3.3. Motions and Voting.

8.3.3.1. Only members and guests recognized by the Chair may speak.

8.3.3.2. Only voting members may vote on an issue.

8.3.3.3. Generally, before any item can be discussed, there should be a motion made and seconded. Once a motion has been seconded, discussion will follow. After discussion, one of four things can happen:

8.3.3.3.1. There can be a vote on the motion. In the event of a tie, the Chair casts the deciding vote; or

8.3.3.3.2. The motion can be amended (second required). Then there can be discussion on the amendment. The amendment can be voted. If the amendment passes, the motion automatically passes. If the amendment fails, the motion still stands and can be discussed until voted; or

8.3.3.3.3. The motion can be tabled (second required). There can be no discussion on a motion to table--a vote must be taken immediately. If the vote is to table, no further discussion can take place on the motion; or

8.3.3.3.4. There may be no action on the motion--therefore it becomes old business at a future meeting.

8.3.3.4. Motions must be clear and concise. A motion to "improve permitting practices" would be vague and discussions could meander. However, a motion to "implement template permit processes for a new chemical agent monitor" is specific and could be effectively discussed and acted on.

8.4. Disagreement Resolution. The RIC Chair is responsible for maintaining order. On procedural questions, the Chair's ruling will be final.

8.5. Record Keeping.

8.5.1. The RICS will ensure that appropriate files for each meeting are maintained in accordance with all applicable requirements. This will include as a minimum, the agenda, meeting minutes, copy of all pertinent reference materials, background information, memoranda, standing reports, and presentations applicable to each meeting.

8.5.2. RICS will maintain correspondence, permit actions, Notices of Violations (NOVs) or enforcement actions, and other applicable materials during the quarter to ensure a complete agenda.

8.5.3. Records of RIC meetings, to include agendas, presentations, and meeting minutes, shall be kept for the duration of existence of the MML.

DOROTHOY A. HOGG
Lieutenant General, USAF, NC
Surgeon General

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFPD 40-2, *Radioactive Materials (Non-Nuclear Weapons)*, 12 Jan 15

5 U.S.C. Section §552a, *Privacy Act of 1974*

10 CFR §20.2106, *Records of Individual Monitoring Results*

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10 CFR §30.15, *Certain Items Containing Byproduct Material*

10 CFR §30.19, *Self-luminous Products Containing Tritium, Krypton-85, or Promethium-147*

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10 CFR §20.2006, *Transfer Disposal and Manifests*

10 CFR §20.2002, *Method for Obtaining Approval of Proposed Disposal Procedures*

10 CFR §20.2108, *Records of Waste Disposal*

10 CFR Part 61, *Licensing Requirement for Land Disposal of Radioactive Waste*

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5 U.S.C., Chapter 5, *Administrative Procedure*

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Prescribed Forms

None

Adopted Forms

AF Form 847, *Recommendation for Change of Publication*

AF Form 1297, *Temporary Issue Receipt*

DOE/NRC Form 741, *Nuclear Material Transaction Report*

NRC Form 3, *Notice to Employees*

NRC Form 241, *Report of Proposed Activities in Non-Agreement States, Areas of Exclusive Jurisdiction or Offshore Waters*

NRC Form 313, *Application for Materials License*

NRC Form 314, *Certificate of Disposition of Materials*

Abbreviations and Acronyms

AEA—Atomic Energy Act of 1954, as amended

AF—Air Force

AFCEC—Air Force Civil Engineering Center

AFI—Air Force Instruction

AFIA—Air Force Inspection Agency

AFJI—Air Force Joint Instruction

AFJM—Air Force Joint Manual

AFMAN—Air Force Manual

AFMSA—Air Force Medical Support Agency

AFPD—Air Force Policy Directive

AFRRAD—Air Force Radioactive Recycling and Disposal Office

AFSEC—Air Force Safety Center

ALARA—As Low As is Reasonably Achievable

CERCLA—Comprehensive Environmental Response, Compensation, and Liability Act

CFR—Code of Federal Regulations

DoD—Department of Defense

DOE—Department of Energy

DTR—Defense Transportation Regulation

EPA—Environmental Protection Agency

EPCRA—Emergency Planning and Community-Right-To-Know-Act

ESOHC—Environmental, Safety, and Occupational Health Council

GLD—Generally Licensed Device

HAZMAT—Hazardous Material

IAEA—International Atomic Energy Agency

IATA—International Air Transport Association

IRSO—Installation Radiation Safety Officer

LLMW—Low Level Mixed Waste

LLRW—Low Level Radioactive Waste

MAJCOM—Major Command

MML—Master Materials License

MW—Mixed Waste

NARM—Naturally Occurring or Accelerator Produced RAM

NOV—Notice of Violation

NRC—Nuclear Regulatory Commission

NSN—National Stock Number

PRSC—Permit Radiation Safety Committee

PRSO—Permit Radiation Safety Officer

RAM—Radioactive Material(s)

RAMMIS—Radioactive Materials Management Information System

RCRA—Resource Conservation and Recovery Act

RIC—Radioisotope Committee

RICS—Radioisotope Committee Secretariat

RPM—Remedial Project Manager

RSC—Radiation Safety Committee

RSO—Radiation Safety Officer

RWS—Radioactive Waste Sites

SNM—Special Nuclear Material

SSDR—Sealed Source and Device Registry

USAF—United States Air Force

USAFSAM—United States Air Force School of Aerospace Medicine

U.S.C.—United States Code

Terms

91(a) Material—RAM exempted from NRC licensing controls under Section 91(a) of the AEA of 1954, as amended, in the interest of national defense, under the possession of the DOE.

91(b) Material—RAM exempted from NRC licensing controls under Section 91(b) of the AEA of 1954, as amended, in the interest of national defense, under the possession of the DoD. These include materials in nuclear weapons.

Accelerator Produced Radioactive Material—RAM produced as the result of operating a particle accelerator.

Agreement State—Any state, territory, or possession of the US that, by agreement with the NRC, has assumed regulatory authority over byproduct, source, and certain small quantities of SNM.

Allegation—Declaration, statement or assertion of impropriety or inadequacy associated with NRC or USAF regulated activities, the validity of which has not been established.

Alternate Permit Radiation Safety Officer—A person, named on the USAF RAM Permit, who is qualified by education or training, to act as PRSO when the primary PRSO is absent. Unless otherwise requested by the Permittee, the alternate PRSO becomes the primary PRSO when the named primary PRSO leaves the organization.

Annual—Recurring, done, or performed every year (i.e., every 12 months) at intervals not to exceed 1 year; or, once per year, at about the same time each year, plus or minus one calendar month.

As Low As is Reasonably Achievable (ALARA)—In accordance with the US Nuclear Regulatory Commission (NRC), ALARA means making every reasonable effort to maintain exposures to ionizing radiation as far below the dose limits as practical, consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest.

Authorized User—For non-medical permits, authorized users are approved by the RSC or in the absence of an RSC, the RICS based on a review of qualifications, or by the Permittee if authorized by a permit condition. For medical permits, in accordance with 10 CFR §35.2: a physician, dentist or podiatrist who meets the requirements in 10 CFR §35.59, and §35.190(a), §35.290(a), §35.390(a), §35.392(a), §35.394(a), §35.490(a), §35.590(a) or §35.690(a), and is an authorized user as specified on a USAF RAM permit.

Byproduct Material—RAM (except source or SNM) yielded in, or made radioactive by, exposure to the radiation incident to the process of producing or using source or SNM. The definition of byproduct material has changed with the Energy Policy Act of 2005 to include some forms of naturally occurring or accelerator produced RAM (reference AFPD 40-2).

Exclusive Federal Jurisdiction—Property under the exclusive control or ownership of the Federal government that has been ceded legislative power by the state or has had such power reserved from grants to the states.

General License—The NRC and/or an Agreement State issues a general license for individuals to acquire and use specific devices that have been manufactured and distributed according to the specifications approved by the NRC or the Agreement State. Individuals do not need to apply for this license; it is inherent in the distribution of the device. However, they must comply with the requirements for labeling, instructions for use, and proper storage or disposition of the device in accordance with 10 CFR §31.5.

Incident—For purpose of this manual, any event involving radioactive material that is not defined as a mishap, and that may result in adverse public reaction. This includes weather-induced events, attacks against sensitive information, or spontaneous/unforeseen failures of equipment or material.

Items—Instruments, manufactured articles or major end items constructed of or having RAM as a component part, often assigned a NSN, normally procured, stored and distributed through USAF and Department of Defense logistical supply systems. Items include but are not limited to such devices as chemical agent detectors/monitors, radiation detector sets, lensatic/military compasses, dials, and gauges. Items are not considered to include any loose RAM, radioactive contamination on other materials or in soil, or any material exhumed from a radioactive burial site.

License—Written authorization from the NRC or an Agreement State to acquire, receive, use, store or transfer byproduct, source, or SNM. Licenses will be either (1) General License published in NRC or Agreement State Regulations, that is effective without any need to send an application to, or that is effective to any applicant on registration with, the NRC or an Agreement State or (2)

Specific License issued by the NRC or Agreement State to a named applicant who has filed an application authorizing acquisition, ownership, receipt, storage, use, transfer, and disposal of chemical or physical forms of radioisotopes specified in the license. This license has an expiration date renewable on application to the issuing authority. The license may be limited in scope (authorizing only certain specific radioisotopes for limited users) or broad (authorizing the use of a wide variety of radioisotopes without regard to form, quantity, or use).

Licensee—Individual who holds a an NRC or Agreement State radioactive material license.

Medical Event—Any event that meets the criteria of 10 CFR §35.3045(a).

Mishap—For purposes of this manual, a mishap is defined in AFI 91-202, *The U.S. Air Force Mishap Prevention Program*. An event involving human acts of omission or commission involving a nuclear reactor, radioisotope power system, or radioactive material resulting in any of the following: (A) A loss of control of radioactive material that presents a hazard to life, health, or property. This includes loss of control that may result in any person in exceeding federal limits. (B) Any unexpected event involving radioactive materials or radiation exposure that is serious enough to warrant the interest or action of officials or agencies outside the Air Force. This includes any event: having domestic or international implications, those that may cause inquiries by the public or press, and those requiring immediate notification to the Nuclear Regulatory Commission under federal regulations.

NUREG—Technical reports on various topics related to the regulation of nuclear energy published by Nuclear Regulatory Commission; NUREG is not an acronym but a term used by the Nuclear Regulatory Commission as a label for a series of technical reports.

Naturally Occurring and Accelerator Produced Radioactive Material (NARM)—Discrete sources of radium-226 or material made radioactive by use of a particle accelerator that is produced for use by commercial, medical or research activities. Examples include fluoride-18, cobalt-57, and iodine-123. Also included is any discrete source of naturally occurring RAM (other than source material) that the NRC determines could pose a threat to public health or security.

Nuclear Reactor—A facility using fissile materials in a self-supporting chain reaction (nuclear fission) to produce heat or radiation for both practical applications and research and development.

Nuclear Regulatory Commission (NRC)—An agency established by Title II of the Energy Reorganization Act of 1974 (Public Law 93-438) to regulate byproduct, source, and SNM as provided for by the Atomic Energy Act of 1954, as amended. Within the NRC, final authority rests with the five member Commission acting as a body.

Particle Accelerator—A device that accelerates electrically charged particles to high velocities, for the purpose of inducing high energy reactions or producing high energy radiation.

Permit—Shortened term for written authorization from an appropriate authority for Air Force organizations to receive, possess, distribute, use, transfer, or dispose of radioactive materials. See also Air Force Radioactive Material Permit.

Permittee—The Commander, civilian equivalent or designated representative of a USAF organization that is responsible for and controls the radiation safety program for RAM covered by this manual and has the authority to provide the resources necessary to achieve regulatory compliance.

Radiation Safety Committee—A group of individuals appointed by a Permittee to oversee all uses of permitted byproduct material. The Radiation Safety Committee (RSC) must include an authorized user of each type of use permitted, the RSO(s), a representative of the nursing service (for medical RSCs only), and a representative of management who is neither an authorized user nor an RSO. RSCs may include other members the licensee considers appropriate.

Radiation Safety Officer—An individual with specific education, training, and professional experience in radiation protection practice appointed by a Permittee or the USAF Radioisotope Committee to manage radiation safety programs. The term "Radiation Safety Officer" is a functional title and does not denote a commissioned status or specialty code. The RSO must have the education, training, and professional experience needed for the job. Take care when addressing RSO qualifications and duties to distinguish between IRSO and PRSOs. Individuals appointed as the IRSO might not always have the specific technical experience and training needed to qualify as the PRSO. See **Chapter 3** for RSO training requirements in the USAF.

Radiation Worker—An individual engaged in activities licensed or regulated by the NRC (or RIC) and controlled by a licensee (or Permittee) or regulated entity, but does not include the licensee (or Permittee) or regulated entity, in accordance with 10 CFR Part 19.

Radioactive Item—A single unit or article constructed of or having RAM, greater than exempt quantities, as a component part.

Radioactive Material (RAM)—Material with nuclei, because of their unstable nature, that decay by emission of ionizing radiation. The radiation emitted may be alpha particles, beta particles, gamma rays, X-rays, or neutrons.

Radioactive Material Management Information System (RAMMIS)—An online database used to maintain NRC compliance by allowing users to manage and inventory all permitted and generally licensed USAF radioactive materials.

Radioactive Waste—Waste that contains RAM. Radioactive waste can be generally classed in one of four categories:

Radioactive Waste: High-Level Radioactive Waste—Spent nuclear fuel from nuclear power plants and waste material from reprocessing spent nuclear fuel.

Radioactive Waste: Low-level Radioactive Waste (LLRW)—LLRW is any radioactive waste that is not High-Level Radioactive Waste, uranium tailings, or transuranic waste.

Radioactive Waste: Mixed Waste—A waste that contains both hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) and source, special nuclear or byproduct material subject to the Atomic Energy Act of 1954, as amended.

Radioactive Waste: Transuranic Waste—Waste material that contains transuranic elements with half-lives greater than 20 years and concentrations greater than 100 nanoCuries per gram. A transuranic is an element with an atomic number greater than 92 (e.g., plutonium, americium, and curium).

Radionuclide—An unstable isotope of an element that decays or disintegrates spontaneously, thereby emitting radiation.

Restricted Area—For this manual, a restricted area is an area having access limited to protect individuals against undue risk from exposure to radiation and RAM. Restricted area does not

include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area.

Requiring Activities—For this manual, organization charged with meeting a mission and delivering requirements; responsible for obtaining funding or developing the program objective memorandum and may also be responsible for written requirement or statement of need for services; provides trained and qualified Contracting Officer's Representative to monitor contractor performance.

Source Material—Uranium or thorium or any combination thereof in any physical or chemical form; or ores that have, by weight, one-twentieth of 1 percent (0.05 percent) or more of uranium, thorium, or any combination thereof. Source material does not include SNM.

Specifically Licensed Material—RAM controlled by a specific NRC or Agreement State license; or a USAF, US Navy, or Veterans Affairs permit.

Special Nuclear Material (SNM)—Plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235; any other material that the NRC determines to be SNM and any material artificially enriched by the foregoing. SNM does not include source material.

Unrestricted Area—For this manual, an unrestricted area is any area access to which is not controlled by the Permittee. Generally, it is an area that is accessible to a person who is not trained to work with RAM or accessible to a member of the public.

USAF Master Materials License (MML)—The single Nuclear Regulatory Commission license issued to the United States Air Force and managed by the Air Force Radioisotope Committee.

USAF Radioactive Material Permit—Written authorization from the Air Force Radioisotope Committee for Air Force organizations to receive, possess, distribute, use, transfer, or dispose of radioactive materials.

USAF Radioisotope Committee (RIC)—A committee established to satisfy the requirements of with the Air Force master materials license to coordinate the administrative and regulatory aspects of licensing, possessing, distributing, using, transferring, transporting and disposing of all radioactive material in the Air Force except that transferred from Department of Energy to the Department of Defense in nuclear weapon systems, certain radioactive components of weapons systems and nuclear reactor systems, components and fuel controlled under Section 91 of the Atomic Energy Act of 1954, as amended.

USAF Radioisotope Committee Secretariat (RICS)—The office providing day-to-day management of USAF permitting activities under the purview of the USAF MML. The Secretariat generally comprises members from the Radiation Health function of AFMSA/SG3PB.

United States School of Aerospace Medicine (USAFSAM)—An organization, belonging to the 711th Human Performance Wing, who mission's include, relative to this AFMAN: The Air Force Dosimetry Center, a radioanalytical lab, and health physics consultants.

User—For this manual, a user is (1) An organization authorized by a USAF RAM Permit to have and use RAM, or (2) A person specifically named on a USAF RAM Permit as authorized to handle or to supervise handling RAM listed on the permit, or (3) A person named in a permit condition by a radiation safety committee with local approval authority to handle or supervise the handling of RAM listed on the permit. Also see Authorized User.

Written Directive—An authorized user's record written order for the administration of byproduct material or radiation from byproduct material to a specific patient or human research subject, as specified in 10 §CFR 35.40. An order must be in writing for a specific patient, dated and signed by an authorized user before the administration of iodine-131 greater than 30 microCuries, any therapeutic dosage of unsealed byproduct material or any therapeutic dose of radiation from byproduct material in accordance with 10 CFR §35.40.

BY ORDER OF THE SECRETARY OF THE AIR FORCE

AIR FORCE MANUAL 48-148

20 JULY 2020

Aerospace Medicine

IONIZING RADIATION PROTECTION

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This manual implements Air Force Policy Directive (AFPD) 48-1, *Aerospace & Operational Medicine Enterprise*. This manual applies to all civilian employees and uniformed members of the Regular Air Force, Air Force Reserve and Air National Guard. It also applies to all tenants of Air Force controlled property, including Department of Energy personnel, in accordance with host-tenant support agreements, and Air Force contractors where specified herein and when required by the terms of their contracts. **See paragraph 1.2** for additional applicability. This manual specifies the requirements for the protection of Air Force (AF) personnel and the public from exposure to ionizing radiation resulting from AF activities. It defines responsibilities for the protection, monitoring and medical follow-up of military personnel for the full spectrum of military operations. This manual requires the collection and/or maintenance of information protected by the Title 5 United States Code (U.S.C.) Section 552a, *Privacy Act of 1974*, authorized by Title 10 Code of Federal Regulations (CFR), Section 20.2106, *Records of Individual Monitoring Results* and Title 29 CFR Section 1910.1096(b), *Exposure of Individuals to Radiation in Restricted Areas*, Title 29 CFR Section 1910.1096(n), *Record*s, and Title 29 CFR Section 1910.1096(o), *Disclosure to Former Employee of Individual Employee's Record.* The applicable system of records notice (SORN) F044 AF SG O, *United States Air Force Master Radiation Exposure Registry* is available at: **http://dpclo.defense.gov/Privacy/SORNs.aspx**. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Instruction (AFI) 33-322, *Management of Records and Information Governance Program*, and disposed of in accordance with the Air Force Records Disposition Schedule in the Air Force Records Information Management System. Refer recommended changes and questions about this publication to the Office of Primary Responsibility using the AF Form 847, *Recommendation for Change of Publication*; route AF

Forms 847 from the field through the appropriate functional chain of command to the Air Force Medical Readiness Agency (AFMRA)/Bioenvironmental Engineering Division, 7700 Arlington Blvd., Falls Church, VA 22041. This publication may be supplemented at any level, but all supplements must be routed to the OPR of this publication for coordination prior to certification and approval. The authorities to waive wing and unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See AFI 33-360, *Publications and Forms Management*, for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the requestor's commander for non-tiered compliance items. Compliance with the attachment in this publication is mandatory

SUMMARY OF CHANGES

This document has converted from an AFI to a manual; it has been substantially revised and must be completely reviewed. The document has been streamlined, revised, and updated. Major changes include radon policy revision, updated training requirements, revised clearance criteria, and updated local policy requirements.

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Chapter 1

PROGRAM OVERVIEW

1.1. Overview. This manual addresses the hazards associated with exposure to ionizing radiation, regardless of source, and specifies requirements to keep exposures as low as reasonably achievable (ALARA). It outlines ionizing radiation protection roles and responsibilities for all ionizing radiation threats including those encountered by nuclear capable units and weapons storage areas unless stated otherwise in Department of Defense (DoD) publications or AF 91-series publications. This manual should be read in conjunction with Air Force Manual (AFMAN) 40-201, *Radioactive Materials (RAM) Management*, AFMAN 48-125, *Personnel Ionizing Radiation Dosimetry* and AFI 91-108, *Air Force Nuclear Weapons Intrinsic Radiation and 91(b) Radioactive Material Safety Program*. Specific AF requirements for nuclear weapons and the AF Radioisotope Committee regulated RAM, are found in AFI 91-108 and AFMAN 40-201, respectively.

1.2. Applicability. The requirements outlined in this manual apply to all AF, or AF-led, installations with operations that involve:

1.2.1. Possession or use of RAM as specified in AFMAN 40-201 and AFI 91-108.

1.2.2. Possession or use of radiation producing devices including situations where emissions are incidental to use.

1.2.3. Use of RAM or radiation producing devices by contractors, as specified by contract. **Note:** Contractors are solely responsible for the health and safety of their employees in accordance with Occupational and Safety Health Administration and/or Nuclear Regulatory Commission requirements, to include ionizing radiation, unless otherwise specified by the contract. This manual does not prohibit providing workplace sampling and survey information to contractors, based on local arrangements or in order to determine AF personnel and public exposures from contractor activities.

1.2.4. Doses resulting from planned, emergency, or existing exposures.

1.3. Requirements Outlined. The requirements outlined in this manual apply at Air Force installations overseas, including deployed locations, so long as the requirements do not conflict with applicable provisions from any of the following: international agreements, the Overseas Environmental Baseline Guidance Document, country-specific final governing standards, geographic combatant command policy, and environmental annexes to operational orders, operational plans or other operational directive.

1.4. Objectives of the AF Radiation Protection Program.

1.4.1. Prevent radiation exposures that would result in deterministic effects (i.e., cataracts, skin erythema).

1.4.2. Limit the risk of stochastic effects (e.g., cancer and leukemia) for which the probability of occurrence is proportional to dose.

1.4.3. Ensure radiation workers are properly trained on the risks of radiation and methods to minimize exposure.

1.4.4. Assess health risks, recommend and implement controls, and document exposures to ionizing radiation.

1.5. Planned, Emergency, and Existing Exposures. For the purposes of radiation protection, there are three broad categories of exposure: planned, emergency, and existing.

1.5.1. Radiation Protection Policy for Planned Exposure. This manual considers all AF activities involving the routine use of radiation producing devices or RAM in medicine, research, industry and training to be planned exposures. In addition to occupational exposures, medical exposures of patients also fall within the "planned" category for radiation protection purposes.

1.5.1.1. Examples of planned exposures. Common practices resulting in potential occupational exposures include, but are not limited to: industrial radiography, depleted uranium munitions handling, research involving nuclear materials or radiation producing devices, soil density testing, diagnostic radiology, nuclear medicine, radiation therapy and activities involving maintenance of nuclear weapon systems.

1.5.1.2. Justification: Any proposed activity causing exposure to persons should yield a sufficient benefit to society, the individual (for medical exposures), or the military to justify the risks incurred by the radiation exposure.

1.5.1.3. Optimization: The magnitude of individual doses and the number of people exposed shall be kept ALARA.

1.5.1.4. Dose limits: The dose to an individual resulting from a combination of all relevant planned exposures shall not exceed the occupational or public limits, as applicable, specified in this manual, **see paragraph 4.4.1** for occupational limits and **paragraph 5.2.4** for public limits. **Note:** These limits do not apply to a patient who is prescribed radiation as part of a diagnostic or therapeutic medical procedure.

1.5.2. Radiation Protection Policy for Emergency Exposures. These are unexpected situations that may require urgent protective actions to be implemented to avoid or reduce exposures. Examples include, but not limited to, incident or contingency response activities required to save life or property, humanitarian assistance operations, and military operations conducted where national interests may force personnel to incur radiation doses beyond occupational limits.

1.5.2.1. Justification: A proposed emergency response should do more good than harm by balancing the goals of military objectives and/or humanitarian assistance with the increased risk of deterministic and/or stochastic effects.

1.5.2.2. Optimization: The form, scale, and duration of the emergency response should be optimized so the net benefit is maximized and the net detriment is minimized. Again, individual doses shall be maintained ALARA.

1.5.2.3. Dose guidance: Occupational or "planned" dose limits do not apply for emergency exposures. Instead, operational dose guidance is utilized which considers the factors of acceptable risk and mission importance.

1.5.3. Existing Exposures. These are exposure situations that already exist, such as natural background radiation.

1.5.4. Exposures to the Public. Public exposures may occur as a result of planned, emergency, or existing exposures. Public exposures of concern, for the purposes of this manual, include those resulting indirectly from AF occupational and medical practices, radon, and from radiological incidents and accidents.

Chapter 2

ROLES AND RESPONSIBILITIES

2.1. The Assistant Secretary of the Air Force for Installations, Environment and Energy (SAF/IE). The Assistant Secretary of the Air Force for Installations, Environment and Energy (SAF/IE) shall appoint a voting representative and alternate to the Air Force Radiation Safety Committee (AF-RSC).

2.2. The Assistant Secretary of the Air Force for Acquisition (SAF/AQ) shall:

2.2.1. Appoint a voting representative and alternate to the AF-RSC.

2.2.2. Ensure adequate acquisition procedures exist governing the life-cycle management of sources of radiation not covered by AFMAN 40-201 or AFI 91-108.

2.2.3. Ensure the AF-RSC is informed regarding the acquisition of new systems and upgrades that utilize sources of radiation not covered by AFMAN 40-201 or AFI 91-108 prior to fielding.

2.3. The Deputy Chief of Staff for Logistics, Engineering, and Force Protection (AF/A4) shall:

2.3.1. Appoint one voting representative and one alternate from among the staff of both AF/A4L and AF/A4C to the AF-RSC, who can represent their respective offices and will coordinate with AF/A4 functional areas as required.

2.3.2. Ensure adequate radiation safety guidance exist as they pertain to logistics, maintenance, civil engineering, and security.

2.3.3. Provide logistics, maintenance, civil engineering, and security consultation associated with accidents, incidents, or attacks involving RAM, radiation producing devices, or weapons of mass destruction.

2.4. The Surgeon General of the Air Force (AF/SG) shall:

2.4.1. Establish AF policy for controlling radiation hazards. Ensures AF policy compliance with relevant federal policies and accepted scientific practice.

2.4.2. Appoint an AF/SG Health Physics Consultant and an AF/SG Medical Physics Consultant, who can be one individual if qualified for both positions.

2.4.3. **The Assistant Surgeon General, Medical Operations (AF/SG3/4), shall:**

2.4.3.1. Oversee the use of sources of radiation not covered by AFMAN 40-201 or AFI 91-108 to ensure compliance with all Federal, DoD, and AF regulations and requirements.

2.4.3.2. Establish the AF-RSC to serve as the focal point for all ionizing radiation issues and medical non-ionizing radiation issues, e.g. magnetic resonance imaging and medical lasers.

2.4.3.3. Chair, or delegate a primary and alternate to chair the AF-RSC.

2.4.3.4. Appoint a voting representative and alternate from the Radioisotope Committee Secretariat to the AF-RSC. They will be the Executive Secretary of the AF-RSC (AF-RSCES). The AF-RSCES is authorized to conduct business on behalf of the AF-RSC such as setting the AF-RSC agenda, preparing for and conducting AF-RSC meetings, etc.

2.4.3.5. Appoint a voting representative and alternate from Bioenvironmental Engineering (AFMRA/SG3PB) to the AF-RSC.

2.4.3.6. Appoint the AF/SG Consultant on Medical Physics and an alternate medical physicist as voting representatives to the AF-RSC. The Consultant on Medical Physics serves as the liaison for the Air Force Medical Physics Working Group (AFMPWG) to the AF-RSC.

2.4.3.7. Appoint a voting representative and alternate from Medical Readiness (AFMRA/SG3X) to the AF-RSC.

2.4.3.8. Appoint a voting representative and alternate to the DoD Ionizing Radiation Working Group.

2.4.4. **AF/SG Consultant(s) for Health Physics and Medical Physics shall:**

2.4.4.1. Adjudicate conflicts in prioritization between competing health and medical physics requirements.

2.4.4.2. Provide a recommendation on the qualification status, to the Bioenvironmental Engineering Associate Corps Chief, for Air Force active duty medical physicists.

2.4.4.3. Manage the Air Force-Medical Physics Working Group to address medical physics policy, requirements, and standards.

2.5. The Commander, Air Force Inspection Agency shall:

2.5.1. Appoint a voting representative to the AF-RSC.

2.5.2. Conduct special emphasis inspections as requested by the AF-RSC.

2.6. The Chief, Weapons Safety Division, AF Safety Center (AFSEC) shall:

2.6.1. Appoint a voting representative to the AF-RSC to provide consultation on radiation programs related to nuclear weapon systems.

2.6.2. Consult with AF/SG3/4 on ionizing radiation exposures to personnel from nuclear weapon systems and nuclear weapons testing.

2.7. The Commander, Air Force Legal Operations Agency (AFLOA) shall:

2.7.1. Appoint one non-voting legal advisor and one alternate from AFLOA/JAC to the AF-RSC to attend all scheduled meetings of the AF-RSC.

2.7.2. Serve as chief counsel to both the AF-RSC and to the AF- RSCES on an as needed basis and collaborate with AF-RSCES to obtain and provide accurate interpretations of all statutes, regulations, instructions, and guidance documents affecting implementation of the AF radiation protection program for all AF components covered by this manual.

2.8. Major Commands (MAJCOM) shall:

2.8.1. **MAJCOM Surgeon Generals shall** appoint a voting representative and an alternate to the AF-RSC for consultation which may include: research and development, training, health risk surveillance, and medical readiness issues.

2.8.2. **The Commander, 711th Human Performance Wing, on behalf of the Commander, Air Force Materiel Command (AFMC/CC), shall** :

2.8.2.1. Appoint a voting representative and an alternate to the AF-RSC to provide consultation on research and development, training, and technical matters. **(T-1).**

2.8.2.2. Maintain a consultative service capable of addressing the radiation issues facing the AF. **(T-1).**

2.8.2.3. Provide operational health physics support during nuclear or radiological contingencies. **(T-1).**

2.8.2.4. Manage the Air Force Personnel Dosimetry Program and implement AFMAN 48-125 requirements. **(T-1).**

2.8.2.5. Maintain the AF Master Radiation Exposure Registry (MRER). **(T-1).**

2.8.2.5.1. Utilize the MRER to archive comprehensive dosimetry records for the lifetime of the AF Master Materials License, for all military personnel and for other personnel who use AF dosimetry services. **(T-0).**

2.8.2.5.2. Data from classified operations will be included to the fullest extent possible. **(T-0).** An individual's assessed dose, in most circumstances, is not classified. Where classification is deemed necessary, **see paragraph 6.5.4.2** for further guidance.

2.8.2.6. Update discrepancies (e.g., dates of birth, social security numbers, name spelling, MRER dose vs. historical hard copy records) in MRER based on credible evidence provided to the AF Dosimetry Center. **(T-1).** For significant MRER changes, as determined by the AF Dosimetry Center, present discrepancy in question to AF-RSC for adjudication. **(T-1).**

2.8.2.7. Provide operational reach back support to installations for radiation dosimetry to include consultation and supply of emergency dosimeters when available. **(T-2).**

2.8.2.8. Maintain a capability suitable for the collection of environmental and bioassay samples, conducts in-vivo monitoring, and performs radiochemical analysis of samples. **(T-2).** The capability shall support both operational requirements and medical-legal documentation of individual internal exposures during peacetime, combat and non-combat military operations, and war. **(T-2).**

2.8.2.9. Process, analyze and interpret bioassay and environmental samples in accordance with the most current, industry-accepted methods of sample analysis and assessments methodology to meet regulatory requirements. **(T-3).**

2.8.2.10. Maintain complete records of all bioassay samples, sample analysis results, and estimation of internal dose for the lifetime of the AF Master Materials License, including estimates below detection limits of the analytical method. **(T-2).**

2.8.2.11. Provide a dose estimate, resulting from bioassay analysis, to the supported commander's medical staff. **(T-2).**

2.8.2.12. Provide technical advisory services on radiation protection issues, examples include health risk assessments, exposure reconstructions, radiation safety program reviews, radiation safety quality assurance program development, radiation safety training, and decommissioning survey reviews. **(T-2).**

2.9. The Air Force Radiation Safety Committee (AF-RSC) shall:

2.9.1. Provide direction on uses of radiation, not otherwise covered in AFMAN 40-201 (e.g. machine generated radiation) and AFI 91-108, and grants authority to the AF-RSC Executive Secretariat to conduct all business on its behalf (**reference Chapter 9**). **Note:** Issues related to the AF Master Materials License, or directed energy, to include non-medical lasers, are addressed by other groups.

2.9.2. Serve as the primary AF point of contact for communications with federal, state, and host nation regulatory authorities regarding radiation issues, not otherwise covered in AFMAN 40-201 and AFI 91-108. **Note:** HQ AFSEC is the single point of contact for material controlled under Section 91 of the Atomic Energy Act of 1954 codified in Title 42 U.S.C. Section 2121, *Authority of Commission*.

2.9.3. Recommend policies to AF/SG for keeping radiation exposure ALARA.

2.9.4. Identify new or special inspection needs and reports them to the Air Force Inspection Agency.

2.9.5. Establish the AFMPWG via the Associate Corps Chief for Bioenvironmental Engineering and the AF/SG Consultant for Medical Physics. **Note:** The AFMPWG reports on medical physics issues to the AF-RSC and to the Associate Corps Chief for Bioenvironmental Engineering for planning purposes of the Bioenvironmental Engineering Corporate Board.

2.9.6. Meet as often as necessary, but not less than semi-annually, and delegate action items to voting representatives or other technical representatives. A quorum of at least 50% of the appointed representatives is required for each meeting.

2.9.7. Publish and makes available minutes to all members.

2.9.8. Provide final resolution for allegations concerning the safe use of radiation in compliance with all regulations, not otherwise covered in AFMAN 40-201 and AFI 91-108.

2.9.9. Be comprised of the members identified **in Table 9.1**, but may add non-voting members as deemed necessary.

2.9.10. **The AF-RSC Executive Secretariat (AF-RSCES) shall:**

2.9.10.1. Manage the affairs and executes the decisions of the AF-RSC and maintains AF policy pertinent to ionizing and medical non-ionizing radiation safety.

2.9.10.2. In collaboration with relevant AF/SG consultant(s), determine whether individuals are qualified by training, education, and experience to use radiation covered by this AFMAN.

2.9.10.3. Prior to making a recommendation to procure and field new sources of ionizing radiation covered by this AFMAN, ensure safe operating procedures exist, ionizing radiation hazards are fully characterized, and exposures to operators, maintainers, and personnel are kept ALARA using engineering controls, administrative controls, or personal protective equipment. **Note:** Equipment procured through the Air Force Diagnostic Imaging and Radiotherapy Board is outside the scope of the AF-RSC.

2.9.10.4. Prior to making a recommendation to procure and field new ionizing radiation detectors or dosimeters, ensure the devices are appropriate for the desired use, proper calibration requirements exist, and adequate training requirements are identified.

2.9.10.5. Consult with AFLOA/JAC or SAF/GCN, as designated in Headquarters Air Force Mission Directive 1-14, *General Counsel and The Judge Advocate General*, on questions regarding federal regulations, Department of Defense instructions (DoDIs) and AF publications; AFLOA/JAC and SAF/GCN will coordinate with each other on consultation requests, consistent with HAFMD 1-14, when significant or non-routine matters are at issue.

2.9.10.6. As necessary, conduct visits, respond to incidents and mishaps within the scope of this manual, and accompany the Air Force Inspection Agency during inspections where special emphasis investigations are being addressed.

2.10. The Wing or Installation Commander, as appropriate, shall:

2.10.1. Ensure the wing or installation radiation safety program is comprehensive, compliant with current requirements, and fully integrates the radiation safety programs of units, tenant units, and geographically separated units. Specific tasks include:

2.10.2. Appoint, in writing and by name, a qualified individual to be the installation radiation safety officer (IRSO) and an alternate if possible. Qualifications for IRSOs are **listed in Chapter 3. (T-1).**

2.10.3. Ensure tenant organization and unit radiation safety programs are fully integrated into the wing or installation radiation safety program. **(T-2).**

2.10.4. **The IRSO shall:**

2.10.4.1. Ensure the overall coordination of installation radiation safety activities and provide direct support and information to the installation commander on radiation health and safety issues and effectiveness of measures to control radiation hazards to comply with Federal, DoD and AF requirements (reference: AFMAN 40-201, AFI 91-108, and AFMAN 48-125). **(T-1).**

2.10.4.2. Joint Basing. If an Air Force wing is not lead agent on a joint base, lead service will appoint IRSO; if AF member is not appointed IRSO, the AF wing commander must designate a wing radiation safety officer (RSO) to execute IRSO responsibilities for wing-owned personnel and operations. **(T-2).** The wing RSO is equivalent to IRSO and must meet same requirements. **(T-2)**.

2.10.4.3. Develop and maintain specific written guidance for the execution of all applicable AFIs, AFMANs, and federal regulations concerning radiation protection on the installation (e.g. installation-level guidance memos, instructions, or AFMAN supplements, etc.). **(T-3).**

2.10.4.3.1. Annually review the installation guidance. **(T-3).**

2.10.4.3.2. For an AF-led joint base or joint operation, the guidance must be signed by each co-located service component commander in addition to the installation commander. **(T-2).**

2.10.4.4. Establish and manage the overall installation radiation safety program **in accordance with Chapter 4**. **(T-1).** The program must include at least: annual reviews of current procedures and practices; status or outcome of any new facility designs and work orders; current and new restricted areas; radiation training status; exposure control (including dosimetry trends and results); and monitoring/surveillance (e.g. compliance and shipping surveys) activities. **(T-1).** Reports deviations from this manual and local policy, as applicable, to the installation commander, AFMRA/SG3PB or AFSEC/SEW, and through the MAJCOM/SGPB, as applicable. **(T-1).** This review is separate from intrinsic radiation and radioactive material permit reviews that may also need to be done at the installation in accordance with AFI 91-108 and AFMAN 40-201, but they may all be done within one document.

2.10.4.4.1. Brief the installation commander at least annually regarding the results of this review. **(T-1). Note:** Providing this briefing to the Environmental, Safety, and Occupational Health Council satisfies this requirement; may be done in conjunction with similar AFI 91-108 and AFMAN 40-201 requirements if applicable to the installation.

2.10.4.5. Assist commanders with the development of installation radiation safety policies, operating instructions or radiation safety manuals, as appropriate and requested. **(T-3).**

2.10.4.6. Ensure radiation workers receive training on the risks of radiation, methods to minimize exposure, and the ALARA principle. **(T-0).**

2.10.4.7. Conduct public dose assessments and radon monitoring and assessment **described in Chapters 5 and 7**. **(T-1).**

2.10.4.8. Assist Civil Engineering as requested to ensure adequate design of facilities containing radiation sources and/or devices or requiring radon mitigation. **(T-3).**

2.10.4.9. Manage installation's personnel dosimetry and bioassay program in accordance with AFMAN 48-125 requirements.

2.10.4.10. Ensure discrepancies in radiation dosimetry reports due to lost or damaged radiation monitoring devices are corrected in the MRER in coordination with the AF Dosimetry Center within 30 days of identification. **(T-1).**

2.10.4.11. Forward unit personnel's off-duty or moonlighting radiation dose records to United States Air Force School of Aerospace Medicine (USAFSAM) for inclusion into the MRER. **(T-0).**

2.10.4.12. Document radiation source incidents **(T-2)** and coordinate with Bioenvironmental Engineering to ensure installation personnel's potential workplace radiation hazards are referenced in the appropriate Defense Occupational and Environmental Health Readiness System similar exposure group. **(T-1).**

2.11. Organization or Unit Commander, as appropriate, shall:

2.11.1. Designate, in writing, a unit RSO (URSO) when in possession of RAM (not requiring a permit RSO in accordance with AFMAN 40-201, such as generally licensed devices) or radiation producing devices. **(T-2). Note:** This URSO is separate from, and in addition to, requirements of URSO and permit RSO appointments in AFI 91-108 and AFMAN 40-201. However, the same member may be appointed if qualified to fulfill this manual's, AFMAN 40-201, and/or AFI 91-108 requirements. Units possessing only exempt radioactive material (e.g. magnesium-thorium components, thoriated optics, or check sources not covered by permits) do not require URSOs. Commanders may appoint URSO for their units possessing only exempt radioactive material, for purposes of appropriate control of the material and program.

2.11.2. Provide facilities, equipment, and resources for radiation protection and safety. The nature and extent must be commensurate with the ALARA concept and the radiation hazards of the workplace. **(T-0).**

2.11.3. Implement policies, procedures, and a radiation protection program to ensure the requirements of this manual are met. **(T-1).**

2.11.4. Ensure implementation of AF radiation dosimetry and/or bioassay program, as necessary. **(T-2).**

2.11.5. Ensure radiation workers receive education and training in accordance with this manual. **(T-3).** Ensure radiation workers are properly trained on the risks of radiation, methods to minimize exposure, and the ALARA principle. **(T-0).**

2.11.6. Ensure reports are made and records are maintained in accordance with this manual. **(T-1).**

2.11.7. Ensure workers incidentally exposed to ionizing radiation in their workplace (not otherwise directly related to or required by their work) receive the same level of protection as if they were members of the public. **(T-1).**

2.11.8. Integrate risk management into operations, activities, and planning during establishment, review, and approval of procedures involving ionizing radiation exposure in accordance with established policy (DoDI 6055.01, *DoD Safety and Occupational Health (SOH) Program* and AFI 90-802, *Risk Management*). **(T-3).**

2.11.9. Notify the IRSO before procurement or making changes regarding RAM, radiation or radiation producing devices (RPD) (i.e., the amount or types of RAM or RPDs; new or altered radiation producing devices; special operations; solicitation of goods or services using RAM or RPDs; or construction of new facilities). **(T-1).** The IRSO shall also be notified prior to any change in facilities affecting source or device security requirements, increased potential for personnel exposures, the location of RAM or radiation producing devices, or the potential for release of RAM. **(T-1).**

2.11.10. **Unit Radiation Safety Officer (URSO) shall:**

2.11.10.1. Meet the qualifications for URSOs **listed in Chapter 3**. **(T-1).**

2.11.10.2. Provide technical support to organization or unit commanders on radiation protection issues; inform organization/unit commanders and the IRSO about radiation health and safety issues and effectiveness of measures to control radiation hazards. **(T-1).**

2.11.10.3. Establish and manage the organization or unit radiation safety program **in accordance with Chapter 4**, as applicable. **(T-2).** The program must include review of procedures and practices, facility design review and classification, training, exposure control activities, and routine monitoring and surveillance activities. **(T-2).**

2.11.10.4. Provide commanders assistance in developing organization specific radiation safety operating instructions and radiation safety manuals. **(T-3).**

2.11.10.5. Maintain and manage records as required by this manual. **(T-2).**

2.11.10.6. Ensure radiation workers are properly trained on the risks of radiation, methods to minimize exposure, and the ALARA principle. **(T-0).**

2.11.10.7. Forward unit personnel's off-duty or moonlighting radiation dose records to IRSO for inclusion into the MRER. **(T-0).**

2.12. Medical Treatment Facility (MTF) Commander or equivalent, as appropriate, shall:

2.12.1. Ensure either measured or estimated radiation dose received by personnel during occupational practices and/or contingency operations is available to the monitored individual. **(T-1).**

2.12.1.1. Ensure dose determination records are forwarded to USAFSAM for incorporation into the MRER (to include locally performed bioassays). **(T-1).**

2.12.1.2. Maintain and ensure accessibility to all radiation exposure data for organizations or units including classified operations. **(T-1).**

2.12.2. Ensure collection of bioassay and laboratory specimens as necessary to assess internal exposures from ingested or inhaled RAM or contaminated wounds. **(T-1).** Samples shall be forwarded to USAFSAM for analysis and interpretation. **(T-1).**

2.12.3. Ensure medical follow-up of personnel receiving significant exposures **in accordance with paragraph 6.7 (T-1).**

2.12.4. If the MTF maintains qualified medical physicists:

2.12.4.1. Support medical physics regional mission as **identified by Chapter 8**. **(T-1).**

2.12.4.2. Shall ensure the resourcing of assigned medical physicists consistent with AFMPWG recommendations to the Bioenvironmental Engineering Associate Corps Chief, The Joint Commission requirements and Air Force Diagnostic Imaging Review Board equipment outfitting recommendations. **(T-1).**

2.12.5. If the MTF does not maintain qualified medical physicists:

2.12.5.1. Shall request support from their regional medical physics office at least 90 days in advance of a requirement; if the regional consulting physics office does not deem direct support as feasible and advantageous, the MTF shall seek support through alternative means under advisement of the regional office. **(T-1). Note:** MTFs receive baseline funding for one routine medical physics visit per year, and shall be responsible

for the funding and logistical support of their organization's medical physics requirements. **(T-3).**

2.12.5.2. Final reports of testing performed by non AF medical physicists must be forwarded to the designated regional consulting medical physics office for review within 30 days of receipt and, for initial testing, prior to equipment acceptance. **(T-1). Note: See Chapter 8**, Medical Treatment Facility Specific Guidance and Requirements, for additional and more detailed guidance.

2.13. The Commander (or Director, or Chief), Installation Contracting, shall:

2.13.1. Ensure that all contracts involving RAM or use of RPDs contain required contract clauses and incorporate a detailed performance work statement or statement of work. **(T-1).**

2.13.2. Ensure requirements likely to contain RAM or use RPDs contain IRSO approval documented in the requirement package prior to procuring goods or services. **(T-1). Note:** Common equipment that contains RAM or RPDs include: x-ray machines, medical diagnostic imaging equipment, chemical detectors, laboratory analysis equipment (e.g. gas chromatographs and lead paint analyzers), and moisture density gauges. Common contracted services that may utilize RAM or RPDs include: medical shielding surveys, soil moisture density testing, and lead based paint surveys.

2.14. The Commander (or Director, or Chief), Installation Civil Engineering, shall:

2.14.1. Design facilities **in accordance with paragraph 4.2 (T-3).**

2.14.2. Incorporate radon reduction measures in the construction of new facilities as required in current DoD and AF policy **(T-1)**; mitigate structures with radon **exposures in accordance with Chapter 7**. **(T-3).**

2.14.3. Manage radioactive waste generated during remedial actions or emergency operations, and ensure wastes are disposed of via the Air Force Radioactive Recycling and Disposal Office in accordance with AFMAN 40-201, AFI 91-108 and AFMAN 32-7002, *Environmental Compliance and Pollution Prevention*. **(T-1).**

2.15. Referring medical practitioners shall:

2.15.1. Consult with an expert in radiation bio-effects (e.g. radiologist, nuclear medicine authorized user, radiation oncologist, and/or medical physicist) regarding abnormally high potential/actual radiation doses or demonstrable radiation injuries prior to advisement of a patient to pursue an irreversible action based on radiation concerns (e.g. termination of a pregnancy based on radiation exposure). **(T-3).**

2.15.2. Request a dose estimate consult from a qualified medical physicist following an exposure of a conceptus to a primary radiation field (i.e. direct beam of radiation) or internalization of radioactive material. **(T-3).**

2.16. Radiological medical practitioners. Radiologists, radiation oncologists, nuclear medicine physicians, other qualified physicians, and qualified radiological technologists that use radiation devices and/or RAM shall:

2.16.1. Control all aspects of the conduct and extent of the examinations. **(T-3).**

2.16.2. Ensure radiographic examinations, radiation therapies or nuclear medicine procedures are only performed by properly trained personnel with adequate knowledge of the physical properties and harmful effects of radiation. **(T-3).**

2.16.3. Ensure the procedures used are appropriate and the minimum necessary radiation used for the clinical problem presented. **(T-3).**

2.17. Medical physicists shall: s upport diagnostic imaging, nuclear medicine, radiation oncology, and/or related medical radiation protection functions within their MTF or medical physics region as applicable, within the scope of their practice. **(T-1).**

2.18. Workplace supervisors shall:

2.18.1. Ensure workplace adherence to the requirements of this manual. **(T-2).**

2.18.2. Ensure protection of Airmen and AF civilians from occupational exposures. Contractors shall comply with this manual regarding the use and control of radiation devices and are solely responsible for the health and safety of their personnel as specified in their contract. **(T-1).**

2.18.3. Ensure protection of the public from workplace practices. **(T-1).**

2.18.4. Ensure personnel are trained on radiation hazards in the workplace and appropriate protection requirements. **(T-2).**

2.18.5. Ensure radiation safety procedures are current and adhered to by radiation workers. **(T-2).**

2.18.6. Notify the IRSO and URSO, as soon as practicable after identification, of changes in practices or procedures involving radiation, potential violations of this manual, unsafe work practices involving radiation, or accidents or incidents involving radiation. **(T-1).**

2.18.7. Ensure radiation workers are properly trained on the risks of radiation, methods to minimize exposure, and the ALARA principle. **(T-0).**

2.18.8. For MTF supervisors where ionizing radiation and/or RAM are used: designate personnel to execute the patient dose monitoring, occupational dosimetry, personal protective equipment (PPE) inventory and testing, radiation safety training, and equipment quality control programs in their area. **(T-2).**

2.19. Radiation worker shall:

2.19.1. Follow applicable rules or procedures, and receive information, instruction, and training for radiation protection and safety specified by organizational management and this manual. **(T-1).**

2.19.2. Use issued dosimeters and personal protective equipment correctly. **(T-1).**

2.19.3. Provide the URSO and/or IRSO information on past and current work relevant to ensure comprehensive effective protection and safety for themselves and others, to include any moonlighting dosimetry data to the URSO and IRSO. **(T-1).**

2.19.4. Perform operations in a manner that maintains doses ALARA. **(T-1).**

2.19.5. Notify workplace supervisors of changes to procedures or operations that could affect exposure, potential violations of this manual, unsafe work practices involving radiation, or accidents or incidents involving radiation. **(T-1).**

2.19.6. An active duty pregnant female shall, on becoming aware she is pregnant, notify her workplace supervisor or primary care manager. **(T-1). Note:** A non-military or civilian member is encouraged to notify her workplace supervisor or Public Health office of her pregnancy. It is important to remember that it is the decision of a civilian woman whether or not she declares her pregnancy. This applies to female radiation workers and not all females.

Chapter 3

TRAINING AND QUALIFICATIONS

3.1. General. This chapter provides the training requirements and qualifications required for all AF radiation workers and radiation safety officers (RSOs). In general, the AF has three types of RSOs: installation radiation safety officer (IRSO), URSO, and permit RSO.

3.2. IRSO Qualifications.

3.2.1. A Primary IRSO shall:

3.2.1.1. Be a fully qualified Bioenvironmental Engineer (43E3X) or 1306 Series General Scale (GS) employee who meets at least one of the following: **(T-1)**

3.2.1.1.1. Attended the Bioenvironmental Engineer Officer Course prior to 1999 or after 2007; or

3.2.1.1.2. Be a fully qualified Bioenvironmental Engineer Health Physics Specialty (43E3G); or

3.2.1.1.3. Is a certified health physicist; or

3.2.1.1.4. Has received 40 hours of RSO training (**reference Table 3.1**) via a formal course.

3.2.1.2. Knows the radiation hazards on the installation in order to fulfill the IRSO requirements of this manual, AFMAN 40-201, and AFI 91-108 IRSO requirements as applicable to the installation. **(T-3). Note:** Bioenvironmental Engineering Radiation Skills Course completion is preferred but not required for IRSO appointment.

3.2.1.3. In the absence of a 43E3X or 1306 Series GS employee, or if a unit is geographically separate from one, the IRSO may be a 43E2X or a 7-level Bioenvironmental Engineering Craftsman (4B071) provided they meet at least one of the criteria in **paragraphs 3.2.1.1.1, 3.2.1.1.2, 3.2.1.1.3, or 3.2.1.1.4**

3.2.2. Alternate IRSO. A 43E3X, 1306 Series GS employee, 43E2X, or a 7-level Bioenvironmental Engineering Craftsman (4B071) may be appointed as an alternate IRSO provided they meet at least one of the criteria in **paragraphs 3.2.1.1.1, 3.2.1.1.2, 3.2.1.1.3, or 3.2.1.1.4**

3.2.3. Contractors cannot be the IRSO or alternate. **(T-1).**

3.2.4. Permittees listed on a permit issued by the AF Radioisotope Committee Secretariat cannot be an IRSO or alternate. **(T-1).**

3.3. URSO Qualifications.

3.3.1. URSO qualifications are based upon radioactive material and/or radiation producing devices used by the unit. URSOs shall have the required training **listed on Table 3.1 (T-1).**

3.3.2. URSOs responsible for general licensed devices will be trained on: locations of use and storage of RAM, material control and accountability, transfer and disposal, and AFMAN 40-201. **(T-0).**

3.3.3. URSOs for nuclear capable units (intrinsic radiation programs) will be appointed and trained in accordance with AFI 91-108 requirements. **(T-1).**

3.4. Permit RSOs Qualifications. See AFMAN 40-201.

3.5. Radiation Workers. All radiation workers will have the training **listed on Table 3.1 (T-3).** Initial and annual training is provided by the IRSO, URSO, or permit RSOs depending on scope and use as determined by the IRSO. **(T-3).**

Table 3.1. Training guidance for radiation safety officers and radiation workers.

Topic	IRSO[1]	URSO[2]	Radiation Worker[3]
Radioactivity, radioactive decay, and radiation production devices (x-rays, neutrons)	X	As Applicable	As Applicable
Radiation vs. contamination	X	X	X
Internal vs. external exposure and dose	X	X	X
Biological effects of radiation	X	X	X
Types and hazards associated with RAM or devices	X	X	X
ALARA concept	X	X	X
Training in the principles of time, distance, and	X	X	X
Radiation detection and measurement	X	As Applicable	As Applicable
Personnel dosimetry	X	X	X
Applicable regulations and reporting requirements	X	X	X
License/Permit conditions, amendments, renewals	X	-	-
Locations of use and storage of RAM	X	As Applicable[4]	As Applicable
Material control and accountability	X	As Applicable[4]	As Applicable
Annual audit of radiation safety program	X	As Applicable	As Applicable
Transfer and disposal	X	As Applicable[4]	As Applicable
Record keeping	X	X	X
Prior events involving permitted material	X	-	-
Managing incidents and mishaps	X	X	X
Recognition and assurance of radiation warning signs; visibility and legibility	X	X	X
Inspection by regulatory agencies	X	X	-
Requirement for complete and accurate information	X	X	-
Employee protection	X	X	X
Deliberate misconduct	X	X	X
Emergency response procedures	X	X	X
Protective action guides	X	-	-
Air monitoring procedures	X	-	-
Bioassay techniques	X	As Applicable	As Applicable

[1] These are the minimum topics for a 40 hr course to train IRSOs.
[2] Specific training requirements for permit RSOs are contained in AFMAN 40-201 and intrinsic radiation URSOs are contained in AFI 91-108.
[3] Specific training requirements for intrinsic radiation workers are contained in AFI 91-108.
[4] Required for general licensed device URSOs in accordance with DoDI 6055.08, *Occupational Ionizing Radiation Protection Program*. **(T-0).**
Note: Medical unit RSOs should ensure radiological medical practitioners are additionally trained on national initiatives for patient dose reduction or optimization (e.g. "Image Wisely", "Image Gently") for compliance with accrediting bodies.

Chapter 4

RADIATION PROTECTION FOR OCCUPATIONAL PRACTICES

4.1. Organization and Administration. Every organization or installation that uses non-exempt quantities of RAM, RPDs, or has the potential for exposures to residual RAM associated with AF operations shall implement a radiation safety program commensurate with the scope of the program and its potential health hazards and have a URSO. **(T-1).** Critical program elements are found in this chapter and are generic to all AF practices involving potential exposure to ionizing radiation.

4.1.1. Installation Radiation Safety.

4.1.1.1. IRSO. The IRSO has overall responsibility and authority over the installation or Air Force owned operations requiring a radiation safety program, as described in **paragraph 2.10**, to include suspension of radiological operations, see AFMAN 40-201 para 2.9.2. **(T-1).**

4.1.1.2. URSO. This individual shall be directly responsible to senior management of the organization, properly resourced to execute the requirements of the radiation safety program, and have ready access to all levels of the organization that may use radiation. **(T-3).**

4.1.1.3. Radiation Safety Committee (RSC) shall be established when directed by federal standard (e.g. Title 10 CFR Section 33.13, *Requirements for the Issuance of a Type A Specific License of Broad Scope*, or Title 10 CFR Section 35.24, *Authority and Responsibilities for the Radiation Protection Program*) or when specified as a permit condition issued by the AF Radioisotope Committee Secretariat. **(T-0). Note:** Optional RSCs may be established by commanders of facilities, organizations, or installations with extensive radiation protection program requirements after advisement from their respective IRSO or URSO(s). Examples include installations with many diverse operations involving radioactive material permits or activities with large radiation sources (e.g. irradiators, radioactive waste facilities). Optional RSCs should be composed of senior management, the IRSO, URSO(s), and other individuals knowledgeable and responsible for RAM and radiation producing devices. The RSC should meet at a frequency appropriate to evaluate the purpose, safety, and compliance of the radiation safety program and regulatory requirements.

4.1.2. Radiation Safety Program Policy, Instructions, Procedures and Manuals.

4.1.2.1. Commanders, URSOs, and workplace supervisors shall institute a radiation safety policy that defines the goals of the radiation safety program, the organization and administrative controls required for use of RAM and radiation producing devices, and state a commitment to radiation protection policy. **(T-1).**

4.1.2.2. Commanders, URSOs, and workplace supervisors shall ensure radiation safety procedures are incorporated into appropriate procedures or instructions. **(T-1).** These procedures and instructions should describe the actions or steps necessary to safely conduct a particular task involving a radiation source and document performance of the task. Radiation safety procedures and instructions shall be clearly written, readily

available to all users of radiation producing devices, and annually reviewed and updated, as necessary. **(T-1).** They shall describe the safety controls and procedural safeguards necessary to limit exposure and actions to be followed in the event of a mishap or emergency. **(T-1).**

4.2. Facility Design, Layout, and Area Classification.

4.2.1. Facility Design.

4.2.1.1. Facilities in which non-exempt quantities of RAM, nuclear weapons or components, 91(b) material, or radiation producing devices are used shall be designed so that exposures from normal operation of the facility are ALARA and do not result in exposures that exceed applicable limits as provided in **paragraph 4.4.1** **(T-1).** Where appropriate, facilities shall also be designed so as to prevent or mitigate radiation mishaps. **(T-1).**

4.2.1.2. Consideration shall be made, but not limited to: site selection, facility layout, equipment and system design, shielding, ventilation (including fume hoods and glove boxes), RAM waste management, monitoring and surveillance requirements, and access controls (References: National Council on Radiation Protection (NCRP) Report No. 127, *Operational Radiation Safety Program*, **Chapter 4**, Facility Design, NCRP Report No. 88, *Radiation Alarms and Access Control Systems*, NCRP Report No. 147, *Structural Shielding Design for Medical X-Ray Imaging Facilities*, and NCRP Report No. 151, *Structural Shielding Design and Evaluation Megavoltage X- and Gamma-Ray Radiotherapy Facilities*). **(T-1).**

4.2.1.3. AF facilities designed, whether new construction or renovation project, for use of RAM or radiation producing devices shall be constructed so that a member of the public will not likely receive more than 0.02 milliSievert (mSv) (2 mrem) deep-dose equivalent in any one hour and 1 mSv (100 mrem) total effective dose equivalent in a calendar year from the normal operation of the facility. **(T-0).**

4.2.1.4. The planning and design of new or significantly modified facilities shall include a review by a qualified expert (as defined in **Attachment 1**) to ensure appropriate radiation safety features are incorporated. **(T-1).** Where local expertise is unavailable, contact USAFSAM for assistance. AFMRA/SG3PB should be contacted on questions regarding policy implementation.

4.2.1.5. Administrative controls and personal protective equipment shall not be used as a substitute for engineering controls and appropriate facility design. **(T-3).**

4.2.1.6. Consider future decommissioning requirements during the design phase for facilities using unsealed RAM, accelerators producing photons with energies greater than 13 mega-electron volt, or neutron sources. **(T-1).**

4.2.2. Classification of Areas.

4.2.2.1. Restricted Areas. Restricted areas shall be established, as required, to control radiation exposures, spread of contamination, or access to RAM and devices. **(T-1).** Restricted areas shall:

4.2.2.1.1. Be delineated appropriately through engineered and physical controls, signage, and/or administrative controls, as appropriate. **(T-1).**

4.2.2.1.2. Have access controlled so personnel having approval of the unit or organization are permitted unescorted access. Visitors and other personnel (e.g., patients) entering restricted areas shall be escorted. **(T-3).**

4.2.2.2. Radiation areas, high radiation areas, and very high radiation areas shall:

4.2.2.2.1. Be considered restricted areas. **(T-3).**

4.2.2.2.2. Adhere to posting and other requirements in accordance with Title 10 CFR Part 20, *Standards for Protection Against Radiation* or Title 29 CFR Section 1910.1096, *Ionizing Radiation*, as applicable. **(T-0).**

4.3. Training.

4.3.1. Radiation Workers (non-intrinsic radiation). All personnel (military, civilians and in-house contractors) who have the potential to be occupationally exposed to 1 mSv (100 mrem) in a year shall receive initial and annual training that is appropriate in breadth and depth to the radiation hazards present in the workplace. **(T-0).** IRSO may identify other populations for training including emergency responders.

4.3.1.1. Train according to guidance **in Table 3.1 (T-0).**

4.3.1.2. The radiation training shall be developed by the unit, organization, or IRSO; reviewed and revised as necessary to reflect changes in practices in the workplace; and included in the Job Safety Training Outline in accordance with AFI 91-202, *The US Air Force Mishap Prevention Program*. **(T-2).**

4.3.1.3. Record Keeping. Training programs presented, course curricula, and attendance shall be maintained for a period of three (3) years unless otherwise specified. **(T-1).** Training shall be documented in accordance with AFI 91-202. **(T-1).**

4.3.2. Intrinsic radiation safety training shall be given to all nuclear weapons specialists (2W2) assigned to nuclear weapons capable units or to units with 91(b) materials in accordance with AFI 91-108 training requirements and frequency. **(T-1). Note:** The content of training is provided at the AFMRA Radiation Programs website located on AFMS Knowledge Exchange; **https://kx.health.mil/kj/kx5/radiationprograms/Pages/home.aspx**. Additionally, the IRSO and URSO can expand the scope of this training as appropriate (e.g. handlers, loaders, security forces, and aircrew).

4.4. Radiation Exposure Control.

4.4.1. Dose Limits. Personnel shall not exceed dose limits specified by 10 CFR Part 20 for either radioactive material or machine produced radiation. **(T-0).**

4.4.2. Radiation exposures investigations are used to correct dose assignments and/or to enhance current radiation control practices, **see paragraph 4.5.2**

4.4.3. Exposure Control. Radiation workers shall use the following techniques under the judgment and discretion of the IRSO to ensure dose limits are not exceeded and exposures are ALARA.

4.4.3.1. Time, Distance, and Shielding. As appropriate, minimize the time around sources of external radiation, maximize the distance to RAM and radiation producing

devices, and utilize radiation shielding between radiation source and potential exposed personnel to control external radiation doses. **(T-1).**

4.4.3.2. Personal Protective Equipment. Personal protective equipment, including lead aprons, glasses and thyroid shields to protect from x-rays, plastic face shields and glasses to protect from beta particles, and clothing and gloves to protect from contamination shall be used to the greatest extent possible. **(T-1)**. Respiratory protection is normally limited to specific permitted operations and emergencies, and use is managed in accordance with AFI 48-137, *Respiratory Protection Program*. Use personal protective equipment except when such use may result in overall more significant internal or external radiation exposure, or other health risks more severe than that posed by the potential radiation exposure. **(T-1)**.

4.4.3.3. Contamination Control.

4.4.3.3.1. In the absence of superseding regulatory or advisory guidance, a surface is contaminated if total radioactivity is above the screening levels in DoD Manual (DoDM) 3145.03, *DoD Chemical, Biological, and Radiological Clearance Guidance for Platforms and Materiel*. **(T-1).** If screening levels are met, free release criteria are met. **(T-1). Exception:**

4.4.3.3.1.1. Routine low-level contamination by short-lived radionuclides (half-life less than 120 days).

4.4.3.3.1.2. Permitted material which is covered under specific permit conditions.

4.4.3.3.1.3. Derived, case by case, clearance levels greater than screening levels, if approved by AFMRA/SG3PB.

4.4.3.3.2. Operational guidance for use of contaminated material is based on exposure guidance and screening levels found in DoDM 3145.03.

4.4.3.3.3. Always prevent or keep radioactive contamination ALARA. **(T-1).**

4.4.3.4. Access Control and Alarm Systems. Provide access control and/or alarm systems to prevent access to or warn of a radiation hazard, as appropriate for areas that can be classified as high or very high radiation areas under **paragraph 4.2.2** **(T-3).** For additional information, consult USAFSAM.

4.4.3.5. Radiation Safety Procedures and Work Permits. Implement, use and at least annually review radiation safety procedures and radiation work permits, as appropriate. **(T-3).**

4.4.3.6. Change of Duty or Curtailment. Individuals who are likely to exceed the occupational dose limits, even with application of the above measures, shall have duties modified or curtailed so that limits are not exceeded. **(T-1).** Such changes in duty shall remain in effect until the individual's projected dose will be less than the prescribed limits. **(T-1).**

4.4.3.7. Change of Duty or Curtailment of Pregnant Radiation Workers. Based on the exposure information and workplace assessment of the IRSO, the female radiation worker's primary care manager (if military) or health care provider (if civilian) will determine any recommended restrictions to the radiation worker's duties involving

occupational radiation exposure in accordance with AFMAN 48-125. **(T-1).** The following guidelines are prudent and should be taken into consideration for declared pregnant radiation workers:

4.4.3.7.1. Declared pregnant technologists or providers should be recommended for restrictions to perform fluoroscopic and interventional procedures.

4.4.3.7.2. Declared pregnant technologists can perform routine radiographic studies, portable examinations to include the operating room (except fluoroscopy or C-arm), computed tomography, mammography, and radiation therapy.

4.4.3.7.3. Declared pregnant nuclear medicine technologists may work in imaging rooms; but should be recommended for restrictions to compound radiopharmaceuticals, dose patients, and work in the hot lab.

4.4.3.7.4. Female nuclear weapons specialists (2W2) who declare pregnancy should be recommended for restrictions of duty requiring contact with or occupancy in rooms where Hydrogen-3 (tritium) vapors/oxides are present. If operational requirements of the unit make it necessary for pregnant females to work in those areas, then the unit commander shall review the exposure potential. The unit commander shall consult AFSEC (Weapons Safety Division), the IRSO, and/or the radiation worker's primary care manger to discuss the potential for exposure and risk. **(T-1).**

4.5. Radiation Dosimetry.

4.5.1. Personnel Monitoring Criteria. Individuals who are occupationally exposed to ionizing radiation as part of their duties must be provided dosimetry and bioassays as described in AFMAN 48-125 when any of the following apply: **Note:** For non-permitted material environmental radon exposures **see Chapter 7** for separate requirements.

4.5.1.1. Exposures are measured or calculated to exceed 1 mSv (100 mrem) total effective dose equivalent in a year, 2% of a committed effective dose equivalent based annual limit of intake, or 2% of the occupational limits. **(T-1).**

4.5.1.2. If the type of radiation is detectable by the AF personnel monitoring program, at the discretion of the IRSO, dosimetry services may be provided in the following cases:

4.5.1.2.1. Monitoring to demonstrate compliance with ALARA work practices;

4.5.1.2.2. Monitoring is desirable to evaluate potential exposure conditions to relieve worker concern;

4.5.1.2.3. Requested by the individual.

4.5.1.3. Individuals entering a high or very high radiation area. **(T-0).**

4.5.1.4. Members of the 2W2 career field assigned to a nuclear capable unit shall be monitored for both gamma and neutron dose in accordance with AFI 91-108, except those assigned to duties not having the potential for intrinsic radiation exposure (i.e., administrative positions). **(T-1).**

4.5.1.5. Pregnant occupational radiation workers must be monitored monthly throughout their gestational period, see AFMAN 48-125. **(T-0).**

4.5.1.6. Aircrew: U-2 pilots will have radiation dose assessed, see AFMAN 48-125. **(T-1).**

4.5.1.7. Contractors will only be provided dosimetry when legally required, as specified in the contract. **(T-1).** The contract should state the contractor's employer (not the USAF) will provide dosimetry. The AF always has the responsibility to control exposures due to licensed radioactive material in accordance with 10 CFR Part 20. **(T-0).**

4.5.2. Radiation Exposure Investigations.

4.5.2.1. Abnormal Investigations. Personnel should not receive a dose in excess of 25% of the applicable annual dose limits in a quarter, or 8% of the applicable annual dose limits in a month without proper justification and optimization of the procedure. See AFMAN 48-125 for threshold values. If these reference levels are exceeded, this will drive an abnormal investigation as described in AFMAN 48-125. **(T-1).**

4.5.2.2. Potential Overexposure Investigations. Personnel receiving doses in excess of applicable annual dose limits will drive a potential overexposure investigation as described in AFMAN 48-125. **(T-1).**

4.5.2.3. Investigation Action Level Investigations. IRSOs or the RSC where applicable, shall ensure the local program includes documented acceptable dose threshold levels based upon historical dosimetry and bioassay results, and/or surveillance (see investigation action level in **attachment 1**). **(T-1)**. IRSOs shall conduct an investigation into causative factors and identify corrective measures when this threshold level is exceeded. **(T-1).** Refer to AFMAN 48-125 for additional information. **Note:** Investigation action level investigations should follow the methodology of abnormal investigations, however reports are internal to the installation and used as a tool to improve radiation protection practices locally. **Note:** These reporting requirements established here do not replace or supersede the reporting requirements associated with a nuclear reactor or radiological mishap as established in AFI 91-204, *Safety Investigation and Reports*.

4.5.2.4. Investigations for members of the public, **see paragraph 5.2.6**

4.5.3. Previous or Concurrent Occupational Dose. The IRSO shall make a reasonable effort to collect dosimetry records for individuals having either past or present non-AF employment involving radiation exposure. **(T-1).** AF personnel moonlighting in jobs where they are monitored for radiation exposure shall make arrangements to routinely (e.g., annually or based on monitoring period) provide these results to the IRSO or shop supervisor. **(T-1).** The IRSO shall ensure these results are forwarded to USAFSAM for incorporation in the MRER. **(T-1).** The individual bears ultimate responsibility for ensuring any non-AF dosimetry results become part of the MRER. **(T-1).** See AFMAN 48-125 for additional requirements on previous or concurrent occupational dose.

4.5.4. Administrative Doses. Assignment of administrative doses are required for lost or damaged dosimeters or for those individuals with exposures other than the purpose for which it was intended. **(T-1).** Exposure information from recovered dosimeters shall replace administrative dose estimates. **(T-1). Note:** Recovered badges can only be analyzed by the dosimetry center 6 months after the end of monitoring period. Assigned doses must be

estimated by the IRSO using the procedures in AFMAN 48-125. **(T-1).** The IRSO shall ensure the assigned dose replaces the null placeholder in the MRER within 30 days. **(T-1).**

4.6. Monitoring and Surveillance Programs and Instrumentation.

4.6.1. Types of Surveys. Two types of surveys are common: routine surveys conducted on a fixed, periodic basis at common locations to determine changes or trends in the radiation environment and non-routine surveys performed to evaluate new or expected changes in a radiation field. Surveys shall be conducted in areas where the potential exists for exposure to external radiation fields, airborne contamination, or surface contamination. **(T-0).**

4.6.1.1. Non-routine surveys and routine surveys shall be performed by a qualified expert (see **Attachment 1**) following requirements of this manual. **(T-2).**

4.6.1.2. For non-routine surveys, new survey measurements must be taken after any modification of the facility impacting the shielding or RAM control, replacement or change of the radiation source, and/or a significant change in practice or the uses of the radiation source. **(T-2).** The survey shall determine the efficacy of any installed shielding to protect surrounding areas from primary or scattered radiation, as applicable. **(T-2).** In all cases, the survey shall be conducted within 90 calendar days of the facility acceptance date or the change in the radiological characteristics of the source; this includes nuclear weapons storage and maintenance facilities, as well as facilities housing 91(b) materials. **(T-2).**

4.6.2. Instrumentation. Instrumentation used to perform surveys, shall be appropriate to the type(s) of radiation and emitted energy(ies). **(T-0).** IRSOs shall consult with USAFSAM on instrumentation requirements prior to performing intrinsic radiation, atmospheric radiation, high energy (>13 mega-electron volt) accelerator surveys or other mixed radiation environments. **(T-3).**

4.6.2.1. Instrumentation shall be calibrated annually, or at a frequency specified in the applicable Air Force RAM permit; use National Institute of Standards and Technology traceable radiation sources for calibration or post-calibration verification. **(T-0).**

4.6.2.2. Instrument performance shall be checked before each use, in accordance with manufacturer's recommendations, as applicable. **(T-1).**

4.6.3. Record Keeping.

4.6.3.1. Survey results shall be maintained for a period of three years or as specified in the applicable AF RAM permit, whichever is most stringent. **(T-0). Note:** Additional specific record keeping requirements for radiation protection programs utilizing RAM can be found in AFMAN 40-201.

4.6.3.2. Survey results shall include: a description and/or drawing of each measurement location; measured dose and/or contamination levels at each location; the type, model number, serial number, and calibration date of the instrument; name of individual performing the survey; date of the survey and applicable comments. **(T-1).**

4.7. Radioactive Waste Management.

4.7.1. Radioactive waste minimization: waste generation shall be minimized, or preferably prevented at the source. **(T-1).**

4.7.2. Radioactive waste storage: all waste pending disposition shall be stored in a restricted area, in clearly marked containers. **(T-2).**

4.8. Occupational Medical Surveillance and Follow-Up. For personnel who are occupationally exposed and whose doses do not exceed the applicable dose limits, testing and monitoring should be the same as standard clinical preventive services that follow guidelines for the general population (e.g., routine mammography, pap smears, etc.). Medical surveillance of overexposures shall be evaluated on a case-by-case basis by the MAJCOM/SG in coordination with AFMRA/SG3PB and USAFSAM (**see paragraphs 6.6 and 6.7**). **(T-3).**

Chapter 5

RADIATION PROTECTION OF THE PUBLIC

5.1. General. Public dose is the dose received by a member of the public from exposure to radiation or radioactive material used in AF practices, or radon within Air Force controlled buildings. Public dose does not include occupational dose or doses from other background radiation sources or any medical administration the individual has received.

5.2. Control of Public Exposures from AF Practices. Administrative and engineering controls, policies, or procedures are implemented to control public dose from AF practices. The following requirements are specified for all AF practices that may result in public exposure.

5.2.1. All practices shall be conducted to minimize public exposure utilizing the ALARA principle. **(T-0).**

5.2.2. Members of the public shall not occupy vehicles during cargo or vehicle inspections that use scanning systems employing radiation. **(T-2).**

5.2.3. All practices shall be conducted in such a manner that a member of the public will not exceed the applicable dose limits specified. **(T-0).** For non-medical practices, the IRSO shall be responsible for the determination, either by measurement or calculation that this dose is not exceeded, and maintain this record permanently using Defense Occupational and Environmental Health Readiness System (documented in the similar exposure group process). **(T-1).** For medical practices, the permit RSO, responsible medical physicist, health physicist or BEE, as appropriate, shall be responsible for this determination. **(T-1).**

5.2.4. Unrestricted Areas. The dose in any unrestricted area resulting from AF controlled radiation will not exceed 0.02 mSv (2 mrem) in any one hour, or 1 mSv (100 mrem) in a year, occupancy and use factors being taken into account. This requirement does not apply to those excepted by Title 10 CFR Section 35.75, *Release of Individuals Containing Unsealed Byproduct Material or Implants Containing Byproduct Material*. **(T-0).** The IRSO shall be responsible for the assessment, either by measurement or calculation, that these dose limits are not exceeded and maintain this record permanently (i.e., Defense Occupational and Environmental Health Readiness System, documented in the similar exposure group process). **(T-1).**

5.2.5. Control of Visitors.

5.2.5.1. Visitors to any restricted area must be accompanied by personnel knowledgeable about the protection and safety measures in the area. **(T-1).**

5.2.5.2. Visitors must be provided adequate information and instruction before they enter a restricted area to ensure appropriate protection of the visitors and of other personnel in the area. **(T-1).**

5.2.5.3. Visitors entering a location defined as "Radiation Area" or "High Radiation Area" or that could incur a deep dose equivalent in excess of 0.10 mSv (10 mrem) shall be provided personal monitoring devices (i.e. a dosimeter). **(T-1).** A log of all such monitored individuals shall be maintained and the results communicated to the individual. **(T-1).**

5.2.6. Public Overexposures. If an individual member of the public may have received a dose in excess of the applicable limit, this dose and practice shall be immediately investigated by the IRSO. **(T-0).** If appropriate, the unit, organization or IRSO should implement, with commander's approval, protective actions to mitigate further exposures. **(T-0).**

5.2.6.1. Notification. When a member of the public may have received a dose above the applicable limits, the IRSO shall be contacted immediately. **(T-1).** The IRSO shall contact USAFSAM to validate the assessment of dose. **(T-1).** If the dose is validated, the IRSO shall immediately notify the MAJCOM BEE and AFMRA/SG3PB. **(T-1). Note:** Report to the AFMRA/SG3PB by calling DSN 761-6946, Commercial (703) 681-6946; or to report after normal duty hours, call the Andrews Regional Command Post, DSN 858-5058, Commercial (301) 981-5058.

5.2.6.2. Reporting. The IRSO shall investigate suspected exposures above the limits, with a written report of the investigation submitted through the MAJCOM BEE to AFMRA/SG3PB within 7 days of notification. **(T-1).** The written report must include: **(T-1).**

5.2.6.2.1. The organization's name and office symbol where the exposure occurred;

5.2.6.2.2. A brief description of the event;

5.2.6.2.3. A description of the person(s) exposed and their estimated dose equivalent;

5.2.6.2.4. Why the event occurred; and

5.2.6.2.5. What actions, if any, have been taken or are planned to prevent recurrence.

5.3. Protection of the Public During Emergencies. Specific protective measures and guidance that can be implemented are contained in the Environmental Protection Agency's (EPA) Manual: EPA-400/R-17/001, *Protective Action Guides and Planning Guidance for Radiological Incidents*. The decision to invoke a protective action, i.e., sheltering or evacuation, should be based on whether the action will allow the population to avert (or avoid) the recommended threshold dose provided with a given action or intervention.

Chapter 6

RADIATION PROTECTION OF AF PERSONNEL DURING EMERGENCIES

6.1. General. This chapter provides guidance for protecting AF personnel conducting actions in uncontrolled radiation environments. These environments may include garrison or deployed locations where known or suspected nuclear or radiological hazards exist and radiological environments created by hostile action or industrial, medical, nuclear incident or accident. Emergency exposure interventions are specific actions performed in these environments to mitigate the source(s) of exposure, to save life or limb, protect high value assets, or achieve higher objectives that may merit personnel incur risks greater than those permitted for practices. This section also applies to nuclear capable units and units with 91(b) material. It includes radiation protection considerations described in Joint Publication (JP) 3-11, *Operations in Chemical, Biological, Radiological, and Nuclear Environments*.

6.2. Radiation Protection Principles and Guidance for Emergencies.

6.2.1. There are three basic principles of ionizing radiation protection used to manage the risks associated with ionizing radiation exposure.

6.2.1.1. Justification. No unnecessary exposure should be undertaken.

6.2.1.2. Optimization. The level of individual doses, number of people exposed and likelihood of incurring exposure should be kept ALARA.

6.2.1.3. Limitation. The dose to an individual conducting operations shall be monitored and limited in accordance with the commander's operational exposure guidance. **(T-1).**

6.2.1.4. For public dose guidance, reference EPA-400/R-17/001, **see paragraph 5.3**

6.2.2. Applying radiation protection principles should not introduce a higher level or more severe risk to the unit or mission. Complete risk management requires:

6.2.2.1. Information. Personnel must assess risk using an all hazards approach using all available information such as measurements, visual observations, and modeling.

6.2.2.2. Justification. Consideration of threshold and random health consequences of radiation exposure needs to be considered. Unnecessary risks to health should not be accepted.

6.2.2.3. Optimization. To minimize the potential effects of exposure, emergency planning should involve efforts to reduce the time in a radiation area, maintaining the maximum distance possible from RAM and radiation producing devices, and using shields between exposed personnel and RAM and radiation producing devices to keep radiation exposures ALARA.

6.2.3. Dose guidance should be developed for a given emergency. Dose limits do not apply for emergencies. Instead, the operational exposure guidance is applicable. The commander's decision to allow this exposure should be based on the radiation exposure status category found in JP 3-11 and made in the context of the situation and balance the anticipated benefit with both short and long-term health risks the exposure may cause. The exposure will vary depending on whether the mission is critical, priority, or routine and the

severity of the radiological threat. Operational exposure guidance should be set for each mission with potential for exposure, for decontamination of personnel or equipment, or for immediate or operational decontamination.

6.2.3.1. Dose due to the ingestion or inhalation of RAM cannot be accurately measured in the field but can be estimated for operational purposes. Depending on the type of RAM and its dispersed form, the internal dose may be much larger than the external dose for a given operation.

6.2.3.2. Medical authorities should recommend PPE, including respiratory protection. Commanders will dictate PPE use based on operational risk analysis. **(T-3).** Operational risk analysis should include the detriment posed by reduced vision, hearing, mobility, and tactile sensation; increased heat and psychological stress; increased time to complete tasks, and decreased task accuracy when wearing PPE. These in turn can lead to increases in external radiation exposures and the magnitude of other mission risks.

6.2.4. Voluntary Participation. Where practical, emergency operations predicted to result in significant exposures (those greater than practice limits) should make use of volunteers to the greatest extent possible. Experienced volunteers may be preferred, since experienced workers typically can complete an operation in a timelier manner, reducing their dose.

6.2.5. Excluded Populations. Operational personnel that are, or may be pregnant, or that are less than 18 years of age shall not conduct emergency radiological operations. **(T-1).**

6.3. Allowable Contamination Levels. Recommended contamination levels for clothing, skin, and equipment shall be managed to levels that are ALARA **consistent with paragraph 4.4.3.3** or guidance provided by the assigned radiation protection personnel. **(T-1).**

6.4. Training and Risk Communication. Personnel participating in an emergency operation shall be informed of the potential health risks their radiation exposure may result in, and trained in the necessary principles and procedures to minimize their exposure consistent with **paragraph 4.3 (T-1).** Depending on the nature of the operation, training should be provided by medical radiation protection personnel.

6.5. Monitoring During Emergency Operations. Implementing risk management and supporting operational dose guidance requires the ability to estimate or measure individual doses. This is optimally done through the use of radiation survey instruments, environmental sampling, personnel dosimeters, and/or bioassays.

6.5.1. Personnel deployed in known or potential radiation environments shall be provided individual dosimeters if the potential to exceed 1 mSv (100 mrem) exists. **(T-0).**

6.5.2. Personnel entering contaminated environments should be afforded in-vitro or in-vivo bioassays to determine the extent of internal exposures if internal contamination is suspected.

6.5.3. If individual dosimetry or prompt bioassay measurements are not available, efforts will be made to estimate individual doses through group dosimetry, radiation survey, environmental monitoring data, modeling, or dose reconstructions **(T-0).**

6.5.4. Systematic, individual dose records for external and internal exposure result shall be maintained indefinitely in the AF MRER, even if the dosimeter or bioassay result is zero. **(T-0).**

6.5.4.1. For units for which group dosimetry is used, doses as measured may be averaged and applied to the entire group for the purposes of applying the commander's operational exposure guidance. The RSO supporting the unit shall track unit doses, determine the acceptability of the unit dose to reflect individual doses, and forward this dose information for each unit member for inclusion in the MRER. **(T-0).**

6.5.4.2. Classification of exposure data may prevent its inclusion in the MRER. Medical authorities for the command conducting classified operations shall maintain and be able to access all classified exposure data, ensuring all releasable data is available for maintenance in the MRER and to the monitored individual. **(T-0).**

6.5.5. Reports of dosimetry or bioassay results shall be given promptly to the potentially exposed individual and their commander or delegated representative. **(T-0).**

6.6. Medical Diagnosis and Treatment. Medical professional should use Army Techniques Publication (ATP) 4-02.83, *Multiservice Tactics, Techniques, and Procedures for Treatment of Nuclear and Radiological Casualties*, as a reference when evaluating or treating personnel who receive unknown doses of radiation or doses exceeding the applicable established limits.

6.7. Medical Surveillance.

6.7.1. Doses greater than 50 mSv (5 rem): On completion of a military operation or operations involving radiation exposure, long term, periodic health monitoring is required for individuals receiving cumulative effective doses in excess of 50 mSv (5 rem). **(T-1).** Such follow-up shall be performed through USAFSAM **(T-1)**, and may include, but not be limited to:

6.7.1.1. Creation of a registry for the impacted population;

6.7.1.2. Submission of biological or bioassay samples to determine absorbed dose and residual burdens of RAM, respectively; and/or

6.7.1.3. Annual or biannual medical examination through the local Base Operational Medicine Clinic, particularly following the latent periods of known radiogenic cancers. Known radiogenic cancers include leukemia, multiple myeloma, lymphomas, thyroid, breast, lung, esophageal, stomach, urinary tract, skin, and colon cancer.

6.7.2. Doses less than 50 mSv (5 rem): For those personnel who have received doses less than current occupational dose limits, there is not a requirement to conduct follow up medical testing and monitoring. Personnel should continue with normally prescribed medical procedures authorized by their primary care provider, such as those testing and monitoring programs included in guidelines for the general population (e.g., routine mammography and pap smears).

6.7.2.1. Health monitoring may include submission of bioassay samples to document intakes of radionuclides, and screening for cancers consistent with current medical practices.

Chapter 7

INDOOR RADON EXPOSURE SURVEILLANCE AND MITIGATION

7.1. Radon Exposure Guidance. Note: This radon guidance does not apply to Nuclear Regulatory Commission regulated radioactive material that would generate a radon hazard, follow AFMAN 40-201 guidance on managing Nuclear Regulatory Commission regulated (AF permitted materials). **(T-0).**

7.1.1. Exposure to radon will be assessed by radon progeny exposure in the units of Working Level Months in a year (WLM/yr). **(T-1).** Radon-222 gas concentration in the units of Becquerel per meter cubed (Bq/m^3) (traditional units are picoCuries per liter, pCi/L) may be used as a surrogate to estimate the exposure in WLM/yr; radon gas concentration will most likely be used to determine compliance due to its convenience in measurement. However radon gas concentrations must be converted to a time-weighted exposure to determine compliance. **(T-1). Note:** Equilibrium Factor (EF) can be assumed to be as low as 0.4, unless it is assessed directly by measurements; time (hours/yr) is the duration of occupant exposure. For housing, a conservative 100% occupancy may be assumed. To convert radon gas concentrations to WLM/yr, one may use the following equation.

Figure 7.1. Convert Radon Gas Concentrations to WLM/yr.

$$X\left\{\frac{\mathrm{WLM}}{\mathrm{yr}}\right\} = \frac{\left(\mathrm{Radon}^{222}\ \mathrm{Concentration}\left\{\frac{\mathrm{pCi}}{\mathrm{L}}\right\}\right) \times (\mathrm{EF}\{\mathrm{unitless}\}) \times \left(\mathrm{Time}\left\{\frac{\mathrm{hours}}{\mathrm{yr}}\right\}\right)}{\left(17000\left\{\frac{\mathrm{pCi}}{\mathrm{L}} \times \frac{\mathrm{hours}}{\mathrm{WLM}}\right\}\right)}$$

7.1.1.1. Residential housing example: Estimating WLM/yr from Radon-222 gas concentration of 4 pCi/L using 8760 hours/yr (100% occupancy):

Figure 7.2. Residential Housing Example.

$$X\left\{\frac{WLM}{yr}\right\} = \frac{\left(4\left\{\frac{pCi}{L}\right\}\right) \times (0.4) \times \left(8760\left\{\frac{hours}{yr}\right\}\right)}{\left(17000\left\{\frac{pCi}{L} \times \frac{hours}{WLM}\right\}\right)}$$

$$X \cong 0.8\ \frac{WLM}{yr}$$

7.1.1.2. Occupied workplace example: Estimating WLM/yr from Radon-222 gas concentration of 16 pCi/L using 2000 hours/yr:

Figure 7.3. Occupied Workplace Example.

$$X\left\{\frac{WLM}{yr}\right\} = \frac{\left(16\left\{\frac{pCi}{L}\right\}\right) \times (0.4) \times \left(2000\left\{\frac{hours}{yr}\right\}\right)}{\left(17000\left\{\frac{pCi}{L} \times \frac{hours}{WLM}\right\}\right)}$$

$$X \cong .75\,\frac{WLM}{yr}$$

7.1.2. The annual limit is 4 WLM/yr. **(T-1).**

7.1.3. The AF goal is the annual average concentration of radon gas in occupied buildings (homes, schools, child development centers, work centers, and office buildings) be maintained at or below to concentration where exposure from radon progeny does not exceed 0.8 WLM/yr.

7.1.4. Mitigation will begin at exposures greater than 0.8 WLM/yr. **(T-1).**

Table 7.1. Mitigation Timelines. (T-3).

Radon Progeny Exposure, WLM/yr	Mitigation Timeline	Comments
< 0.8	Not applicable	none
0.8 to < 1.6	Mitigate within 5 years	After remediation, if result is still between 0.8 to < 1.6 WLM/yr further remediation may not be warranted or beneficial. For housing: Give tenant option to move
1.6 to < 4	Mitigate within 2 years	Recommend not using facility if mitigation will be delayed beyond timelines. For housing: Give tenant option to move, do not re-lease until mitigated.

> 4	Mitigate within 6 months	Recommend not using facility if mitigation will be delayed beyond timelines. For housing: Give tenant option to move, recommend moving as soon as practicable if mitigation will be delayed; do not re-lease until mitigated.

7.2. Housing, Child Development Centers, and DoD Education Activity Schools.

7.2.1. All installations must have radon assessments for structures supporting housing, child development centers, and DoD Education Activity schools. **(T-1).** Results of testing will be made available to occupants. **(T-3). Note:** If radon assessments were completed, this requirement does not necessitate resampling.

7.2.2. This applies to all installations, except deployed locations (**see paragraph 7.4.8**) **(T-1)**; **see paragraph 7.4.6** for privatized housing requirements.

7.2.3. Housing structure assessments may be based on representative sampling, e.g. 10% of dwellings, provided that all screening values are less than 0.8 WLM/yr **(T-2)**, consistent with historical housing screening programs implemented by the DoD services.

7.2.4. Only long-term sampling must be reported to occupants. **(T-3).**

7.2.5. DoD housing residents will not be required to live in a home or assessed a turndown option for refusing a home with an assessment of 0.8 WLM/yr or higher. **(T-1).**

7.2.6. Follow mitigation timelines **in Table 7.1 (T-3).** If post-mitigation sampling results in exposure less than 1.6 WLM/yr; then no further mitigation may be warranted or beneficial.

7.3. Occupied Workplace Buildings (Structures not included in paragraph 7.2).

7.3.1. Assess the concentration of radon in occupied workplace buildings according to a sampling plan, particularly the six installations previously documented as having high-risk to radon. **(T-1). Note:** Sampling plan guidance and high-risk installations can be found in USAF School of Aerospace Medicine's *Bioenvironmental Engineer's Guidebook for Radon Management.* One hundred percent assessment of installation facilities may not be required, *see* **paragraph 7.3.3**

7.3.2. Installations not identified as high-risk to radon but have facilities that may pose a risk to high radon exposure (e.g. subterranean buildings, facilities with inadequate ventilation) should only be sampled after consultation with the IRSO and/or USAFSAM.

7.3.3. If facilities tested are less than the goal of 0.8 WLM/yr, additional testing of like structures may not be needed after consultation with USAFSAM.

7.3.4. IRSO will ensure occupants are notified of exposure levels greater than 0.8 WLM/yr and are provided radon awareness training annually in accordance with AFI 48-145, *Occupational and Environmental Health Program*. **(T-1).**

7.3.5. Document radon measurement results in Defense Occupational and Environmental Health Readiness System in accordance with AFI 48-145 procedures. **(T-1).** See the *Bioenvironmental Engineer's Guidebook for Radon Management* for best practices.

7.3.6. Follow mitigation timelines **in Table 7.1 (T-3).** If post-mitigation sampling results in exposure less than 1.6 WLM/yr; then no further mitigation may be warranted or beneficial.

7.4. Additional Radon Requirements.

7.4.1. IRSO will apply ALARA to exposure mitigation, building mitigation strategy, and facility design reviews. **(T-1).** IRSO may consider using risk assessment codes, as warranted, to assist with installation funding prioritization and make commanders aware of risk levels.

7.4.2. Radon measurements must be conducted, analyzed, documented and periodically re-evaluated in accordance with the *Bioenvironmental Engineer's Guidebook for Radon Management*. **(T-2).**

7.4.3. Long-term sampling and post mitigation results must be reported to occupants. **(T-3).**

7.4.4. New structures should not be tested for one year after construction to allow for foundation settling; it is acceptable to occupy a facility in the absence of initial radon test results. **(T-2).**

7.4.5. Civil Engineering will notify the IRSO within 5 days after completion of facility construction or facility radon mitigation. **(T-3).** Radon mitigated facilities should have radon testing initiated within 90 days after the mitigation system is installed. **(T-3).**

7.4.6. Radon testing and mitigation in current privatized housing will be accomplished by the project owner as specified in the applicable project documents; new privatized housing projects will assure radon testing and mitigation is accomplished by the project owner as specified in the applicable project documents. **(T-2).**

7.4.7. Radon-related guidance published in the Unified Facility Criteria will be followed for construction and renovations in DoD housing, privatized housing, child development centers, and other facilities. **(T-1).**

7.4.8. Enduring deployment locations will monitor facilities consistent with this manual at the discretion of the MAJCOM Bioenvironmental Engineering overseeing industrial hygiene at the location **(T-2)**; radon assessment will be included in the Occupational and Environmental Health Site Assessment. **(T-2).**

Chapter 8

MEDICAL TREATMENT FACILITY SPECIFIC GUIDANCE AND REQUIREMENTS

8.1. Introduction. This section outlines some various radiation program elements specific to medical operations to ensure safe and optimal use of ionizing radiation in medicine.

8.2. Not Used.

8.3. Medical Credentialing, Authorizations and Qualifications.

8.3.1. Referring Medical Practitioners (i.e. Requesting Health Professionals). The use of ionizing radiation or radioactive materials for the purposes of diagnosis or treatment of disease or injury can be ordered (i.e. requested) by individuals who are appropriately privileged within the applicable health care facility consistent with the following provisions:

8.3.1.1. Imaging studies or therapeutic procedures may be requested by doctors of medicine or osteopathy who are licensed in the United States (or a United States territory or possession) or are certified by an appropriate certifying agency.

8.3.1.2. Doctors of dental surgery or dental medicine may request appropriate examinations of the head, neck and chest. Such requests are normally confined to the oral region.

8.3.1.3. Podiatrists and chiropractors may request x-ray examinations appropriate to their specialty.

8.3.1.4. The chief of medical staff (SGH), in consultation with the lead radiologist, may authorize the credentials committee to grant privileges to order radiographic exams to other healthcare providers (e.g. physician assistants, nurse practitioners, physical therapists, occupational therapists, etc.), consistent with their training and abilities.

8.3.2. Medical and Dental Use of Machine Produced Ionizing Radiation. Machine produced ionizing radiation for medical and dental use can only be applied by radiological medical practitioners, radiological dental practitioners, diagnostic radiologic technologists, dental technicians, or other individuals approved by the SGH for specialty applications. **(T-1).**

8.3.2.1. Radiological medical practitioners are health professionals with education and specialist training in the medical uses of radiation that are competent to independently perform or oversee procedures involving medical exposure in a given specialty.

8.3.2.1.1. Radiologists are licensed physicians that are certified in radiology or diagnostic radiology by the American Board of Radiology or the American Osteopathic Board of Radiology, or have completed a diagnostic radiology residency program approved by the Accreditation Council for Graduate Medical Education or the American Osteopathic Association.

8.3.2.1.2. Other physicians who use ionizing radiation for imaging outside the radiology department, e.g., fluoroscopy in the operating room; when acting as a radiological medical practitioner, have the same responsibilities for imaging protocols and for supervising equipment operation that would otherwise be assigned to a radiologist.

8.3.2.2. Radiological dental practitioners are health professionals, with education and specialist training in the dental uses of radiation, who are competent to independently perform or oversee procedures involving dental exposure in a given specialty.

8.3.2.3. Diagnostic radiologic technologists are the primary personnel who operate medical imaging equipment, deliver radiation to patients, and capture diagnostic images. Active duty member proficiency is demonstrated by award of the AF specialty code 4R0X1, skill level 3. Civilian proficiency can be evidenced by accreditation with the American Registry of Radiologic Technologists, or by meeting specific requirements delineated within applicable job core documents and performance work statements.

8.3.2.4. Dental technicians that operate ionizing radiation producing equipment receive appropriate education and training in the areas of anatomy, physics, technique and principles of radiographic exposure, radiation protection, radiographic positioning, and image processing that are relevant to dental imaging. Proficiency can be demonstrated by award of the AF specialty code 4Y0X1, skill level 3 or satisfying existing state certification programs for dental auxiliaries.

8.3.2.5. Medical and dental residents may operate ionizing radiation equipment in their specialty while under the general supervision of a fully qualified radiological medical or dental practitioner.

8.3.2.6. Diagnostic radiologic technologist trainees and dental technician trainees may operate ionizing radiation equipment in their specialty while under the direct supervision of a fully qualified radiologic technologist or dental technician.

8.3.2.7. The SGH, in consultation with the lead radiologist and URSO, may approve other individuals to operate ionizing radiation equipment for specialty medical and dental applications. These operations must be conducted under the supervision of a radiological medical/dental practitioner. **(T-1).** Examples of such operations include, but are not limited to: directed operating room usage of fluoroscopy by nurses; operation of grenz-ray systems, and operation of bone densitometry systems. The SGH, lead radiologist, and URSO may impose caveats on such operations as deemed necessary.

8.3.2.8. Initial and Annual Medical RPD Operator Training. Training shall be provided initially prior to utilization of equipment and at least annually thereafter for all staff that operate RPDs. **(T-1).** In addition, those staff that operate or supervise the operation of fluoroscopy systems must receive initial and annual training that covers at a minimum The Joint Commission requirements. **(T-1).** Continued education, with local radiation staff approval, may satisfy the annual training.

8.3.2.9. For deployed locations not subject to The Joint Commission requirements, active duty medics not specified **in paragraphs 8.3.2.1 through 8.3.2.6**, may use diagnostic imaging equipment of limited scope provided they follow a training plan approved by the: radiology consultant, dental consultant, radiologic technologist career field manager, or dental assistance career field manager as appropriate. **(T-1).** Or, these medics may be individually approved in writing by the radiology consultant or radiologic technologist career field manager after suppling adequate documented training of diagnostic imaging equipment technique and safety. **(T-1).**

8.3.3. Medical use of RAM: All use of RAM for medically licensed or permitted activities must be conducted by, or under the general supervision of, an authorized user and comply with associated license or permit conditions. **(T-0).**

8.3.4. Uses of Ionizing Radiation and RAM Ancillary to Medicine and Dentistry. Ancillary uses of ionizing radiation and RAM (e.g. equipment testing, quality control, calibration, training, and protocol development) that are reasonably expected to further safety and clinical efficacy objectives are allowable contingent on the following:

8.3.4.1. All applicable regulatory and accreditation qualification requirements are met and measures are implemented as necessary to ensure staff and public safety. **(T-0).**

8.3.4.2. Ionizing radiation and RAM shall not be applied to a human. **(T-0).**

8.3.4.3. The use is performed directly by, or under the general supervision of: an IRSO or URSO, a qualified medical physicist (QMP), a qualified biomedical equipment technician, service engineer, or an individual authorized to use the same equipment or RAM. **(T-1).**

8.3.5. Medical and Dental Research Use of Ionizing Radiation and RAM. The use of ionizing radiation and RAM for medical and dental research is allowable contingent on the following:

8.3.5.1. The research complies with DoDI 3216.02_AFI 40-402, *Protection of Human Subjects and Adherence to Ethical Standards in Air Force Supported Research*, **(T-0)** and measures are implemented as necessary to ensure staff and public safety in consultation with the URSO or IRSO. **(T-1).**

8.3.5.2. Ionizing radiation and RAM use that is not indicated for medical care shall not be applied to a human without investigational review board approval granted in consultation with a qualified medical physicist or radiation safety committee. **(T-1).**

8.3.6. Qualified Medical Physicists (QMPs). QMPs are competent authorities for quality control of modalities within the medical physics scope of practice. In this capacity, QMPs have authority to deem equipment or practices unsafe. Following such a determination, only a QMP can reinstate the equipment/practice. **(T-1).** Correspondingly, an individual will be deemed a QMP for a particular medical physics function under the following conditions:

8.3.6.1. All applicable regulatory and accreditation qualification requirements are met, and the individual is an Air Force active duty or civil service member that meets the approved qualification standard certified by the AF/SG consultant for medical physics. **(T-1).** (**Note:** The AF specialty code for medical physics is 43EXM.), *or*

8.3.6.2. All applicable regulatory and accreditation qualification requirements are met and the individual has been deemed by a different federal or state agency, professional certifying agency, or applicable host nation government as being qualified for the particular function. **(T-1).** In cases of ambiguity (e.g. differing qualification categorization schemes) an Air Force QMP for that particular function or the AF/SG consultant for medical physics can determine the individual's qualification status.

8.3.7. Medical physicist assistants are individuals that may perform certain medical physics functions under the general supervision of a QMP. Allowable functions are those that they have been deemed qualified for by the supervising QMP and are not precluded by applicable

regulations. **(T-1).** Medical physicist assistants shall have previously obtained a bachelor's degree (or higher) in a relevant field or certification as a radiologic technologist, nuclear medicine technologist, radiation therapist, or biomedical equipment technician. **(T-1).** Medical physicist assistants may be required to obtain supplemental training and qualifications to support radiology information technology systems. Medical physicist assistants possess the authority to temporarily deem equipment and practices unsafe pending consultation with a QMP.

8.4. Equipment Requirements.

8.4.1. The technical requirements in this section are applicable to medical and dental devices that use ionizing radiation, radioactive material, ultrasound, medical grade diagnostic displays, and magnetic fields for diagnostic or therapeutic purposes on a human that are owned, and under the operational control of, the Air Force. Contract devices operated by personnel provided under the terms of the contract shall provide the Air Force with documentation demonstrating ongoing compliance with all pertinent requirements of the applicable state or host nation. Other devices (e.g. Air Force owned equipment at an Army location) shall have a written arrangement between the affected parties to ensure that all applicable regulatory and accreditory requirements are met. **(T-3).** All devices sited at locations under Air Force jurisdiction shall comply with Air Force occupational and public safety requirements. **(T-1).**

8.4.2. All clinics shall implement a quality control program for each diagnostic imaging, nuclear medicine, and radiation therapy modality present. **(T-0).** These programs are aimed at ensuring staff and public safety while optimizing clinical efficacy and patient radiation dose. QMPs are deemed the subject matter experts for quality control of these systems and all associated quality control programs are subject to their inspection. In cases of conflict, the AF/SG consultant for medical physics is the final arbiter.

8.4.3. Equipment performance evaluations (EPEs) of medical ionizing radiation producing or imaging systems shall be performed in the following situations:

8.4.3.1. Initial EPEs (i.e., acceptance testing) shall be performed before the first use of a therapeutic or mammographic system on a human. **(T-0).** Other non-therapeutic (diagnostic) systems can be used in conjunction with vendor overseen applications setup or training after consultation with medical physicist. **(T-1).** An initial EPE must be conducted prior to all other uses of these systems on a human. **(T-3).**

8.4.3.2. Sustainment EPEs shall be performed annually (i.e. 12 months +/- 2 months) unless otherwise determined for a particular function by the AFMPWG. **(T-1).**

8.4.3.3. Post-modification EPEs shall be performed following repair, upgrade, modification, or relocation in a manner that may significantly affect the equipment's performance relative to a demonstrable standard. **(T-1).** The evaluation scope may be limited to that necessary for accessing compliance with potentially effected standards. However, evaluations that do not cover all components of a sustainment EPE cannot reset the evaluation cycle. The need for a post-modification EPE shall be determined by an individual qualified to perform an EPE on the subject equipment. **(T-1).** A qualified individual should be consulted prior to system modification.

8.4.3.4. Extensions in evaluation timelines can be granted by a QMP for up to 30 days of clinical use if the extension does not pose significant risk of harm or violate applicable regulations or accreditation standards.

8.4.3.5. The AF/SG consultant for medical physics can waive EPE requirements when compliance is incompatible with military necessity (e.g. use of a system immediately following repair during combat.). **Note:** See AFI 41-201, *Managing Clinical Engineering Programs*, for additional guidance. The QMP may be consulted for assistance with understanding manufacturer or accreditation requirements pertaining to EPEs.

8.4.4. Equipment performance evaluations (EPEs) of medical ionizing radiation producing or imaging systems shall comply with the following:

8.4.4.1. Applicable regulations, accreditation requirements and AFI 41-201. **(T-1).**

8.4.4.2. Existent AFMPWG standards for technical requirements. **(T-1).** In the absence of these standards, industry standards or vendor methodology should be used.

8.4.4.3. Existent AFMPWG standards for personnel qualifications. **(T-1).** QMPs may certify work of others provided that no applicable regulations or accreditation requirements are violated and the QMP verifies the technical acceptability of the work.

8.4.4.4. Initial EPEs shall not be performed by an equipment vendor or their representative. **(T-1).** Equipment vendors, or their representative, may assist in the evaluation (e.g. familiarize the evaluator with a novel equipment interface). The availability of a vendor representative during initial testing should be integrated into purchase agreements.

8.4.4.5. EPE records shall be published within 30 days of the completion of the EPE. **(T-3).**

8.4.4.6. For non-therapeutic devices, EPE records shall be maintained for the life of the equipment plus three years. **(T-1).**

8.4.4.7. For therapeutic devices, EPE records shall be maintained for the life of the equipment plus five years. **(T-1).**

8.4.5. Identified discrepancies of applicable regulations or accreditation requirements shall be managed consistent with those requirements. **(T-1).** If no corrective action timeline for the applicable regulation and accreditation requirements is defined; QMPs can define requirements and establish parameters for follow-up evaluations.

8.5. Facility Requirements.

8.5.1. **See paragraph 4.2** for design and classification requirements.

8.5.2. Facilities shall ensure that departments that medically use orally or intravenously administered radioactive material have a dedicated patient bathroom for that purpose. **(T-3).**

8.5.3. Facilities shall maintain records of installed radiation shielding until the relevant shielding is removed. **(T-1).**

8.5.4. Facilities shall post signs consistent with the following:

8.5.4.1. Signs advising patients to inform staff of potential pregnancies shall be clearly posted in departments where unsealed radioactive material is medically administered or ionizing radiation may be directly applied to the abdomen or pelvis. **(T-1).**

8.5.4.2. Signs demarcating magnetic resonance imaging safety zones 2, 3, and 4 consistent with American College of Radiology's magnetic resonance imaging safety zone recommendations. **(T-1).** (**Note:** Zone 1 is defined to be all areas freely accessible to the general public and does not need to be posted).

8.5.4.3. Warning signs on the entry to areas where magnetic fields may exceed 5 gauss. Signs shall communicate the area as being restricted to screened patients (if applicable) and trained personnel only. **(T-1).** Signs shall communicate if magnetic fields are present continuously or during use only. **(T-1).**

8.5.4.4. Doors and walls that contain lead, or other intentional radiation shielding material, shall be posted and include thickness information. **(T-3).** This requirement can be consolidated into a single placard for each effected room.

8.5.4.5. Signs shall be in English and in the language of the host nation (if different). **(T-1).**

8.6. Clinical Requirements.

8.6.1. The clinical requirements in this chapter are applicable to medical and dental devices that use ionizing radiation, radioactive material, ultrasound, medical grade diagnostic displays, and magnetic fields for diagnostic or therapeutic purposes on a human that are owned, and under the operational control of, the Air Force.

8.6.2. Each MTF shall have and implement written operating and safety procedures. **(T-1).**

8.6.3. AF clinics with mammography services offered, see requirements outlined in AFI 44-102, *Medical Care Management*.

8.6.4. During imaging or treatment, the operator shall be able to see, speak to, and hear the patient. **(T-1).** This capacity can be facilitated by electronic means (e.g. video cameras).

8.6.5. The following general imaging principles should be followed to the greatest extent possible consistent with clinical objectives.

8.6.5.1. Minimize patient radiation dose.

8.6.5.2. The minimum necessary anatomy should be exposed (e.g. limit computed tomography (CT) scan range, utilize radiographic collimation).

8.6.5.3. Unnecessary repeat studies should be avoided.

8.6.5.4. Imaging parameters (e.g., kilovoltage peak, milliampere-seconds, CT pitch) should be optimized for the patient's age and habitus.

8.6.6. For fluoroscopy and CT, patient exposure information shall be recorded in each patients' medical record and cumulative logs maintained. **(T-1).** The pertinent consulting regional medical physics office is the final arbiter in the sufficiency of recorded information.

8.6.7. Fluoroscopy (excepting microampere systems) shall be performed only by or under the immediate supervision of a physician granted fluoroscopy privileges. **(T-1).**

8.6.8. Exposure of Fertile Women to Radiation for Treatment or Diagnosis. Due to the increased radiation exposure risks to the conceptus (including all embryonic and fetal development stages), the possibility of pregnancy shall be addressed for any woman of reproductive capacity when considering any nuclear medicine procedure and/or any radiographic examination involving the lower abdomen. **(T-1).**

8.6.8.1. Before any medical procedure involving radiation is performed, the patient shall be asked if she is pregnant; if the patient is pregnant or there is a possibility that she could be pregnant, the attending physician shall be immediately informed. **(T-1).** Before any therapeutic procedure, a pregnancy test shall be given to all fertile women no sooner than 48 hours preceding the treatment. **(T-1).** Any inconclusive pregnancy test or statement made by the patient as to the potential of being pregnant should delay treatment until a conclusive negative pregnancy test can be obtained. **Note:** A pregnancy test cannot detect the presence of an embryo until several days post implantation.

8.6.8.2. Following an exposure of a conceptus to a primary ionizing radiation field (i.e., within the imaging field of view), or internalization of radioactive material, the responsible clinic shall request a fetal dose consult from a qualified medical physicist. **(T-1).** The patient's physician shall then ensure this consult is recorded in the medical record and interpreted to the patient. **(T-1).** If applicable, adhere to the reporting requirements in **paragraph 8.8** **(T-1).**

8.7. Staff and Public Safety Requirements.

8.7.1. Direct exposure to ionizing radiation shall comply with the following:

8.7.1.1. Individuals shall not be exposed to a direct ionizing radiation beam unless it is conducted as part of a study or procedure ordered by a referring medical practitioner or under an IRB approved research protocol. **(T-1).** Deliberate exposure of an individual for training, demonstration, or other non-healing art is specifically prohibited.

8.7.1.2. No staff or ancillary personnel should be exposed to a direct ionizing radiation beam outside of their own medical care. If a patient must be held in position, mechanical supports or immobilization aids should be used for all therapy applications and when feasible for diagnostic applications. In diagnostic applications, where mechanical devices cannot be used, the individual selected to hold the patient should be a willing, non-pregnant, adult relative or guardian (18 years of age or older). If a relative or guardian is not available, the patient should be held by a staff member from a department other than diagnostic imaging. Diagnostic imaging staff should be the last resort for holding a patient. The individual holding the patient shall be positioned as far away as possible from the direct beam and provided PPE to the extent it does not preclude clinical objectives. **(T-3).**

8.7.1.3. For fluoroscopic applications, if direct beam exposure is unavoidable, care should be exercised to minimize the extent of the exposure. The use of PPE (e.g. leaded gloves) is highly discouraged in the direct beam on systems with automatic brightness control due its pronounced effect on patient dose and the concomitant increase in scatter radiation experienced by the staff. The use of PPE adjacent to the direct beam, or in the direct beam on a system not operating with automatic brightness control, is encouraged provided it does not preclude clinical objectives.

8.7.2. Indirect exposure to ionizing radiation shall comply with the following:

8.7.2.1. Individuals, other than the patient, shall not be in linear accelerator vaults or high dose rate brachytherapy vaults during machine use. **(T-1).**

8.7.2.2. Only individuals whose presence is necessary shall be in the room during the operation of a stationary RPD or within 6 feet of the x-ray source, or patient, during operation of a portable RPD. **(T-1).** Individuals within these exclusion zones shall be protected with shielding appropriate for the situation as determined by the URSO and/or IRSO (e.g., PPE, portable shields, etc.). **(T-1).**

8.7.2.3. Exceptions can be granted by the URSO and/or IRSO if specific circumstances still enable compliance with dose limits and the ALARA principle.

8.7.3. See **paragraph 4.5** and AFMAN 48-125 for occupational radiation monitoring requirements.

8.7.4. Departments utilizing RPDs shall implement a PPE program in consultation with the URSO or IRSO. **(T-3).** Pertinent details include:

8.7.4.1. Sufficient quantities of PPE should be readily available to staff.

8.7.4.2. PPE should be stored in manner that preserves its effectiveness.

8.7.4.3. PPE shall be inventoried and inspected initially and annually for defects. **(T-1).** Inspection may be conducted either radiographically or through a combination visual and tactile approach.

8.7.4.4. The URSO or IRSO is the final arbiter for the adequacy of PPE and inspection criteria.

8.8. Adverse Medical Incident Reporting and Notification.

8.8.1. Urgent matters that could result in future patient, staff, or public injury, (e.g. identification of significant defects in equipment that is widespread) shall be promptly reported to AFMRA/SG3PB. **(T-1).**

8.8.2. MTFs shall comply with reporting and notification requirements levied by regulatory agencies (e.g. Food and Drug Administration) **(T-0)**, applicable accreditation agencies (e.g. Joint Commission) and other DoD or AF regulations **(T-1)**. Pertinent examples include:

8.8.2.1. Incident reporting requirements levied by AFI 91-204.

8.8.2.2. Radioactive material incident reporting requirements levied by Title 10 CFR Section 35.3045, *Report and Notification of a Medical Event*, and AFMAN 40-201.

8.8.2.3. Medical device reporting requirements levied by the Safe Medical Devices Act of 1990, Title 21 CFR Part 803, *Medical Device Reporting*, to Title 21 CFR Part 807, *Establishment Registration and Device Listing for Manufacturers and Initial Importers of Devices*, and AFI 44-119, *Medical Quality Operations*. **Note:** This reporting is for incidents involving device malfunction, not operator misuse, with potential to cause serious harm or death. Reporting is accomplished through the medical logistics in accordance with AFI 41-201 and may be facilitated by the SGH's patient safety program.

8.8.2.4. Joint Commission reviewable sentinel events involving ionizing radiation. Reporting and coordination of follow-up actions for sentinel events is performed by the patient safety manager or as directed by the SGH in accordance with AFI 44-119. **(T-1).**

8.8.3. Adverse Medical Incident Determination.

8.8.3.1. Adverse medical incidents that require reporting to AFMRA/SG3PB (Radiation Program) include:

8.8.3.1.1. Medical Events. A medical event is defined as an adverse event which places a patient or human research subject at risk of injury, that was not due to the noncompliance of the individual, in which the use of radiation for medical applications results in: **(T-1).**

8.8.3.1.1.1. An unintended event where a physician determines that demonstrable damage has occurred to an organ or a physiological system of an individual due to, or suspected to be due to, exposure to medical ionizing radiation.

8.8.3.1.1.2. Prolonged fluoroscopy with a cumulative dose exceeding 15 Gy to a single region of skin.

8.8.3.1.1.3. For radioactive material applications; meeting the criteria specified in 10 CFR 35.3045.

8.8.3.1.1.4. For external beam radiotherapy; meeting one of the following criteria:

8.8.3.1.1.4.1. The total dose delivered differs from the prescribed dose by 10% or more;

8.8.3.1.1.4.2. The fractionated dose delivered exceeds the prescribed dose, for a single fraction, by 50% or more;

8.8.3.1.1.4.3. The treatment is delivered to the wrong individual;

8.8.3.1.1.4.4. The wrong treatment modality is used; or

8.8.3.1.1.4.5. The treatment is delivered to the wrong site or target volume.

8.8.3.1.2. Patient Facilitated Adverse Incidents. A patient facilitated adverse incident is defined as an adverse event that occurred due to the noncompliance of a patient or human research subject, in which radiation has or may cause unintended permanent functional damage to an organ or a physiological system, as determined by a physician.

8.8.3.1.3. Reportable Doses to a Conceptus or Nursing Child. MTFs shall report any total effective dose equivalent to a conceptus (i.e., embryo or fetus) or nursing child that is greater than 50 mSv (5 rem) that is a result of the administration of machine produced radiation and/or RAM to a pregnant individual or nursing mother from studies or treatments where the resultant dose was not specifically approved, in advance, by the requesting physician. **(T-0).**

8.8.3.2. The associated clinic shall notify the responsible MTF's SGH, or their designee, and the URSO or IRSO no later than the next calendar day after discovery of a potential adverse medical incident. **(T-1).** The SGH, or designee, will determine if an actual

reportable incident occurred. **(T-1).** Consultation with an expert in radiation (e.g. radiologist, nuclear medicine authorized user, radiation oncologist, and/or medical physicist) is advised.

8.8.4. Adverse Medical Incident Reporting and Notification.

8.8.4.1. If a reportable adverse medical incident is determined to have occurred, or it is determined that one could have occurred but cannot be excluded out at that time, the MTF will initiate reporting and notification requirements. **(T-1).**

8.8.4.2. A verbal report shall be provided to AFMRA/SG3PB (Radiation Program) within 7 calendar days of the discovery and a written report within 15 calendar days of the discovery. **(T-1).** Written reports will be routed through the responsible MAJCOM/SGP and will include **(T-1):**

8.8.4.2.1. The clinic's organization and base;

8.8.4.2.2. The name and unit of the prescribing physician, chief of radiation oncology or diagnostic imaging, and any associated medical physicists or radiation safety officers;

8.8.4.2.3. A brief description of the event and its cause;

8.8.4.2.4. The effect, if any, on the individual(s) that received radiation exposure.

8.8.4.2.5. Actions taken, or planned, to prevent recurrence;

8.8.4.2.6. The status of notification to the individual (or the individual's responsible relative or guardian) and any information that was provided; and

8.8.4.2.7. The report may not contain personal identifiable information.

8.8.4.3. The following notifications shall be made:

8.8.4.3.1. The clinic shall notify the referring physician, or, if unavailable, the responsible referring clinic chief within 24 hours. **(T-1).**

8.8.4.3.2. The affected individual shall also be notified no later than 24 hours after its discovery, unless the referring physician or clinic chief elects to personally inform the individual or that, based on medical judgment, telling the individual would be harmful. **(T-1).**

8.8.4.3.3. The clinic is not required to notify the affected individual without first consulting the referring physician. However, if the referring physician or the affected individual cannot be reached within 24 hours, the clinic shall notify the individual as soon as possible thereafter. **(T-1).**

8.8.4.3.4. The clinic may not delay any appropriate medical care, including any necessary remedial care as a result of the medical event, because of a delay in notification. **(T-1).**

8.8.4.3.5. To meet the requirements of this section, notification may be made to that affected individual's responsible relative or guardian. For reportable doses to a conceptus or nursing child; the affected individual may be regarded as the mother.

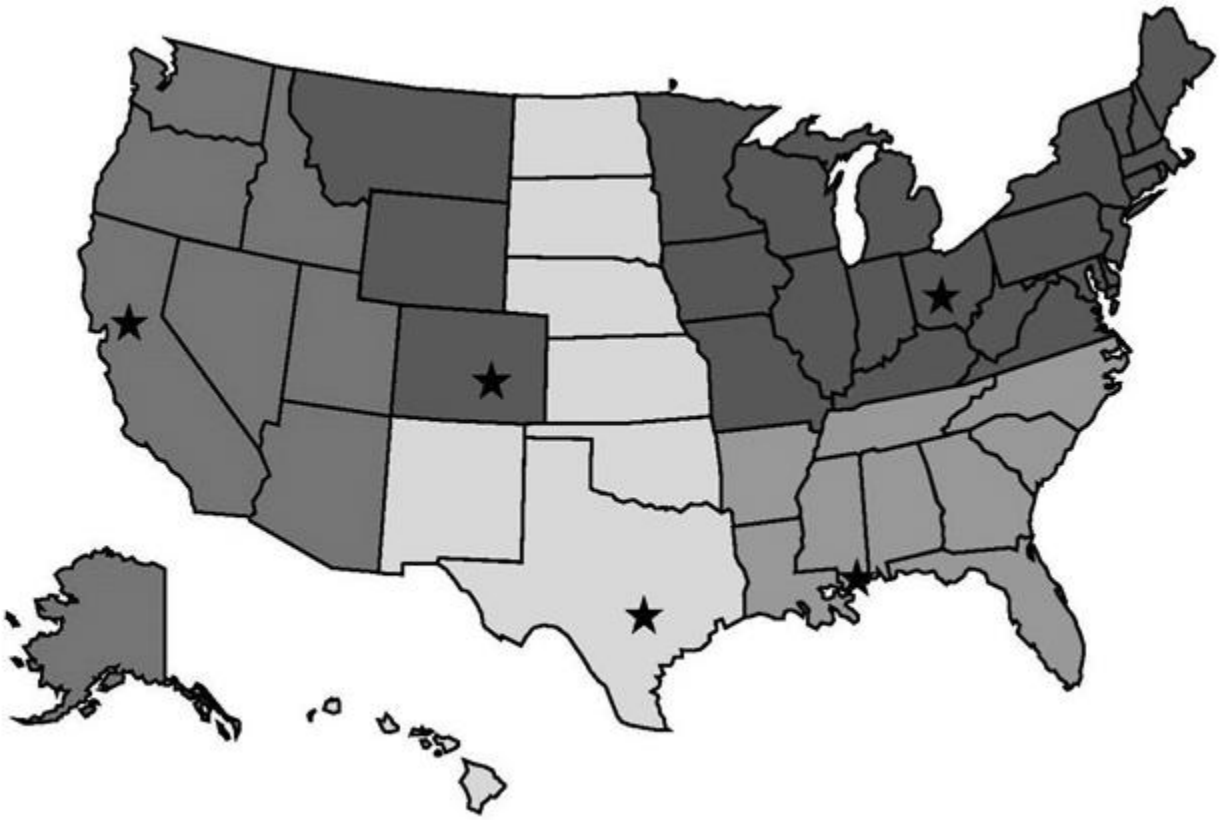
8.8.4.4. If the affected individual was notified under **paragraph 8.8.4.3**, the clinic shall also provide a written report to the individual within 15 days after discovery of the incident. **(T-1).** A clinic may send either:

8.8.4.4.1. A copy of the report that was submitted to the MAJCOM/SGP; or

8.8.4.4.2. A brief description of both the event and the consequences that may affect the individual.

8.8.4.5. The clinic shall retain a record of a medical event or patient facilitated adverse incident for 50 years per the Air Force records disposition schedule. **(T-1).** The record shall contain the information specified in **paragraph 8.8.4.2** **(T-1).**

Figure 8.1. REGIONAL CONSULTING MEDICAL PHYSICS OFFICES.



Note:

1. The AF/SG consultant for medical physics can authorize deviations from the above map, define regional consulting offices for locations not listed where the Air Force is the lead service, and will determine other worldwide locations' regional consulting offices based on manning availability.
2. Active duty members possessing medical physics qualifications that are not assigned to a regional consulting office can be called upon to support regional requirements. They are considered adjunct staff to the regional office covering the geographic area in which they are assigned.

3. Regional offices can derive support from other Air Force sites and federal entities when needed and available.
4. Support can be sought by alternative means if the overseeing regional medical physics office deems direct support to not be feasible and advantageous to the government.

5. Support provided in accordance with written agreements between the leadership of effected organizations (e.g. telerad agreements, memorandums of agreement with other DoD entities, etc.) are not confined by the above map.

Table 8.1. REGIONAL CONSULTING MEDICAL PHYSICS OFFICES.

Region	Regional Consulting Medical Physics
Northeast	Wright Patterson AFB
Southeast	Keesler AFB
Central	JBSA-Lackland
Mountain	USAF Academy
West	Travis AFB
Other	AF/SG MP Consultant Determined

Chapter 9

AIR FORCE RADIATION SAFETY COMMITTEE (AF-RSC)

9.1. Purpose. The AF-RSC is responsible for providing oversight of sources of radiation not covered by AFMAN 40-201 or AFI 91-108 to ensure they are operated in a safe and compliant manner. The AF-RSC is also responsible for the development and execution of the AF's radiation protection program for both planned and emergency exposure situations as outlined in this manual.

9.2. AF-RSC Members Organizations and Responsibilities.

9.2.1. **Table 9.1** summarizes the membership of the AF- RSC. At the request of the AF-RSCES or the AF-RSC chairman additional advisors can be invited.

9.2.2. AF-RSC chair: Open AF-RSC meetings, and preside over their proceedings. Assist in maintaining the discussion focus of the agenda items, and resolve disagreements. Adjourn meeting once completed.

9.2.3. AF-RSC executive secretary (AF-RSCES): Organization, scheduling and planning of the AF-RSC meeting, and generation of meeting minutes.

9.2.4. AF-RSC members: Ensure either they or their alternates attend scheduled AF-RSC meetings to represent their functional areas or commands, and are prepared to address agenda items.

Table 9.1. AF-RSC Membership.

Role	AF-RSC Voting Membership	
	Primary	Alternate
Chair, AF-RSC (AF/SG3/4 or delegate)	1	1
Executive Secretary, AF-RSC (AFMRA/SG3PB)	1	1
AF/SG Consultant for Medical Physics (AFMRA/SG3PB)	1	1
Bioenvironmental Engineering Representative (AFMRA/SG3PB)	1	1
Medical Readiness (AFMRA/SG3X)	1	1
Installations, Environment and Energy Representative (SAF/IE)	1	1
AF Acquisition Representative (SAF/AQ)	1	1
AF Logistics Representative (AF/A4L)	1	1
AF Civil Engineering Representative (AF/A4C)	1	1
AF Inspection Agency Representative (AFIA/SG)	1	
Command Surgeons Representative (ACC/SG; AETC/SG; AFCENT/SG; AFGSC/SG; AFMC/SG; AFRC/SG; AFSOC/SG; AMC/SG; ANG/SG; PACAF/SG; USAFE-AFFRICA/SG)	1	1
USAFSAM Representative (711 HPW)	1	1

Air Force Safety Center Representative (AFSEC/SEWN)	1	
Legal Advisor (AFLOA/JAC)	1 (non-voting)	1 (non-voting)

9.3. Business Practices.

9.3.1. A formal AF-RSC meeting will occur at least semi-annually, but more frequently if determined necessary by the Chair or the majority of the committee. AF- RSC meetings are scheduled by the AF-RSCES.

9.3.2. Ad hoc meetings can be called by the chair on an as needed basis. These meetings are called to address emergent issues that require timely action by the AF-RSC.

9.3.3. Rapid staffing of an action can be approved by the chair to address emergent issues for which an ad hoc meeting cannot be convened. For a rapid staffing the AF- RSCES will prepare a staffing package that addresses the issue and provides the voting members of the AF-RSC the ability to vote without meeting. All rapid staffing actions will be discussed at the next AF-RSC meeting.

9.3.4. Quorum for a meeting is established by having a least one-half of the voting members present.

9.3.5. The chair and the AF-RSCES will establish the specific procedures for the conduct of routine meetings, ad hoc meetings and rapid staffing actions.

9.3.6. Motions and Voting.

9.3.6.1. Only members and guests recognized by the chair may speak.

9.3.6.2. Generally, before any item can be discussed, there should be a motion made and seconded. Once a motion has been seconded, discussion will follow. After discussion, one of four things can happen:

9.3.6.2.1. There can be a vote on the motion. In the event of a tie, the chair casts the deciding vote.

9.3.6.2.2. The motion can be amended (second required). Then there can be discussion on the amendment. The amendment can be voted. If the amendment passes, the motion automatically passes. If the amendment fails, the motion still stands and can be discussed until voted.

9.3.6.2.3. The motion can be tabled (second required). There can be no discussion on a motion to table; a vote must be taken immediately. If the vote is to table, no further discussion can take place on the motion.

9.3.6.2.4. There may be no action on the motion; therefore, it becomes old business at a future meeting.

9.3.6.3. Motions must be clear and concise. A motion to "improve practices" would be vague and discussions could meander. However, a motion to "implement x-ray radiation safety practices for a new x-ray device" is specific and could be effectively discussed and acted on.

9.4. Disagreement Resolution. The chair of the meeting is responsible for maintaining order. On procedural questions, the chair's ruling will be determinative and final.

9.5. Record Keeping.

9.5.1. The AF-RSCES will ensure that appropriate files are maintained for each. This will include as a minimum, the agenda, meeting minutes, copy of all reference materials, background information, memoranda, standing reports, and presentations applicable to that quarters meeting.

9.5.2. Committee members are responsible for providing applicable materials to the AF-RSCES as requested.

9.5.3. Records of AF-RSC meetings, to include agendas, presentations, and meeting minutes, shall be kept for the duration of existence of the AF-RSC.

DOROTHY A. HOGG
Lieutenant General, USAF, NC
Surgeon General

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

5 U.S.C. Section §552a, *Privacy Act of 1974*

10 CFR §20.2106, *Records of Individual Monitoring Results*

10 CFR §33.13, *Requirements for the Issuance of a Type A Specific License of Broad Scope*

10 CFR §35.2, *Definitions*

10 CFR §35.24, *Authority and Responsibilities for the Radiation Protection Program*

10 CFR §35.3045, *Report and Notification of a Medical Event*

10 CFR §35.59, *Recentness of training*

10 CFR §35.75, *Release of Individuals Containing Unsealed Byproduct Material or Implants Containing Byproduct Material*

10 CFR §35.190, *Training for uptake, dilution, and excretion studies*

10 CFR §35.290, *Training for imaging and localization studies*

10 CFR §35.390, *Training for use of unsealed byproduct material for which a written directive is required*

10 CFR §35.392, *Training for the oral administration of sodium iodide I-131 requiring a written directive in quantities less than or equal to 1.22 gigabecquerels (33 millicuries)*

10 CFR §35.394, *Training for the oral administration of sodium iodide I-131 requiring a written directive in quantities greater than 1.22 gigabecquerels (33 millicuries)*

10 CFR §35.490, *Training for use of manual brachytherapy sources*

10 CFR §35.590, *Training for use of sealed sources and medical devices for diagnosis*

10 CFR §35.690, *Training for use of remote afterloader units, teletherapy units, and gamma stereotactic radiosurgery units*

10 CFR, Appendix B to Part 20, *Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage*

10 CFR Part 20, *Standards for Protection Against Radiation*

21 CFR Part 803, *Medical Device Reporting*

21 CFR Part 807, *Establishment Registration and Device Listing for Manufacturers and Initial Importers of Devices*

21 CFR Part 900, *Mammography*

29 CFR §1910.1096, *Ionizing Radiation*

29 CFR §1910.1096(b), *Exposure of Individuals to Radiation in Restricted Areas*

29 CFR §1910.1096(n), *Record*s

29 CFR §1910.1096(o), *Disclosure to former employee of individual employee's record*

42 U.S.C. §263b, *Certification of Mammography Systems*

42 U.S.C. §2121, *Authority of Commission*

42 U.S.C. §§ 2011-2021, 2022-2286i, and 2296a-2297h-13, *Atomic Energy Act of 1954*

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PL 109-58, *Energy Policy Act of 2005*

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Prescribed Forms

AF Form 2753, *Radiological Sampling Form*

Adopted Forms

AF Form 847, *Recommendation for Change of Publication*

Abbreviations and Acronyms

AF—Air Force

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFMPWG—Air Force Medical Physics Working Group

AFMRA—Air Force Medical Readiness Agency

AFPD—Air Force Policy Directive

AF-RSC—Air Force Radiation Safety Committee

AF-RSCES—Air Force Radiation Safety Committee Executive Secretariat

AFSEC—Air Force Safety Center

ALARA—As Low As Reasonably Achievable

ATP—Army Techinque Publication

Bq—Becquerel

CFR—Code of Federal Regulations

Ci—Curie

CT—Computed Tomography

DoD—Department of Defense

DoDI—Department of Defense Instruction

DoDM—Department of Defense Manual

EF—Equilibrium Factor

EPA—Environmental Protection Agency

EPE—Equipment Performance Evaluation

GS—General Scale

IRSO—Installation Radiation Safety Officer

JP—Joint Publication

MAJCOM—Major Command

MRER—Master Radiation Exposure Registry

MTF—Military Treatment Facility

NATO—North Atlantic Treaty Organization

NCRP—National Council on Radiation Protection

pCi/L—picoCurie/Liter

PPE—Personal Protective Equipment

QMP—Qualified Medical Physicist

RAM—Radioactive Material

rem—Roentgen Equivalent Man

RPD—Radiation Producing Device(s)

RSC—Radiation Safety Committee

RSO—Radiation Safety Officer

SGH—Chief of Medical Staff

SI—International System of Units

SORN—System of Records Notice

mSv—milliSievert

URSO—Unit Radiation Safety Officer

USAFSAM—United States Air Force School of Aerospace Medicine

U.S.C.—United States Code

WLM—Working Level Month

Terms

91(b) Material—RAM exempted from Nuclear Regulatory Commission licensing controls under Section 91(b) of the AEA of 1954, as amended, in the interest of national defense, under the possession of the DoD. These include the RAM in nuclear weapons – e.g., uranium isotopes, plutonium isotopes, tritium, and other radioactive components of nuclear weapons. These also include the components of nuclear reactors that fall under the definition of 91(b).

Absorbed Dose (D)—The energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the rad and the Gray (1 rad = 0.01 Gray).

Activity—The rate of disintegration (transformation) or decay of radioactive material. The units of activity are the Curie (Ci) and the Becquerel (Bq).

Administrative Dose—A value assigned in a dose report in cases where a dosimeter is not returned for processing at the end of the wear period, is damaged, or cannot be evaluated due to other factors.

AF Radioisotope Committee—A committee established to satisfy the requirements of with the Air Force master materials license to coordinate the administrative and regulatory aspects of licensing, possessing, distributing, using, transferring, transporting and disposing of all radioactive material in the Air Force except that transferred from Department of Energy to the Department of Defense in nuclear weapon systems, certain radioactive components of weapons systems and nuclear reactor systems, components and fuel controlled under Section 91 of the Atomic Energy Act of 1954, as amended.

ALARA—Acronym for "as low as is reasonably achievable" means making every reasonable effort to maintain exposures to radiation as far below applicable dose limits as is practical, consistent with the purpose for which the activity is undertaken, taking into account the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations and in relation to utilization of nuclear energy, RAM, and radiation in the public interest.

Annual Limit on Intake—The derived limit for the amount of radioactive material taken into the body of an adult (individual 18 or more years of age) worker by inhalation or ingestion in a year. Annual limit on intake is the smallest value of intake of a given radionuclide in a year by the reference man that would result in a committed effective dose equivalent of 50 mSv (5 rem) or a committed dose equivalent (H_T) of 500 mSv (50 rem) to any individual organ or tissue. Annual limit of intakes are listed in 10 CFR, *Appendix B to Part 20*.

Authorized User—For non-medical permits, authorized users are approved by the RSC or in the absence of an RSC, the RICS based on a review of qualifications, or by the Permittee if authorized by a permit condition. For medical permits, in accordance with 10 CFR §35.2: a physician, dentist or podiatrist who meets the requirements in 10 CFR §35.59, and §35.190(a), §35.290(a), §35.390(a), §35.392(a), §35.394(a), §35.490(a), §35.590(a) or §35.690(a), and is an authorized user as specified on a USAF RAM permit.

Background Radiation—Radiation from cosmic sources and naturally occurring radioactive materials. This includes radon (except as a decay product of source or special nuclear material) and global fallout as it exists in the environment from the testing of nuclear explosive devices.

The term "background radiation" does not include radiation from source, byproduct, or special nuclear materials regulated by the Nuclear Regulatory Commission.

Becquerel (Bq)—The International System of Units (SI) unit of radioactivity is equivalent to one disintegration per second. One Ci is equivalent to 3.7E10 (37 billion) Bq.

Bioassay (Radio-bioassay)—The determination of kinds, quantities or concentrations, and, in some cases, the locations of RAM in the human body, whether by direct measurement (in-vivo counting) or by analysis and evaluation of materials excreted or removed (in-vitro) from the human body.

Byproduct Material—Any radioactive material (except source or special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident to the process of producing or using source or special nuclear material. The definition of byproduct material has changed with Public Law 109-58, *Energy Policy Act of 2005* to include some forms of naturally occurring or accelerator produced radioactive material (reference AFPD 40-2, *Radioactive Materials (Non-Nuclear Weapons)*).

Committed Dose Equivalent ($H_{T,50}$—)—The dose equivalent to organs or tissues that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

Committed Effective Dose Equivalent ($H_{E,50}$)—The whole body dose equivalent obtained by adding the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent ($H_{T,50}$) of these organs or tissues.

Conceptus—The developing human organism from conception until time of birth. Referred to as the embryo/fetus.

Curie—A unit of radioactivity equal to 37 billion Becquerels; see Becquerel.

Declared Pregnant Individuals—All pregnant AF military occupational radiation workers. Also AF civilian occupational radiation workers who have voluntarily informed their workplace supervisor or primary care manager, in writing, of her pregnancy and the estimated date of conception. The declaration remains in effect until the declared pregnant individual withdraws the declaration in writing or is no longer pregnant.

Deterministic Effect—Biological effects for which the severity of the effect in an exposed individual varies with the dose, and for which a threshold usually exists (e.g., skin erythema and cataracts). The adherence to federal dose limits eliminates these effects; however commanders need to be aware of deterministic risks when exceeding these limits in incident or contingency operations.

Deep Dose Equivalent (H_D)—Dose assigned to personnel from external whole-body exposure, it is the dose equivalent at a tissue depth of one cm (1000 mg/cm2) which is expressed in units of rem or Sievert (Sv).

Dose (radiation dose)—A generic term that includes absorbed dose, dose equivalent (H_T), effective dose equivalent (H_E), committed dose equivalent, committed effective dose equivalent, or total effective dose equivalent.

Dose Equivalent (H_T—)—The product of the absorbed dose in tissue (D_T) and the quality factor (Q), and all other necessary modifying factors at the location of interest where $H_T = D_T * Q$. The

units of dose equivalent are the rem and Sievert (Sv) (0.01 Sv = 1 rem). The dose equivalent in Sv is equal to the absorbed dose in Gray multiplied by the Q. Its purpose is to have a single unit, regardless of the type of radiation, describing the radiation effect on humans.

Effective Dose Equivalent—The sum over specified tissues of the dose equivalent multiplied by a weighting factor for that tissue, w_T. Expressed in unit of Sievert (Sv) or rem (100 rem = 1 Sv).

Exposure—In radiation protection, the act or occurrence of being exposed to radiation or RAM. In risk management, the frequency and length of time subjected to a hazard.

General Supervision—Circumstance in which an individual has authority and responsibility for an action, but is not required to be physically present during the performance of the action.

Gray—The SI unit of any absorbed dose. One Gray is equal to the absorption of one joule per kilogram of material (1 Gray = 100 rad).

Hazard—Any real or potential condition that can cause injury, illness, death of personnel, damage to or loss of equipment or property, or mission degradation.

High Radiation Area—Any area with dose rates greater than 0.1 rem (1 mSv) in one hour, 30 centimeters from the source, or from any surface through which the ionizing radiation penetrates. Areas at licensee facilities must be posted as "high radiation areas" and access into these areas is maintained under strict control. **(T-0).**

Installation—A grouping of facilities located in the same vicinity, which support particular functions. Installations may be elements of a base. The term installation applies to real properties such as depots, arsenals, hospitals, terminals, and other special mission installations.

Intrinsic Radiation—Radiation emitted through the weapon surface or directly from exposed components of nuclear weapons.

Investigation Action Level—1) A dose equivalent value or radionuclide intake activity set by the IRSO that requires further investigation when exceeded. A 10% default value is recommended for all dose types (e.g., 125 mrem for whole body quarterly badges, 375 mrem for lens of eye quarterly badges, 1250 mrem for extremity quarterly badges, 25 mrem for pregnant women monthly badges), however, at the IRSO discretion, levels can be tailored to each using section's historical dosimetry data in order to promptly identify and correct adverse trends; (2) The committed effective dose equivalent from radioactive material ingested, inhaled, or otherwise taken into the human body or dose equivalent from an external radiation source to which the worker is occupationally exposed which justifies further investigation.

Ionizing Radiation—Any electromagnetic or particulate radiation capable of producing ions, directly or indirectly during its passage through matter. It includes gamma rays, x-rays, alpha particles, beta particles, neutrons, protons and other particles and electromagnetic waves capable of producing ions.

Medical Event—An event that meets the criteria in paragraph 8.8.3.1.1.

Member of the Public—Any individual except when that individual is receiving an occupational dose.

Occupancy Factor—The fraction of time an area of interest is physically occupied by the same individual.

Occupational Dose—The dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation or to RAM from regulated and unregulated sources of radiation, whether in the possession of the licensee or other person. Occupational dose does not include dose received from background radiation; from any medical administration the individual has received; from exposure to patients administered RAM and are properly released/disharged; from voluntary participation in medical research programs; or as a member of the public.

Prescribed Dose—(1) For brachytherapy, stereotactic radiosurgery, or other radiation therapy procedures involving radioactive material, the total dose as documented in the written directive;

(2) For external beam radiotherapy, the total dose and dose per fraction as documented in the written directive.

Qualified Expert—A person who, by virtue of training and experience, can provide competent authoritative guidance about certain aspects of radiation safety or a person having knowledge and training to provide advice regarding radiation protection principles, standards and measurements. In general, a BEE or health physicist with training and experience appropriate to the radiation protection issues to be managed is considered a qualified expert. Ideally, persons should have certification from the American Board of Health Physics, the American Board of Medical Physics, the American Board of Radiology, or the American Board of Industrial Hygiene, to be considered a qualified expert in these respective fields.

Note—A biomedical equipment repair technician is considered a qualified expert to support quality control, equipment repair, collection of data and calibration in accordance with AFI 41-201.
Note—Nuclear medicine or diagnostic radiology: A medical or health physicist may be considered a qualified expert when they have had modality specific training and performed three surveys for a particular type of equipment under the supervision of a board certified medical physicist or a medical physicist who meets all the education, training and experience necessary to complete all aspects of American College of Radiology or American Board of Medical Physics board certification.
Note—Radiation therapy: A medical physicist must be supervised by a board certified radiation therapy physicist until all education, training and experience necessary to complete board certification is met. **(T-1).**
Note—Mammography physics: A qualified expert must meet the education, training and experience in Food and Drug Administration's Mammography Quality Standards Act as codified in 42 U.S.C. § 263b, *Certification of Mammography Systems.* **(T-1).**
Note—A senior health physicist or BEE with readiness experience (e.g., a current or former member of Air Force Radiation Assessment Team unit type codes) can be considered a qualified expert for purposes of accident and incident response and/or consequence management involving radiological and nuclear materials.
Note—Qualified Medical Physicists (QMPs) and Medical Physicist Assistants qualifications are delineated **in paragraphs 8.3.6 and 8.3.7**, respectively.

Quality Factors and Dose Equivalent—The probability of stochastic health effects (like cancer) is dependent not only on the absorbed dose, but also on the type of radiation causing the

dose. This has been taken into account by weighting the absorbed dose at a point in tissue with a radiation weighting factor, w_T, for a given radiation. The radiation weighting factor in turn is based on the density of ionization along a track of the radiation as it traverses a tissue, referred to as its linear energy transfer. The weighted absorbed dose under this system is called the dose equivalent, H, and expressed in units of rem. The dose equivalent is the dosimetric quantity used in Title 10, Code of Federal Regulations, Part 20, for the purposes of radiation protection from RAM. For the purposes of individual monitoring using personnel dosimetry, three specific quantities of dose equivalent are used:

Rad—A conventional unit for the measurement of absorbed dose. One rad is equal to an absorbed dose of 100 ergs per gram of material (1 rad = 0.01 Gy = 1 cGy).

Radiation—For the purposes of this regulation, unless otherwise specified, ionizing radiation and specific, medical uses of non-ionizing radiation, such as radio- or microwaves, or visible, infrared, or ultraviolet light.

Radiation Area—Any area with radiation levels greater than 5 millirem (0.05 milliSievert) in one hour at 30 centimeters from the source or from any surface through which the radiation penetrates.

Radiation Safety—For the purposes of this manual, a scientific discipline whose objective is the protection of people and the environment from unnecessary exposure to radiation. Radiation safety is concerned with understanding, evaluating, and controlling the risks from radiation exposure relative to the benefits derived. Health physics and radiation protection are synonyms.

Radiation Safety Committee—A group of individuals appointed by a Permittee to oversee all uses of permitted byproduct material. The Radiation Safety Committee (RSC) must include an authorized user of each type of use permitted, the RSO(s), a representative of the nursing service (for medical RSCs only), and a representative of management who is neither an authorized user nor an RSO. RSCs may include other members the licensee considers appropriate.

Radiation Safety Officer—The person that the commander designates, in writing, as the person responsible for the installation, organization or unit radiation safety program. The term "Radiation Safety Officer" is a functional title and does not denote a commissioned status or specialty code. The RSO must have the education, training, and professional experience needed for the job.

Radiation Source—Any non-exempt quantity of RAM, equipment, or devices which spontaneously generate or are capable of generating ionizing radiation. Examples include nuclear reactors, medical and dental radiographic and fluoroscopic x-ray systems, particle generators and accelerators, certain electromagnetic generators operating at electrical potentials that result in the production of x-rays, x-ray diffraction, industrial radiographic and spectrographic equipment, electron microscopes, electron-beam welding, melting, and cutting equipment, nuclear moisture or density gauges, byproduct, source, and special nuclear materials, natural or accelerator-produced radioactive materials, materials containing induced or deposited radioactivity and radioactive commodities.

Radiation Worker—An individual who may be occupationally exposed to ionizing radiation in the course of their duties or designated by the IRSO. For the purposes of this regulation, the term radiation worker does not broadly include contractors, see **Purpose, Applicability, and paragraph 2.13** for contractor related distinctions.

Rem—The conventional unit of any of the quantities expressed as dose equivalent. The dose equivalent in rem is equal to the absorbed dose in rad multiplied by a radiation quality factor, Q (1 rem = 0.01 Sv = 1 cSv).

Restricted Area—An area, access to which is limited by the facility for the purpose of protecting individuals against undue risks from exposure to RAM and radiation producing devices. Restricted area does not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area.

Risk—The probability and severity of loss or adverse impact from exposure to various hazards.

Risk Assessment—The process of detecting hazards and their causes, and systematically assessing the associated risks.

Risk Management—A logical six step thought process, applicable to any situation or environment, for identifying and controlling hazards to protect the force.

Sentinel Event—The Joint Commission defines a sentinel event as a patient safety event that reaches a patient and results in either: death, permanent harm, or severe temporary harm and intervention required to sustain life. This includes: prolonged fluoroscopy with a cumulative dose >15 Gy to a single field, and delivery of radiotherapy to the wrong body region or 25% above the planned radiotherapy dose.

Shallow or Skin Dose Equivalent—The external exposure of the skin or an extremity, taken as the dose equivalent at a tissue depth of 0.007 cm (7 mg/cm^2 – the average depth of the germinal cell layer) averaged over an area of 1 cm^2.

Shallow Dose Equivalent (Hs)—Dose equivalent measured at a tissue depth of 0.007 cm (7 mg/cm2, the average depth of the germinal cell layer) averaged over an area of 1 cm^2.

Sievert (Sv)—The SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in Sievert is equal to the absorbed dose in Gray multiplied by appropriate radiation weighting factors, w_R; 1 Sv = 100 rem. One milliSievert (mSv) is 0.001 Sv (0.1 rem or 100 mrem).

Stochastic Effects—Health effects that occur randomly and for which the probability of the effect occurring, rather than its severity, is assumed to be a linear function of dose without threshold. Hereditary effects and cancer incidence are examples of stochastic effects. Commanders should be aware of individual dose histories when planning future operations where radiation threats exist.

Surveys—An evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of radiation. When appropriate, such an evaluation includes a physical survey of the location of radioactive material and measurements or calculations of levels of radiation, or concentrations or quantities of radioactive material present.

Therapeutic Source—In the healing arts, a source of radiation used in the treatment of disease, normally cancer. Includes high energy linear accelerators generating x-rays and/or electron beams used in radiation therapy, RAM based therapy units (e.g., using Co-60), sealed radioactive sources (e.g., Cs-137, Ir-192, I-125) temporarily or permanently implanted within a patient, and unsealed radioactive drugs (e.g., I-131) used for patient treatment.

Total Effective Dose Equivalent—The sum of the deep dose equivalent (Hd) (for external exposures) and the committed effective dose equivalent (for internal exposures) expressed in units of either rem or Sv.

Unrestricted Area—Any area access to which is neither limited nor controlled for the purposes of radiation safety.

Use Factor—The fraction of time a particular device is utilized, or the fraction of time the primary beam of a device is directed towards a given area.

Very High Radiation Area—An area accessible to individuals, in which radiation levels exceed 500 rad (5 Gy) in one hour at 1 meter from the source or from any surface that the radiation penetrates.

Note—For very high doses received at high dose rates, units of absorbed dose (rad or Gy) are appropriate, rather than units of dose equivalent (rem and Sv).

Weighting Factor (Organ or Tissue)—For an organ or tissue, the proportion of the risk of stochastic effects resulting from irradiation of that organ or tissue to the total risk of stochastic effects when the whole body is irradiated uniformly.

Working Level Months—Exposure to radon and its progeny is not measured in the conventional dosimetric quantities described above. Instead exposures are generally indicated by the working-level, a unit originally developed to describe exposures of uranium miners to radon. One working level is defined as that concentration of radon daughters in air that has a potential alpha energy release of 1.3E5 mega-electron volt in a liter of air, equivalent to 2E-5 Joule per cubic meter of air (J/m^3). One working level month (WLM, or 3.5E-3 Jh/m^3) would be the exposure received by being present in that concentration for one working month, equivalent to 170 hours. Exposure to one WLM results in an estimated absorbed dose to the lung of 4 to 13 mGy (0.4 to 1.3 rad). Based on data gather regarding occupational exposures uranium miners, lung cancer probabilities are estimated in the broad range of 1 to 4E-4 per WLM. One WLM is approximately equal to an annual exposure of 4 pCi per liter of radon, if the radon decay products are in 50% equilibrium with the radon.

BY ORDER OF THE SECRETARY OF THE AIR FORCE

DEPARTMENT OF THE AIR FORCE INSTRUCTION 13-213

TINKER AIR FORCE BASE Supplement

11 MARCH 2021

Corrective Action, 18 March 2021

Nuclear Space, Missile, Command, And Control

AIRFIELD DRIVING

COMPLIANCE WITH THIS INSTRUCTION IS MANDATORY

ACCESSIBILITY: Publications and forms are available on the E-Publishing website at **www.e-Publishing.af.mil** for downloading or ordering

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(TINKERAFB) This supplement defines, describes and implements airfield driving policies, responsibilities, and procedures for operating vehicles on the airfield. This publication applies to all military and civilian personnel conducting ground vehicular operations on or around the airfield at Tinker Air Force Base, Oklahoma. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the Air Force Form 847, Recommendation for Change of Publication; route AF Forms 847 from the field through the appropriate functional chain of command. Ensure that all records created as a result of the processes prescribed in this publication are maintained IAW AFI 33-322, *Records Management and Information Governance Program*, and disposed of IAW Air Force Records Information Management Systems (AFRIMS) Records Disposition Schedule (RDS). The information contained is FOR OFFICIAL USE ONLY (FOUO) information which must be protected under the Freedom of Information Act, 5 United States Code (USC) §552, *Public Information; Agency Rules, Opinions, Orders, Records, and Proceedings*, and / or the Privacy Act of 1974, 5 USC §552a, *Records Maintained on Individuals*. Unauthorized disclosure or misuse of this PERSONAL INFORMATION may result in disciplinary action, criminal and / or civil penalties.

SUMMARY OF CHANGES

The OPR noticed and fixed para number errors.

SUMMARY OF CHANGES

This document should be completely reviewed, fundamental changes include converting TINKERAFBI 13-213 into a supplement. This establishes procedures identified in DAFI 13-213 and identifies new airfield driving Computer Based Training (CBT) requirements. Airfield maps have been updated to reflect new KC-46 ramp and new location of air traffic control tower.

2.4.3.1. **(Added)** Operations Group Commander responsibilities will be completed by the Installation Commander.

2.7.26. **(Added)** Endorse (sign) AF Form 483(s), *Certificate of Competency*, for airfield driving. **NOTE:** Airfield Manager or designated AM personnel may endorse (sign) AF Form 483(s).

2.8.5.1. **(Added)** Restrict personnel to unit ramps if mission is limited to aircraft parking ramps only. In these cases, the AF Form 483 will be certified RAMP ONLY. Individuals restricted to unit ramps are required to complete all airfield driving training requirements. Ramp Only drivers are NOT allowed to enter taxiways or runways without an escort. Escort must have "CMA Access" in accordance with this supplement.

2.8.12.1. **(Added)** Administer and store all trainees' answers to required tests, document test results on *Airfield Driving Training Documentation and Certification Checklist* (see **Attachment 11**)

2.8.30.1. **(Added)** When all requirements are met, Airfield Driving Program Manager (ADPM) will be issued an authorization letter to instruct, test, certify training completion, and audit unit program training is issued by AM. The letter will contain the two- letter designation assigned to the unit program. The two-letter designation is placed in front of the certification numbers issued by that unit. Training requirements and testing materials are provided by Wing ADPM. ADPM may train individuals from another organization that do not have an airfield driving program, and documentation for these individuals will be maintained and tracked by the ADPM conducting the training.

2.8.30.2. **(Added)** Prepares *Airfield Driving Training and Certification Checklist and Airfield Driving Qualification Checklist* (see **Attachment 11**), forward documentation, along with the prepared AF Form 483, to Airfield Management (AM) for signature. AM requires the original copy of Certification of Airfield Training Letter be on file with AM. Maintain a copy of all documentation provided to AM for your records. For examples of prepared AF Form 483's.

2.8.30.2.1. **(Added)** Prepare AF Form 483's for re-issue if unreadable, lost or destroyed by presenting a newly prepared competency card to AM for signature. All annual refresher training received must be documented and the word RE-ISSUED written on the reverse side of the AF Form 483. The original training date is indicated on the front of the AF Form 483, with any restrictions and the expiration date remains three years from the original training. The original certificate number issued will also remain the same.

2.8.30.3. **(Added)** Maintain unit's portion of Tinker Airfield Drivers Database available on-line at https://usaf.dps.mil/sites/TMC719240/72OSS/Programs/Airfield.Drivers.Training/SitePages/Home.aspx Access to the Airfield Drivers Database will be given by AM after ADPM has completed ADPM Familiarization Training.

2.8.30.4. **(Added)** Administer color vision testing, using the color vision test meeting mandatory requirements. Color vision test may be purchased by base units through the base supply system or from an ophthalmic supplier. If a driver fails color vision test provided by ADPM, driver may receive additional color vision test provided by medical facility.

2.10.1.1. **(Added)** Surrender their AF Form 483, *Certificate of Competency*, upon request by unit ADPM or AM representatives.

2.10.9. **(Added)** Carries a valid state license, U.S. Government license (if applicable See AFI 24-301, *Vehicle Operations*) and controlled/restricted area badge when driving on the airfield.

2.10.10. **(Added)** Responsible for ensuring all annual training requirements are completed.

2.11.8. **(Added)** Limits vehicle operations in the Mandatory Radio Monitor Area (MRMA) and Controlled Movement Area (CMA). Non-mission essential vehicles are prohibited from crossing Runway 18/36 and Runway 13/31. Mission essential vehicles may include but not limited to: Emergency Services, AMOPS, Transient Alert, RAWLS, USDA, Airfield Lighting, FOD Boss, Airfield Sweepers, Trace Mowers, Pavement Repair Shop, airfield driver training vehicles (must have approved training call sign) and aircraft movers. **NOTE:** Aircraft movers (e.g. tow vehicle, aircraft and no more than two additional vehicles) are limited to towing operations. Towing operations shall be coordinated and approved by AMOPS IAW TAFBI 13-204, *Airfield Operations*. This includes positioning and repositioning of tow support vehicles. All other vehicle operations shall utilize perimeter roads and alternate airfield access points around the airfield to reduce the number of vehicles on the airfield and crossing runways. Any special runway crossing requests must gain approval from AMOPS and/or Airfield Manager at DSN 312-884-2191. Vehicles using the runway as transition routes to other parts of the airfield are considered convenience crossings. These movements are not considered mission essential and shall use perimeter roads and alternative access points around the airfield.

2.11.9. **(Added)** Escorts individuals off the airfield and confiscates individuals AF Form 483.

2.11.10. **(Added)** Requests a statement from individual(s) suspected of committing an airfield driving violation(s).

2.11.11. **(Added)** Documents and reports the incident to the Wing ADPM, AFM, and AOF/CC.

2.15.1.1. **(Added)** Color/vision test will be administered by ADPM using the color vision tests meeting mandatory requirements and may be purchased by base units through the base supply system or from an ophthalmic supplier. If a driver fails color vision test provided by ADPM, driver may receive additional color vision test provided by medical facility.

2.16.4. **(Added)** Contractors. In accordance with AFMAN 91-203, it is the responsibility of the Contracting Division to ensure contractors understand and comply with the airfield driving program and base personnel security access requirements. Additionally, they will inform AM and 72 SFS of contractors who will have a requirement to drive on the airfield. No contractor is authorized to drive on Tinker airfield until properly trained and access granted. This requirement must be written in contract agreements.

2.16.4.1. **(Added)** The contractor shall go to the unit that they are assigned to for training (i.e., airfield pavement repair to CE).

2.16.4.2. **(Added)** Contractors who will have several personnel working on the airfield may assign a designated person(s) to receive airfield driver training. Not all contractor personnel require competency cards but will receive an airfield safety briefing prior to starting work. The designated and certified airfield driver will be responsible for escorting contractor vehicles on the airfield.

2.16.4.3. **(Added)** If a contractor will be on the airfield for a short duration, issue a temporary AF Form 483 after training is completed by stamping the projected completion date on the back of the card. This will be the expiration date. Otherwise, contractors are to be escorted by a certified airfield driver.

2.16.4.4. **(Added)** Contractors requiring access to the airfield for more than seven days must provide their own portable radios with access to communication on tower net radio frequency.

2.16.4.5. **(Added)** All contractor activities within the airfield boundary, including ILS critical areas, and clear zones shall be pre-coordinated with Airfield Manager and 72 ABW/CE Community Planner prior to the contractor proceeding on the airfield. These agencies will evaluate the impact of proposed activity on flight operations and ensure appropriate waivers are approved by 72 ABW/CC prior to start of work.

2.16.4.6. **(Added)** All contractors must receive an airfield safety briefing from Airfield Manager prior to commencing work on the airfield. Procedures for vehicle routes, site maintenances/cleanup, waste control and material/equipment storage will be developed by AM, 72 ABW/CE and OC-ALC/PKO.

2.16.4.7. **(Added)** Ensure all airfield and airfield facilities maintenance activities are pre-coordinated with AMOPS each day prior to proceeding on the airfield, i.e. sweeper, airfield lighting, etc. Personnel and equipment must be removed from airfield when instructed by Tinker Ground or AMOPS.

2.16.4.8. **(Added)** Notify the Airfield Manager (72 OSS/OSAM) at 734-2191 of all pre-construction meetings regarding construction on the airfield.

3.2.1.1. **(Added)** The Airfield Driving Training Documentation and Certification Checklist (see **Attachment 11**) will be used to document all training requirements and will include test date, name, rank, organization, duty phone, AF Form 483 certification number, State Driver's License (list state of issue and restrictions), and signature of unit commander or Unit ADPM to certify that all training was successfully completed. Memo requires training items be initialed by trainer and trainee and signed by unit commander/civilian equivalent or Unit ADPM, to validate member(s) is a mission essential vehicle driver on the airfield. **NOTE:** If creating a roster for multiple trainees, ensure all above items are included on roster, trainees signature and "trainee acknowledgement statement" found in **Attachment 11**.

3.2.1.2. **(Added)** The original copy of Airfield Driving Training Documentation and Certification Checklist and AF Form 483(s) will be hand carried to AM, Bldg., 240, Room 315. A copy of the memo will be retained in ADPM's continuity binder, along with the trainees' answers to tests and CBT certificate.

3.2.2.1. **(Added)** Refresher training will be annotated on the backside of the airfield driver's competency card with date and instructor's signature, i.e. 1st Annual Refresher Training on date/signature. Refresher training documentation will be kept on file by the unit ADPM and made available to AM on request and during program inspections/reviews.

3.2.2.2. **(Added)** Refresher training may be accomplished prior to anniversary date, as long as no more than 1 year has passed since training was last completed and documented. If refresher training is accomplished early, the new anniversary month is based on the month refresher training was last completed. If more than 1 year has lapsed since training was received, the AF Form 483 is expired and all initial training requirements must be re-accomplished. NOTE: Training dates are valid until the last day of the anniversary month.

3.2.4.1. **(Added)** Airfield driving briefing available at 72 OSS/Airfield Driving SharePoint. https://usaf.dps.mil/sites/TMC719240/72OSS/Programs/Airfield.Drivers.Training/SitePages/Home.aspx.

3.2.5.1. **(Added)** After all training and testing are successfully accomplished; the ADPM will prepare AF Form 483 and Airfield Driving Training Documentation and Certification Checklist, (see **Attachment 11**)

3.2.6. **(Added)** The certification number must include unit's two-letter designation, which is placed in front of the certification number. The first two numbers of the certification number will correspond with the current year (for example: EM20001, SP20001). The remaining numbers will run consecutively each year beginning with 001.

3.2.7. **(Added)** Competency cards for airfield driving expire three years from date of issue (last day of month) Place the competency card expiration date on the back of the Form (see **Attachment 11** for example).

3.3. (Added) Individuals must successfully complete the local airfield diagram/layout test, General Knowledge/Communication test, and Runway Incursion Prevention test. Unit ADPMs will administer all tests. Use the Airfield Driving Training Documentation and Certification Checklist to document test results. (See **Attachment 11**) AM provides written tests to ADPMs. ADPMs will maintain security of the written tests.

3.3.1.5.4.1. **(Added-TINKERAFBSUP)** Demonstrate ability to cross and proceed on a runway and request permission "around the horn "without assistance from trainer.

3.3.1.5.6. **(Added)** A daytime practical airfield driving procedure orientation and driving test (check ride) will be conducted for MRMA/CMA and Ramp Only drivers after classroom training. If an airfield driver's duty hours are at night, then a separate practical night orientation and driving test (check ride) must also be conducted. Individuals not receiving night orientation check ride, will have their AF Form 483 restricted to DAYLIGHT HOURS ONLY. If the individual later requires a nighttime authorization, the ADPM will ensure training is provided and documented. The documentation and AF Form 483 will be updated and hand carried to AM for signature. ADPM will update the unit master airfield driving listing on-line.

3.4.4. **(Added)** Color vision testing is mandatory for individuals that have a requirement to drive in the MRMA and CMA.

3.4.5. **(Added)** Color/vision test will be administered by ADPM. If a driver fails color vision test provided by ADPM, driver may receive additional color vision test provided by medical facility. Contractor could incur additional expense.

4.2.1.1. **(Added)** The MRMA is outlined in **Attachment 12** and is the area inside the airfield perimeter fence *excluding* ramp areas and the CMA. All vehicles operating in the MRMA shall be two-way radio equipped and capable to communicate with Tinker Ground. Vehicle operators shall monitor the tower net frequency at all times in the MRMA and shall respond immediately to ground controls instructions. Vehicle operators shall request a radio check with the Tinker Ground, AMOPS, or another radio on Tinker tower net prior to entering the MRMA to ensure their radio is operational.

4.2.1.2. **(Added)** The CMA is outlined in **Attachment 12** and is the runway environment area outlined by runway hold short lines (200ft from runway edge), mandatory signs and pavement markings, overruns, ILS glideslope, Precision Obstacle Free Zone (POFZ), localizer critical areas, and portions of runway clear zones.

4.2.3.1. **(Added)** Using telephones or cell phones to communicate with Tinker Ground is prohibited. Permission cannot be relayed through another vehicle or dispatcher.

4.2.3.2. **(Added)** Portable radios issued by AMOPS will be for a maximum of one day. Radio recipients must be airfield driving certified. TDY personnel must receive a radio/airfield refresher briefing. AMOPS personnel will provide refresher briefings. Upon turn-in, the radio condition and operation will be checked. If a radio does not operate correctly, the hand receipt will not be released, and AM will have the radio inspected for abuse.

4.2.4.1. **(Added)** Light Emitting Diode/Rotating Beacon Lights and/or emergency/hazard warning flashers are required in the CMA, MRMA and ramp areas both day and night.

4.2.9. **(Added)** Local terms "Around the Horn" and "Multiple Intersection" are synonymous and are used when referring to the intersection on the north side of Runway 13/31 at taxiways C, H and K. Use of either phrase is correct when requesting through this area. (See **Attachment 12**) Ground Control approval is required to proceed "Around the Horn" and "Multiple Intersection".

4.6.4.1. **(Added)** Airfield drivers will stop and hold at instrument hold lines/signs. Drivers will request permission from Tinker Ground to proceed inside the instrument hold lines/sign boundaries.

4.8.14.1. **(Added)** Normal vehicle speed limit on runways during non-emergency operations will be 30 MPH or as necessary to expedite exit at Tinker Grounds direction. Speed limits for all emergency response vehicles i.e. fire/crash, AMOPS, ambulance, responding to bona fide emergency situation will be at a speed that is necessary to respond expeditiously and safely.

4.9.1.1. **(Added)** The distance BEHIND heavy aircraft (B-1, B-52, C-5, C-17, KC-10, KC-46, E-3, E-6, KC-135, etc.) with engines running is 600ft. Deviations to these restrictions are permitted only when absolutely necessary for mission accomplishment. Do not operate vehicles within 25 feet of an aircraft unless providing an immediate service to that aircraft (e.g. fueling, servicing).

4.9.1.2. **(Added)** Vehicles will not be driven or parked closer than 10ft from a parked aircraft; 50ft from an aircraft being (or about to be) fueled.

4.9.6. **(Added)** When operating vehicles in the vicinity of parked aircraft, always approach with the driver's side of the vehicle towards the aircraft and the vehicle pointed away from the aircraft.

4.9.7. **(Added)** Tow operators shall comply with procedures outlined in TAFBI 13-204 and local unit requirements.

4.10.6. **(Added)** West of Runway 18/36 and Transient Munitions Facility (TMF) area, AM exercises direct control of all designated parking IAW TAFBI 13-204. Marking of parking spaces is determined by AM in conjunction with requesting unit to promote mission accomplishment and maintain the capability to respond to contingency operations. Vehicle parking may be prohibited on short notice as required.

4.10.7. **(Added)** East of Runway 18/36, AM exercises indirect control, but maintains oversight, of designated vehicle parking through Aircraft Maintenance Group (76 AMXG). 76 AMXG will designate Maintenance Controlled parking spaces on the ramp east of Runway 18/36. Unit traffic wardens will be designated IAW DAFI 31-204 and will ensure parking restrictions.

4.10.8. **(Added)** Only prior approved Privately Owned Vehicles (POV) will be allowed to operate on the 76 AMXG ramp. 76 AMXG's goal is to monitor and reduce government vehicle (GOV) and POV traffic on the 76 AMXG ramp.

4.10.9. **(Added)** 76 AMXG ramp passes are not issued for parking convenience or convenience to drive across the ramp. Individuals/vehicles observed using the ramp pass for parking adjacent to or around buildings in a non-designated parking space will be subject to loss of driving or parking privileges. Parking is prohibited in front of hangar doors or inside painted markings on the ramp designated as necessary clearance for aircraft wing tips. Repeated parking violations will result in forfeiture of ramp pass. POV operators issued a ramp pass will park at designated parking on the north side of Building 3102.

4.10.10. **(Added)** Vehicles parked in a designated parking space will be locked to secure ramp pass. Vehicles temporarily left unattended on the 76 AMXG ramp will be left unlocked with keys in the vehicle. Unattended parked vehicles will have parking brake set or will have chocks in place.

4.10.11. **(Added)** Maintenance Repair Overhaul Technology Center (MROTC) Facility is a controlled industrial work area without direct access to the Tinker airfield. The 76 AMXG/CC will issue ramp pass access to this area.

4.10.12. **(Added)** POVs will not move/enter/exit MROTC area while aircraft are under tow.

4.10.13. **(Added)** There is no private vehicle parking on the airfield. Vehicles may be towed off the airfield at the direction of AMOPS.

4.10.14. **(Added)** All requirements/requests for parking of vehicles and equipment on the airfield will be processed through 72 ABW/CE and AFM.

4.10.15. **(Added)** The 552 MXG/CC shall ensure vehicles parked south of Building 230 do not block the fire lane.

4.10.16. **(Added)** The 507 ARW shall ensure vehicles parked northeast of Building 1030 do not block the fire lane.

4.10.17. **(Added)** Vehicles and wheeled equipment temporarily parked on any part of the airfield shall be left unlocked with the parking brake set, gears set in park, chocks installed, (if without a parking brake) and the keys in the ignition. Exception: Vehicles parked on ramp areas designated for automobile parking.

4.10.18. **(Added)** Unless parked in a designated parking area, all unattended vehicles on the airfield will park so that they will not interfere with taxiing/towed aircraft or emergency vehicles and will not be pointed towards a parked aircraft.

4.10.19. **(Added)** When parked on the airfield at night, leave emergency lights/four-way flashers or beacon operating unless parked in a designated parking area.

4.10.20. **(Added)** Never leave a vehicle unattended while operating in the MRMA or CMA without advising Tinker Ground and AMOPS of intentions.

4.10.21. **(Added)** Do not drive over the Red Carpet located on Southeast side of Building 240.

4.17.1.1. **(Added)** Non-motorized cycle will be operated only within unit ramp areas and not in the MRMA or CMA. Use on ramp areas is discouraged and will only be authorized and operated as individually approved by the unit Vehicle Control Officer (VCO) and subject to unit directives.

4.17.4. **(Added)** Motorcycle/Moped. Operations on the airfield are prohibited except in designated vehicle parking areas.

4.17.5. **(Added)** Pedestrians and/or pets are prohibited in the MRMA and CMA unless coordinated with AM. Official functions, social and morale events, and any recreational or exercise activities on the airfield are prohibited without specific permission from the Airfield Manager. Personnel needing to conduct airfield maintenance and operations in the MRMA and CMA will be transported to and from work site by a government vehicle or other approved vehicle displaying appropriate airfield or ramp pass driven by an airfield driving qualified driver.

4.20.1.1. **(Added)** Primary/Secondary response vehicles must comply with the procedures outlined in this instruction for entry into the MRMA and CMA.

4.20.2.1. **(Added)** Primary response agencies (Fire Department, AMOPS, ambulance) will position at North and South ends of airfield, depending on runway in use. Follow-on/support response agencies (SF, flight surgeon, bio-environmental, unit support equipment) will position at or near building 240 (AMOPS).

4.26.4. **(Added)** The distance BEHIND heavy aircraft (B-1, B-52, C-5, C-17, KC-10, KC-46, E-3, E-6, KC-135, etc.) with engines running is 600ft. Deviations to these restrictions are permitted only when absolutely necessary for mission accomplishment. Do not operate vehicles within 25 feet of an aircraft unless providing an immediate service to that aircraft (e.g. fueling, servicing).

4.29.6.1. **(Added)** The TINKERAFBVA 11-2, *Airfield Pass*, is issued and controlled by AM. The Airfield Pass will be issued to approved individuals who have recurring mission requirements to operate their POV/contractor owned/government leased vehicle on the airfield. The Airfield Pass is valid in areas west of runway 18/36 and is not valid on ALC ramp or area 17 (excluding TMF). Airfield Passes expires annually on 31 December or earlier as directed by AM.

4.29.6.2. **(Added)** The TINKERAFBVA 11-3, *Ramp Pass*, is issued and controlled by AM. The ramp pass will be issued to the approved individuals who have a recurring mission requirement to operate their POV/contractor owned/government leased vehicle on airfield ramps. The ramp pass is not valid on the MRMA, CMA or areas east of runway 18/36 (excluding TMF). The ramp pass expires annually on 31 December or earlier as directed by AM.

4.29.6.3. **(Added)** The TINKER AFB Form 273, *Temporary Airfield Pass* , is an 8 X 11 inch solid colored, numbered pass issued and controlled by AM. The Temporary Pass will be issued to the approved operators of government leased or contractor owned vehicles that have a temporary requirement to drive on the airfield. It is valid in areas west of runway 18/36 and is not valid on ALC ramp or area 17. Personnel will be airfield driving certified or escorted. The Temporary Pass is for short-term need and will expire on the date annotated on the pass. Request for more than one day must be submitted in writing to AM, no later than two working days before needed.

4.29.6.4. **(Added)** The 76 AMXG Ramp Pass, 76 AMXG is designated OPR and will issue and control 76 AMXG ramp passes. 76 AMXG is also the OPR for the ALC Ramp Gate Card used for access through ALC airfield gates. The ramp east of Runway 18/36, excluding the Transient Munitions Facility (TMF), is considered 76 AMXG ramp. 76 AMXG ramp passes are valid in areas east of Runway 18/36 (excluding TMF) and are not valid in areas west of Runway 18/36.

4.29.6.4.1. **(Added)** The 76 AMXG Ramp Pass will be changed annually. Individuals requiring a 76 AMXG ramp pass will be required to submit a request for a new ramp pass each year.

4.29.10. **(Added)** Lost or stolen ramp passes should be reported as soon as possible to office who issued pass. Any ramp pass that has become mutilated or illegible must be turned in to issuing authority for a replacement.

4.29.11. **(Added)** Passes will be displayed from the vehicle's rear view mirror.

4.30.1.1. **(Added)** AFM reserves the right, based on severity of the violation, to increase suspension timelines or to suspend airfield driving privileges indefinitely.

4.31.3. **(Added)** Drivers will be administered an additional driving test by AM prior to reinstatement of airfield driving privileges.

Chapter 6 (Added)

AIRFIELD GATE ACCESS CARD PROCEDURES AND RESPONSIBILITIES

6.1. (Added) Requests. All requests for an Airfield Gate Access Card, TINKER AFB Form 002, Application for 76 AMXG Government Ramp Gate Card, will be forwarded to 76 AMXG Management Operations Section (76 AMXG/MXDSM) with a copy of the front and back of the AF Form 483 attached. All TINKER AFB Form 002's will be approved/disapproved by the 76 AMXG/MXDSM. TINKER AFB Form 002 must provide specific justification on the mission requirement, to include what buildings need to be accessed, on what shift and the reason why (delivery of parts, inspection, etc.).

6.1.1. **(Added)** 76 AMXG/MXDSM will review TINKER AFB Form 002 and attached AF Form 483, for approval for card issue.

6.1.1.1. **(Added)** 76 AMXG/MXDSM will issue airfield gate access cards and maintain WinDSX database of authorized base and contractor users.

6.1.1.2. **(Added)** 76 AMXG/MXDSM will ensure card holder signs TINKER AFB Form 002, *Application for 76 AMXG Government Ramp/Gate Card*, acknowledging receipt of cards, responsibilities for protection, control and disposition procedures. 76 AMXG/MXDSM will retain all TINKER AFB Form 002 applications.

6.1.1.3. **(Added)** 76 AMXG/MXDSM will ensure the cardholder has an AF Form 1199C, *USAF Entry Control Card,* for Area. 17. Personnel must display the badge while inside Area 17 at all times, and follow additional requirements established by the owning organization (76 AMXG).

6.1.1.4. **(Added)** 76 AMXG/MXDSM will view the cardholders AF Form 1199C, *USAF Entry Control Card,* and initial on the TINKER AFB Form 002.

6.1.1.5. **(Added)** 76 AMXG/MXDSM will interrogate the WinDSX database and run gate card reports as necessary to avoid and/or resolve cardholder information discrepancies.

6.1.1.6. **(Added)** 76 AMXG/MXDSM will run a quarterly report identifying cardholders by assigned organizations.

6.1.1.7. **(Added)** It is the responsibility of the card holder to provide 76 AMXG/MXDSM updated AF Form 483, refresher/expiration cardholder or other user information. Cardholders will send their refresher AF Form 483 to 76 AMXG/MXDSM. 76 AMXG/MXDSM will update database to reflect card user's new AF Form 483 card expiration dates.

6.1.2. **(Added)** The 76 AMXG Maintenance Operations Center (MOC) will monitor all WinDSX work station alarms. The MOC will contact Civil Engineering Work Order Desk, 734- 3117, when necessary, to submit a work order when gates are inoperative. The MOC will contact the system administrator for software support. (72 ABW/SCPT via the following Organizational Email account: **ASX.Remedy.Queue@us.af.mil**.

6.2. (Added) Individual Cards . Individual's cards that have not been used to access 76 AMXG gates will be deactivated after 60-days of non-usage. Cards that have not been used in 90-days will be deleted and only reactivated when a new TINKER AFB Form 002 is submitted to 76 AMXG/MXDSM.

6.3. (Added) Multiple Cards. Multiple cards under one name will not be allowed.

6.4. (Added) Gate Cards. Gate cards can only be picked up and signed for by the individual that is getting the card.

6.5. (Added) Point of Contact. All organizations will provide 76 AMXG/MXDSM with a point of contact to conduct quarterly inventory of cards and validate continued mission requirement.

6.6. (Added) Cardholder Responsibility. All cardholders will ensure cards are only utilized by authorized personnel. All users must possess a current state driver's license, a current AF Form 483, an AF 1199C, a ramp pass for POV and contractor vehicles. Users will ensure copies are provided to 76 AMXG/MXDSM.

6.7. (Added) Deactivation. Upon termination of employment, change of organization or when assigned duties that no longer require the ramp card. All Cards can be deactivated by emailing 76AMXG Security Managers Workflow at **76AMXG.SM.Workflow@us.af.mil** or calling 76 AMXG/MXDSM at 734-9557. Upon confirmation that the card has been deactivated, it will be shredded by responsible parties.

6.8. (Added) Airfield Restriction. The installation commander may restrict private vehicles from the ramp area during periods of increased FPCONS. When this occurs, all access cards or specifically contractor access cards will become invalid.

PAUL G. FILCEK, Colonel, USAF
Commander

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

(Added) AFI 24-301, *Vehicle Operations*, 22 October 2019

(Added) TINKERAFBI 13-204, *Airfield Operations*, 7 January 2021

(Added) TINKERAFVA 11-2, *Tinker Airfield Pass*, 2 January 2003

(Added) TINKERAFVA 11-3, *Tinker Ramp Pass*, 2 January 2003

(Added- TINKERAFB) ***Prescribed Forms***

(Added) TINKER FORM 002, *Application for 72 AMXG Government Ramp/Gate Card*

(Added) TINKER FORM 273, *Tinker Temporary Airfield Pass*

Adopted Forms

(**Added**) TINKERAFBVA 11-2, *Tinker Airfield Pass*

(**Added**) TINKERAFBVA 11-3, *Tinker Ramp Pass*

Abbreviations and Acronyms

(Added) **AMOPS**—Airfield Management Operations

(Added) **CE**—Civil Engineering

(Added) **ILS**—Instrument Landing System

(Added) **MROTC**—Maintenance Repair and Overhaul Technology Center

(Added) **OC-ALC**—Oklahoma City Air Logistics Complex

(Added) **POFZ**—Precision Obstacle Free Zone

(Added) **SCW-1**—Strategic Communications Wing ONE

(Added) **SFS**—Security Forces

Terms

(Added) **Long Hotel**—Area on TWY H between RWY 13/31 and TWY B.

(Added) **Mandatory Radio Monitor Area (MRMA)**—The MRMA is outlined in **Attachment 9**. The MRMA is the area inside the airfield perimeter fence excluding ramp areas and the area designated as the Controlled Movement Area (CMA). Vehicles operating in the MRMA shall be radio equipped to communicate with the Tinker Ground. Vehicle operators shall monitor tower net frequency at all times and respond immediately to Tinker Grounds instructions.

(Added) **Short Hotel**—Area on TWY H between TWY B and G.

(Added) **South Hotel**—Area on TWY H South of RWY 13/31.

(Added) **Tinker Ground**—Position within tinker control tower that communicates with vehicles and aircraft ground movements via tower net.

(Added) Transient Munitions Facility (TMF)—Ramp area located east of Runway 18/36 approach end at taxiway Foxtrot used for storage, loading, and unloading of explosive cargo.

Attachment 6

AIRFIELD MANAGEMENT QUALITY CONTROL MEASURES

A6.5. (Added) AF Form 483 Training Certification Check. When an ADPM delivers 483s for AM signature, a random number of airfield drivers may be selected and administered an additional written and driving test by AM personnel. Only after correctly completing tests will the driver receive a signed airfield driver's license.

Attachment 10 (Added)

OUTLINE FOR UNIT ADPM CLASSROOM TRAINING

A10.1. (Added) Instruction Material. Provide a copy of Tinker's *Airfield Driving Training Guide.*

A10.2. (Added) Explanation of terms: refer to this instruction and training guide.

A10.3. (Added) Smoking. No smoking on the airfield, unless in a designated smoking area, this includes inside a vehicle.

A10.4. (Added) General Airfield Driving Procedures and Standards.

A10.4.1. **(Added)** Airfield entry points. Entry points are marked with warning signs stating you are entering the airfield. Only government or POV/contractor owned/government leased vehicles with an airfield or ramp pass are authorized on the airfield. A FOD checkpoint is located at each airfield entry point.

A10.4.2. **(Added)** All vehicles that operate on the airfield inside the FOD checkpoints must be equipped with a self-closing FOD container.

A10.4.3. **(Added)** FOD Control and Prevention. FOD checkpoints are black and white signs painted on the concrete located at airfield entry and at entry locations to areas where aircraft with engines running may be encountered. FOD checks must be done each and every time you enter these areas. Competency cards will be revoked for non-compliance. Proper procedures are:

A10.4.3.1. **(Added)** Stop at FOD checkpoint.

A10.4.3.2. **(Added)** Exit vehicle and check exposed areas of tires and undercarriage for loose debris. Remove debris imbedded in the tires.

A10.4.3.3. **(Added)** Pull vehicle forward until the remaining area of the tire is visible and check for FOD.

A10.4.3.4. **(Added)** Place all debris in the self-closing FOD container in the vehicle or in the FOD container located at the entry point. DO NOT THROW FOD ONTO THE AIRFIELD.

A10.4.3.5. **(Added)** Secure loose items in vehicle cargo areas.

A10.4.4. Vehicle Operations in Vicinity of Aircraft and Airfield Vehicle Traffic Flow.

A10.4.4.1. **(Added)** Always approach parked aircraft with the driver's side of the vehicle towards the aircraft and the vehicle pointed away.

A10.4.4.2. **(Added)** Vehicles will not be driven or parked closer than 10 feet from a parked aircraft; 25 feet to front, or beside an aircraft with engines running or about to be started and 50 feet from an aircraft being (or about to be) fueled.

A10.4.4.3. **(Added)** The distance behind an aircraft with engines running (or about to be started) is 200 feet, except for heavy aircraft such as B-1, B-52, C-5, C-17, DC/KC-10, E-3, E- 6, KC-135 and KC-46 which is 600 feet.

A10.4.4.4. **(Added)** Vehicles shall not be backed toward, driven under or driven forward in the immediate direction of any aircraft except as authorized in certain loading, unloading, or refueling operations. In these cases, pre-positioned wheel chocks will be placed between the aircraft and the approaching vehicle to prevent the vehicle from striking the aircraft. Guides will be posted as a required safety measure.

A10.4.4.5. **(Added)** Use taxiway centerlines as road dividers and remain immediately to the right.

A10.4.4.6. **(Added)** Do a visual check before crossing an intersecting taxiway.

A10.4.4.7. **(Added)** Traffic lanes on the aircraft parking ramps are normally the areas to the right of the aircraft or parallel to the noses of the parked aircraft with the driver's side toward the aircraft. Some ramp areas have clearly marked vehicle traffic lanes.

A10.4.4.8. **(Added)** Give way to aircraft taxiing, in-tow, or being led by a Follow-Me vehicle. Do not drive between a Follow-Me vehicle and the aircraft that it is guiding.

A10.4.4.9. **(Added)** Organizations operating around aircraft must stress speed and procedures for your organization's vehicle traffic flow.

A10.4.5. **(Added)** Procedures for operating a vehicle on the Mandatory Radio Monitor Area (MRMA) and the Controlled Movement Area (CMA).

A10.4.5.1. **(Added)** When in the MRMA/CMA, always be aware of your surroundings. There are always aircraft, vehicles and equipment moving on the airfield.

A10.4.5.2. **(Added)** Airfield drivers must always monitor the Tinker Ground frequency while operating in the MRMA and comply with instructions from Tinker Ground as requested. Airfield drivers shall establish direct radio communications with Tinker Ground to obtain permission to enter the CMA. Use of a third party for communications with Tinker Ground is prohibited. The driver will provide Tinker Ground their radio call sign, location of entrance to the CMA, and intent. The airfield diagram in **Attachment 12** depicts the CMA boundary. Non-compliance with the instruction will result in a CMA violation. Airfield drivers shall read back all instructions by Ground Control to hold short of all runways or runway. Airfield drivers will maintain continuous radio contact with Tinker Ground while in the CMA and will advise Ground when off the CMA.

A10.4.5.3. **(Added)** Vehicle's four-way flashers/emergency lights or beacon will operate at all times (day and night) while operating in the MRMA, CMA and all ramps.

A10.4.5.4. **(Added)** Authorized Airfield Vehicle Traffic/Runway Crossings. Runways will not be used for crossings for convenience. Only mission essential vehicle operations outlined in this instruction are authorized to enter or cross a runway. Vehicle use of the airfield will be monitored by AM to ensure compliance with airfield driving procedures. Use of the airfield for convenience shall not be tolerated.

A10.4.5.5. **(Added)** Vehicles shall give way to taxiing or in-tow aircraft. If an aircraft is approaching your vehicle, exit at the nearest intersecting taxiway or reverse course. Do not drive off pavement, except as a last resort.

A10.4.5.6. **(Added)** Vehicles will not operate or be left unattended within the lateral obstacle clearance zones of runways, taxiways and aprons unless mission essential and in continuous communication with Tinker Ground.

A10.4.5.7. **(Added)** If escorting another vehicle, discuss route to be taken with the other driver. Vehicle being escorted must follow behind escort vehicle at all times. Remain together until mission is complete and off the airfield. Ensure both vehicles have hazard or rotating beacon lights on while operating on the airfield.

A10.4.5.8. **(Added)** When exiting the CMA, notify Ground Control with location of exit point.

A10.4.5.9. **(Added)** Vehicle Disabled/Breakdown. If for any reason the vehicle fails to operate under its own power while in the MRMA and CMA, immediately contact Ground Control of the nature of the problem and your position on the airfield. Ground Control will then contact appropriate personnel and reroute any taxiing aircraft.

A10.4.6. **(Added)** Procedures for proper radio terminology/phraseology and discipline. Refer to Airfield Training Guide and this instruction.

A10.4.6.1. **(Added)** Make clear and concise radio transmissions and use proper radio terminology. Do not use 10 code/series phraseology.

A10.4.6.2. **(Added)** Ensure Tinker Ground's instructions are understood and followed. Read back hold-short instructions received from Tinker Ground.

A10.4.6.3. **(Added)** After making a request to Tinker Ground, make sure the next transmission from Tinker Ground is yours, listen for your call sign. Tinker Ground is in communications with other vehicles and aircraft, don't assume the next radio transmission is yours.

A10.4.6.4. **(Added)** Ensure the radio frequency is open before making a transmission, do not interrupt another radio transmission. Maintain good radio etiquette.

A10.4.6.5. **(Added)** Radios must be programmed by the base land mobile radio (LMR) office to provide selective call feature. This will require two different radio channel numbers on the radio. The first channel allows two-way communication with Tinker Ground. The second channel number will be designated for channel guard; one-way communication with the Tinker Ground (receive only) and two-way communication with all other agencies on the tower net radio frequency. Vehicle operators will use channel guard when conducting routine transmissions with agencies other than Tinker Ground. This reduces the amount of chatter on the tower net radio frequency and allows Tinker Ground to make essential traffic calls. Vehicle operators must switch from channel guard to the second programmed channel in order to communicate with Tinker Ground.

A10.4.6.6. **(Added)** When in doubt, ask Tinker Ground to repeat instructions.

A10.4.6.7. **(Added)** Vehicles with radios can escort vehicles without radios. When escorting, vehicles must remain together at all times in the MRMA and CMA.

A10.4.6.8. **(Added)** Do not use the words CLEAR or CLEARANCE. These words are part of Air Traffic Control terminology. It may also cause another driver to mistake the radio transmission for his/her authorization. Example: *"Tinker Ground, Ops-29, Off Runway 18 at Taxiway Charlie."*

A10.4.6.9. **(Added)** Radio Communications in the CMA/MRMA will be closely monitored by AM. Individuals failing to use proper communications with Tinker Ground will be checked by AM. Proper communication includes using vehicle call signs on each and every transmission, repeating hold short instructions, monitoring the radio, and responding to radio calls promptly.

A10.4.7. **(Added)** Speed Limits for vehicle parking areas/aircraft parking ramps/airfield access roads/taxiways/runways/towing operations. General purpose vehicle: 15 MPH; Special purpose: 10 MPH; **Exception**: Normal vehicle speed limit on the runway during non-emergency operations will be 30 MPH or as necessary to expedite exit at Control Tower direction. Speed limits for all emergency response vehicles responding to bona fide emergency situations will be a speed that is necessary to respond expeditiously and safely. No vehicle will operate in excess of 5 MPH when within 50 ft of an aircraft. No vehicle will operate at a speed in excess of that deemed reasonable and prudent for existing traffic, road, and weather conditions. If Tinker Ground, AM personnel, unit driving program manager, commander, or anyone else on the airfield takes notice of your speed, then you are speeding. Normally, a warning via the radio will be issued unless driver is using unusually excess speeds. If the warning is not followed, then you will be instructed to either hold your position until AM responds or report to AMOPS.

A10.4.8. **(Added)** Airfield and Instrument signs and markings, to include requirements to stop at INST holding positions.

A10.4.8.1. **(Added)** Of primary concern are the HOLD SHORT LINE markings. This line marks the boundary of the runway. Look for multiple yellow lines on a black background 200 ft from the runway edge. DO NOT CROSS this line without authorization from Tinker Ground.

A10.4.8.2. **(Added)** Co-located with the painted HOLD SHORT LINE marking is the RUNWAY HOLD POSITION SIGN, located to the left side of taxiway/runway boundary. This sign is on a red background with white numbers and is lighted for night/inclement weather operations. See **Attachment 3** for example.

A10.4.8.3. **(Added)** Boundaries for the Instrument Land System (ILS) areas are marked by INSTRUMENT (INST) HOLD LINES. When personnel or equipment are within the ILS area, it could seriously degrade the ILS performance. INST Hold Lines are painted with multiple yellow lines on a black background. Drivers will stop at INST Hold Lines and request permission from Tinker Ground to proceed across. CAUTION: Permission to proceed across an INST Hold Line is not authorization to cross a normal HOLD SHORT LINE.

A10.4.8.4. **(Added)** Co-located with the painted INST HOLD LINE marking is the INST HOLD LINE SIGN. This mandatory sign, located to the left of the INST hold line, has a red background with the letters ILS in white. The INST sign is illuminated for nighttime and inclement weather operations. Roadways that enter an ILS critical area have unlit signs warning vehicle operators not to proceed without approval from Tinker Ground. See **Attachment 3** for example.

A10.4.8.5. **(Added)** Painted runway markings are depicted with white retro reflective paint, taxiways and ramps have yellow markings. See **Attachment 12** for location of INST, hold short lines, and critical areas.

A10.4.8.6. **(Added)** Taxiway line markings are used as guides for taxiing aircraft. Vehicles will use the markings as a road divider.

A10.4.8.7. **(Added)** Taxiway Guidance and informative signs identify location, direction, and designations of taxiways. Taxiway signs have black background with yellow lettering or yellow background with black lettering. Yellow lettering identifies the taxiway you are own, and black lettering identifies the taxiway you are approaching. Informative signs are lighted for night/inclement weather. See **Attachment 3** for example.

A10.4.9. **(Added)** Night and Inclement Weather Driving.

A10.4.9.1. **(Added)** The airfield environment at night is different than the day. The night environment may not be as busy, but can be more hazardous due to impaired vision caused by the darkness and the confusion caused by the various lights on the airfield. When driving at night, use more caution.

A10.4.9.2. **(Added)** Aircraft have the right of way on the airfield. Do not shine your vehicle headlights towards a moving aircraft. Turn vehicle headlights off, but always keep the four- way flashers or beacon on. Turning off headlights prevents temporary blindness in the pilot or tow operator. Leaving flashers or beacon operating lets the pilot/tow operator and Tinker Ground know your location at all times. Vehicles with day running lights will position vehicle where lights do not shine toward a moving aircraft.

A10.4.9.3. **(Added)** Tinker Base Weather Station disseminates weather advisories, watches, and warnings on the local LAN during periods of inclement weather. Unit Commanders may impose additional airfield restrictions on their unit drivers. AFMAN 91-203 provides additional safety information and guidance.

A10.4.10. **(Added)** Runway Entry/Crossing, Runway Incursion Prevention, and Reduce non-essential vehicle movements on the airfield and procedures to limit vehicle traffic crossing the runway to an absolute minimum.

A10.4.10.1. **(Added)** Emphasize the possible consequences of crossing or entering the runway without authorization from Tinker Ground. Unauthorized vehicles on the runway cause a serious potential for death and destruction. Failure to obtain authorization prior to entering or crossing any runway is considered a runway incursion. Incursions are serious and all vehicle operators must be thoroughly trained in runway entry/crossing procedures to prevent such occurrences. Remember, the primary function of a runway is the landing and take-off of aircraft.

A10.4.10.2. **(Added)** Emphasize and explain the Hold Short Line and Runway Hold Position Sign.

A10.4.10.3. **(Added)** If requesting to enter a runway, give location, and intent. ***Note:*** The only vehicles that have a mission requirement to be on the runways are Airfield Management, Airfield Lighting, CE, Pavements, SOF, Fire Department, FOD BOSS, and Safety. Remind potential drivers that only mission essential vehicle operations are permitted in the MRMA/CMA. Non-essential vehicle traffic must use perimeter roads.

A10.4.10.4. **(Added)** The only area on the airfield that does not have Hold Short markings to define the runway is where the runways intersect; however, runway hold position signs are installed. To cross or enter the intersecting runway, stop 200 feet prior to the intersecting runway at the runway hold position sign before requesting authorization from Ground Control. To cross an extended runway centerline beyond the overrun, stop a minimum of 200 feet from edge of runway environment and request authorization from Ground Control.

A10.4.10.5. **(Added)** When authorization is given by Tinker Ground, read-back the instructions while doing a visual check of the runway in both directions, then cross or enter the runway.

A10.4.10.6. **(Added)** As soon as the vehicle has passed the Hold Short Line at the exit location or, if no hold line, 200 feet from the runway, inform Tinker Ground that you are **"OFF"** the runway and name the exit location. Do not use the word clear to report off a runway.

A10.4.11. **(Added)** Vehicle Parking and Chocking Procedures.

A10.4.11.1. **(Added)** POV are not authorized on the airfield without prior AM approval. There is no open POV parking on the airfield.

A10.4.11.2. **(Added)** Unless parked in a designated parking area, all unattended vehicles temporarily parked on the airfield will park so that they will not interfere with taxiing or towed aircraft and will not be pointed towards a parked aircraft. When parked, turn ignition off and leave keys in the ignition. If vehicle has a manual transmission, place it in reverse, or if automatic, place it in park. Then set parking brake and leave the doors unlocked.

A10.4.11.3. **(Added)** Use chocks to secure all vehicles and wheeled equipment that do not have an integral braking system when they are left unattended on the aircraft parking ramp. Refer to procedures for special purpose vehicles. Vehicles parked on a designated parking area are exempt.

A10.4.11.4. **(Added)** When parked on the airfield, leave emergency lights/four-way flashers or beacon operating unless parked in a designated parking area.

A10.4.11.5. **(Added)** Never leave your vehicle while on the airfield without advising Tinker Ground of your intentions, unless parked in a designated parking area.

A10.4.12. **(Added)** Airfield Violations and Consequences. Refer to **chapter 4** of this instruction for detailed information.

A10.4.12.1. **(Added)** Speeding, recklessness, ignoring FOD checkpoints, not following tow procedures and improper vehicle operation are some examples.

A10.4.12.2. **(Added)** AM personnel, unit commander, or program managers can revoke airfield driver privileges for any airfield driving violation.

A10.4.12.3. **(Added)** Security Forces may stop you for an airfield driving violation, but will refer your violation to AM for action.

A10.4.14. **(Added)** Airfield Driving CBT. Candidates must complete the CBT as part of classroom training. (one time requirement) The CBT is available on ADLS web page. The CBT test is not the final written test.

A10.4.15. **(Added)** Unique unit requirements/operations and local restrictions.

A10.4.15.1. **(Added)** Taxiways Bravo, Kilo, Hotel and Golf are restricted to vehicle/aircraft use during AWACS Live Fires. Tinker Ground will issue appropriate advisories.

A10.4.15.2. **(Added)** Local terms. Around the Horn and Multiple Intersection are synonymous and are used when referring to the intersection at the north side of Runway 13/31 at Taxiways C, H and K. Use of either phrase is correct when requesting permission through this area.

A10.4.15.3. **(Added)** Unit specific requirements briefing.

A10.4.16. **(Added)** Emergency vehicle operations. Drivers will give way/yield to all fire/crash vehicles, ambulances, and other vehicles (AMOPS, Security, Safety) responding to an emergency. All emergency response vehicles must comply with airfield driving procedures for entry into and operation in the MRMA and CMA. **Exception:** Emergency response vehicles and AM vehicle procedures as outlined in TAFBI 13-204.

A10.4.17. **(Added)** Tower or vehicle radio problem areas and visual blind spots. Areas for potential radio blind spots when communicating with Tinker Ground include the ALC ramp, TMF, Echo ramp, Pegasus Ramp, and southern and western portions of the airfield. Some of same areas cannot be seen from the Control Tower.

A10.4.18. **(Added)** Procedures or restrictions for operating motorcycles, mopeds or scooters, bicycles, tricycles and other vehicles. Bi/Tricycle operations will be operated only within unit ramp areas and not in the MRMA/CMA. Bi/Tricycle operators must be airfield driver certified. Motorcycle/Moped operations on the airfield are prohibited except in designated vehicle parking areas and for the purpose of participating in the Motorcycle hands-on training class sponsored by Base Safety.

Attachment 11 (Added)

AIRFIELD DRIVING TRAINING DOCUMENTATION AND CERTIFICATION CHECKLIST

Figure A11.1. (Added) Airfield Driving Training Documentation and Certification Checklist.

MEMORANDUM FOR: 72 OSS/OSA

FROM:

SUBJECT: Documentation of Airfield Driver Training and Certification

Reference: DAFI13-213, Airfield Driving

NAME/RANK/UNIT **DUTY PHONE** **RESTRICTIONS** **CERTIFICATION #**

Date Completed

- Trainee has valid (*insert state*) Driver's License. _____
- Trainee has valid Government Driver's License. _____
- Airfield Driving CBT (One time requirement) [**Score:**] _____
- Airfield Driver Training Classroom. _____
- Airfield Driving Qualification Training Checklist. _____
- Practical Day Airfield Driver Familiarization Training. _____
- Practical Night Airfield Driver Familiarization Training. _____
- Practical Driving Test. Includes day and night. _____
- Airfield Diagram/Layout Test. [**Score:**] _____
- General Knowledge/Comm Test. [**Score:**] _____
- Runway Incursion Prevention Test. [**Score:**] _____
- Color Vision Test ___ Pass ____ Fail ____ (check one) _____

1. Trainee is knowledgeable of all the following terms used on the airfield:
   a. Runway, Controlled Movement Area (CMA), Controlled Movement Area Violation (CMAV), Runway Incursion, Taxiway, Ramp/Apron, FOD, Overrun, Taxilane, Light Gun, Jet Blast, Vehicle Road, Hot Cargo, Arm/De-Arm Area, ILS, Mandatory Sign, Info Sign, Emergency Vehicle, Circle of Safety, Restricted Area, ECP, Mobile Obstacle, AMOPS, ATCT.

2. Trainee is knowledgeable of all the following local procedures and requirements for operating a vehicle on the airfield, to include hazards associated with aircraft.
   a. Use of vehicle lighting (e.g. Daytime Running, Rotating/IR beacons, hazard/emergency flashers),

   b. Procedures for reporting an accident or vehicle maintenance problems. Vehicle parking and chocking. Perimeter and infield roadways. Lateral distance for mobile obstacles on an apron/ramp and taxiway. Speed limits. Requirements for operating a vehicle around aircraft.

c. Reporting and removing FOD. Restricted visibility and/or night driving. Operating of bicycles, tricycles, etc. on the airfield. Traction control devices. Emergency Vehicle requirements. Vehicle Escort/Convoy Driving procedures as applicable. Right of Way, Taxiing, Jet Blast safety requirements.

3. Trainee is knowledgeable of the airfield environment and has demonstrated the ability to operate a vehicle to and from their designated work areas.

4. Trainee is knowledgeable of the airfield environment to include all the following items:

a. Runway Lights, Edge Lights, Approach Lights, Taxiway Lights, Edge Lights, Centerline Lights, Runway Hold Sign, Taxiway Location Sign, ILS Signs, Direction Sign, Distance Remaining Sign, Runway Markings, Centerline Markings, Edge Markings, Runway ID Numbers, Threshold Markings, VFR Hold Line, Vehicle Stop Bars, Taxiway Markings, ILS Markings, Locations of airfield Navigational Aids, Visual Approach Aids, Restricted Areas, Entry Control Points and Free Zones, Reduced visibility/inclement weather driving, Location of FD, ATC, AM, and Jet Blast hazards, Runway(s) configuration, Taxiway configuration, CMA Boundaries, Congested areas and designated Smoking areas.

5. Trainee is knowledgeable of proper radio terminology and ATCT phraseology use on the airfield to include all the following:

a. Ground Vehicle Communications, Procedural Words and Phrases. Aviation Phonetic Alphabet, Aviation Terminology, Procedures for Contacting the ATCT, Light Gun Signals (Description of ATCT Light Gun signals), ATCT and or vehicle blind spots.

6. Trainee has demonstrated the ability to contact ATC for approval to cross, enter and exit the runway and proceed around the horn. (**CMA/MRMA only)**.

TRAINER CERTIFICATION (*Completed by Authorized Airfield Driving Training Instructor*)
I certify that the trainee has received all required qualification training requirements.

Name of Trainer _____ Grade_____Signature_____Date_____

TRAINEE ACKNOWLEDGEMENT (*Completed by Trainee*)
I have received and completed all of the above training requirements and will comply with *Local Base* Airfield Driving Instruction (ADI). I am also fully aware that no vehicle or pedestrian shall enter a runway or other controlled movement areas without approval from the Air Traffic Control Tower (ATCT). (If creating a roster, this statement MUST be included on roster)

Name of Trainee_____ Grade_____ Signature_____Date_____

UNIT CERTIFICATION (Completed by Unit Commander or Unit ADPM)
I certify that the above trainee has successfully completed all training requirements to operate a vehicle at Tinker AFB. All written tests were administered and retained by ADPM.
Check all applicable restrictions and or special access.
☐ Ramp only
☐ Daylight Hours only
☐ Other (*Specify*)
Name of Trainer _____Grade_____Signature_____Date_____

AIRFIELD DRIVING AUTHORIZATION (*Completed by the Wing ADPM or designated representative)*
☐Approved ☐ Disapproved AF Form 483 CERTIFICATE # _____

Name of Trainer _____Grade_____Signature_____Date_____

Attachment 12 (Added)

CMA/MRMA/RAMP

Figure A12.1. (Added) CMA/MRMA/RAMP.

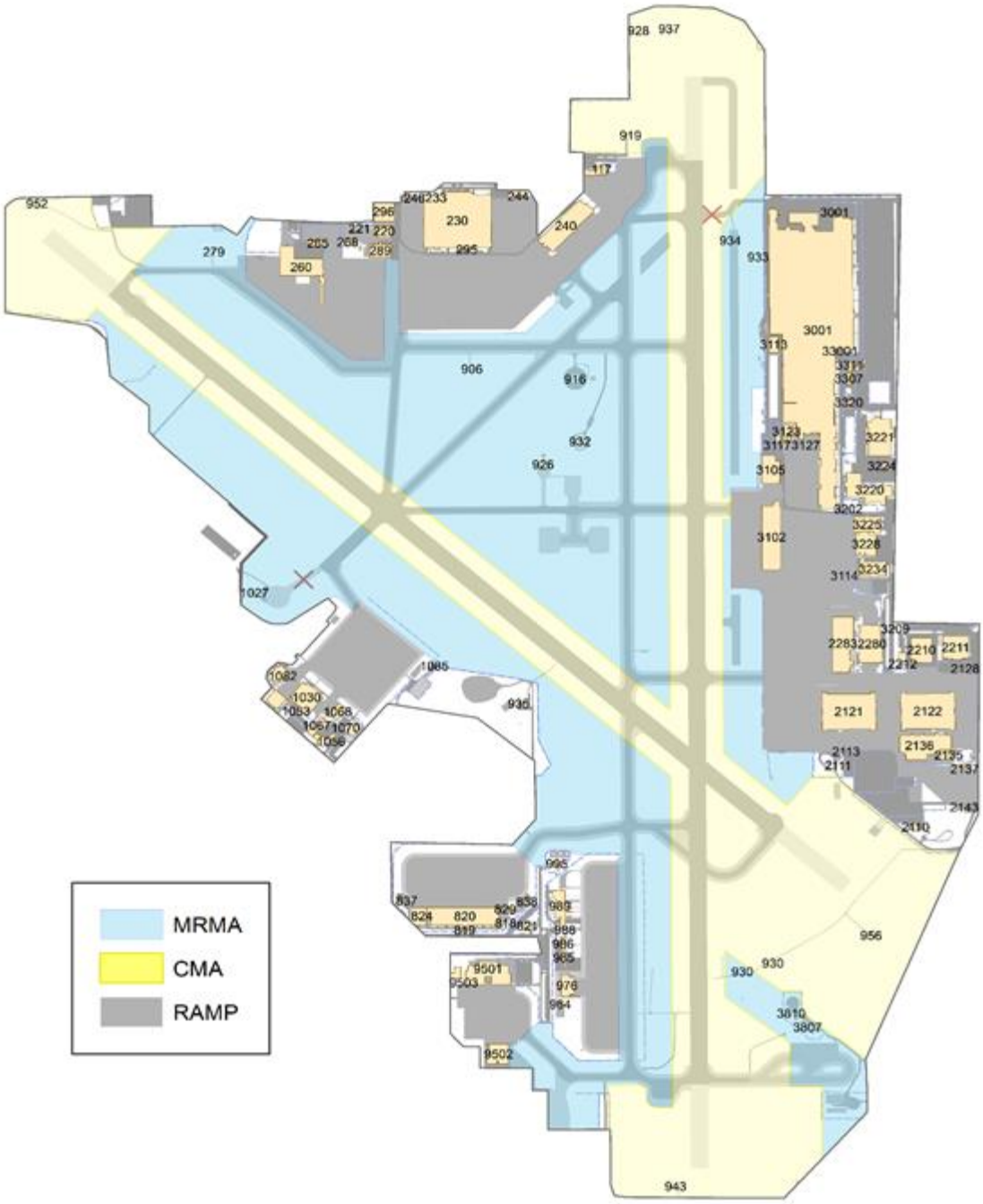
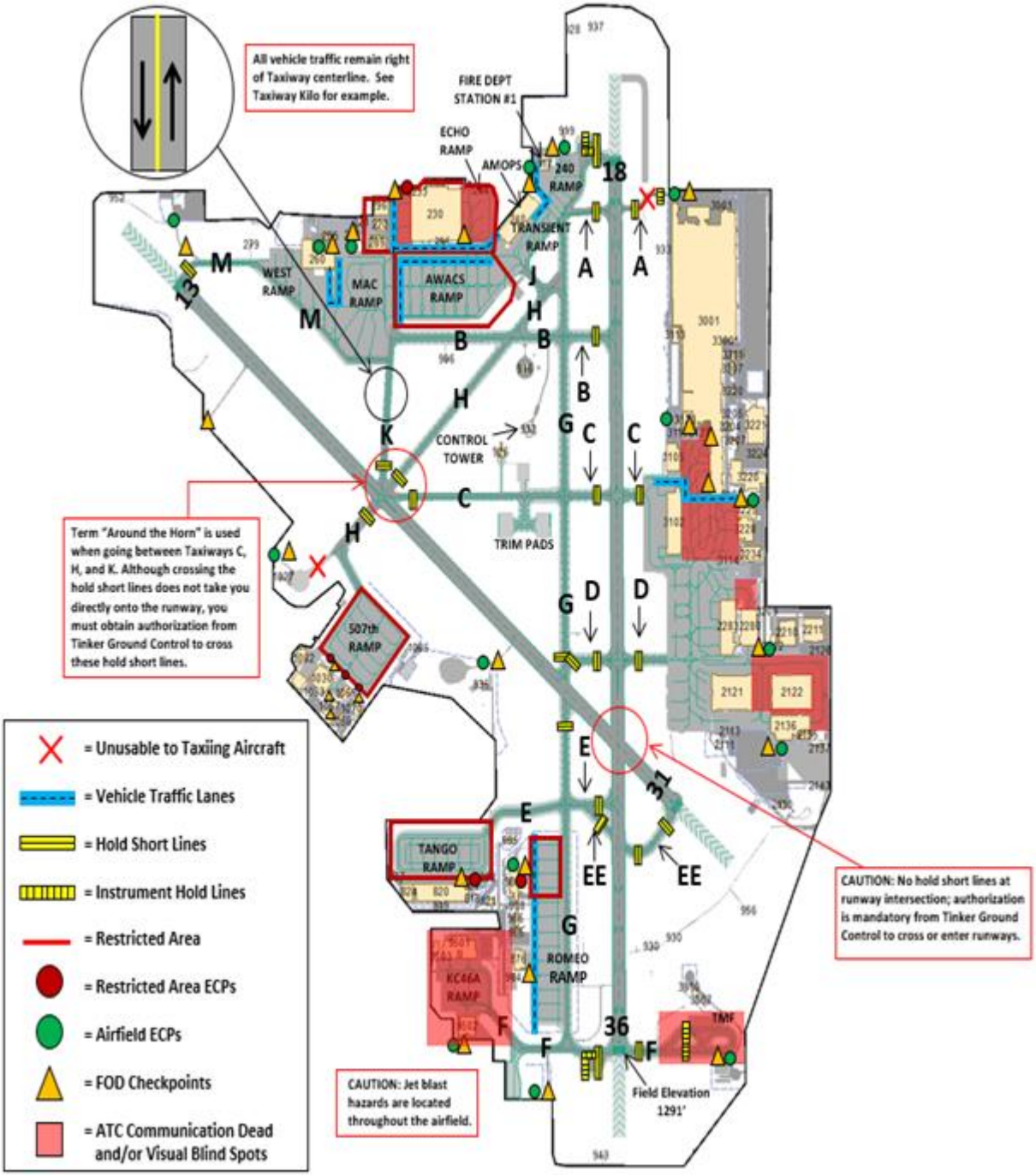


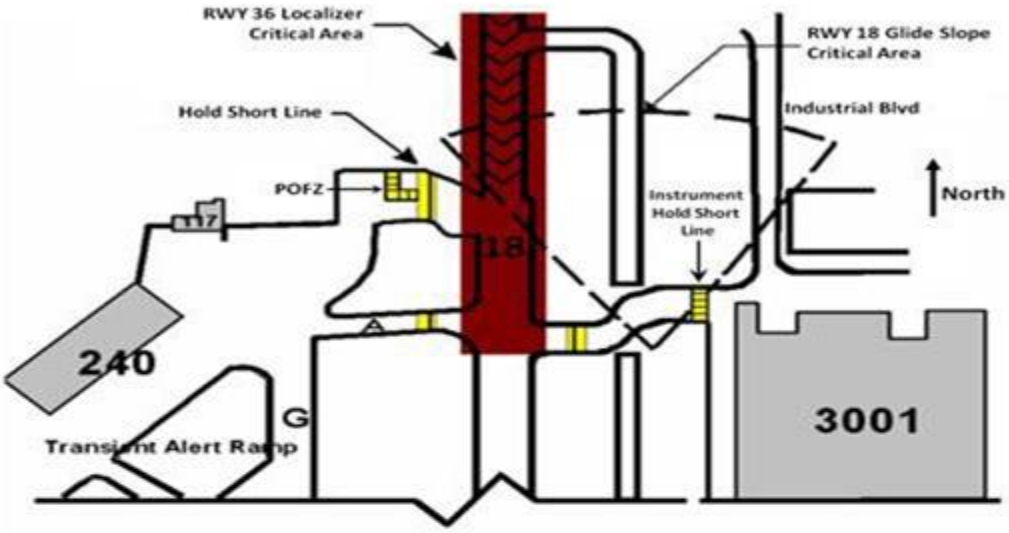
Figure A12.2. (Added) Airfield Diagram.



Attachment 13 (Added)

ILS CRITICAL AREAS

Figure A13.1. (Added) ILS Critical Areas.



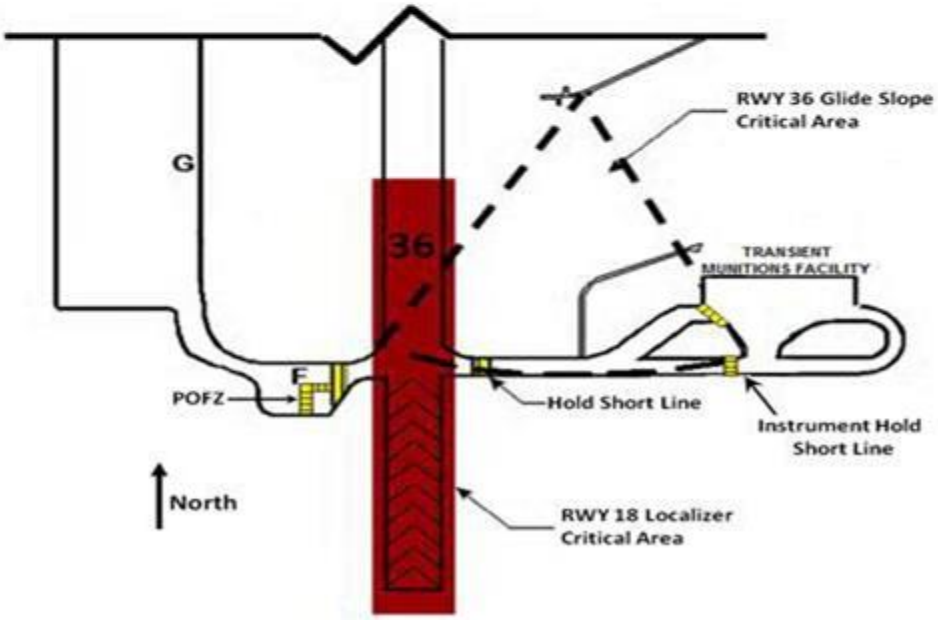
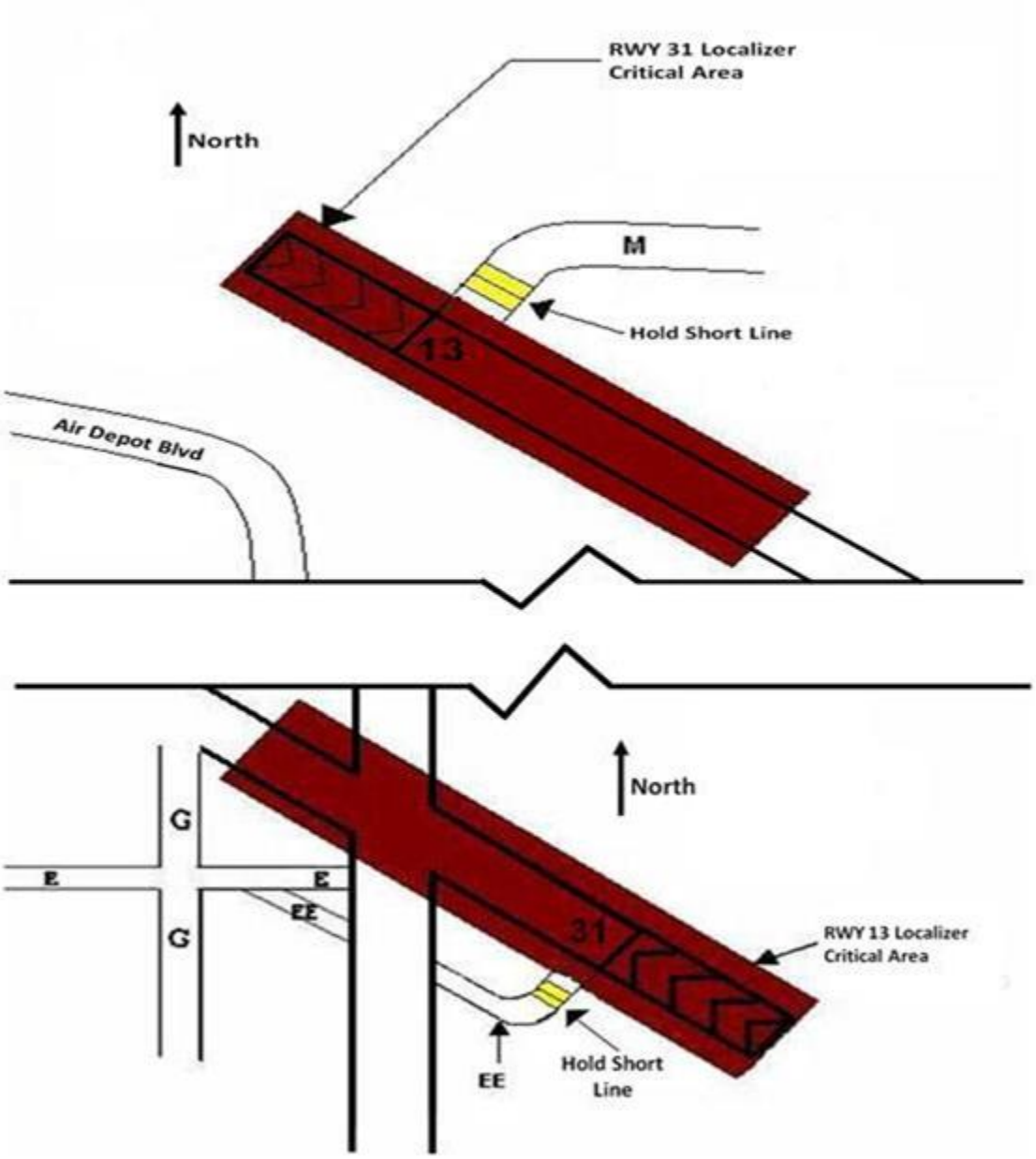


Figure A13.2. (Added) ILS Critical Areas.



Attachment 14 (Added)

CALL SIGN LISTING

Figure A14.1. (Added) Call Sign Listing.

AIRFIELD MANAGER	AIRFIELD-1
ASSISTANT AIRFIELD MANAGER	AIRFIELD-2
AM OPERATIONS	AIRFIELD-3
AM OPERATIONS	AIRFIELD-4
	Portables OPS-25 thru 34
AFSC/CC	CENTER-1
AFSC/CA	CENTER-2
AFSC/CV	CENTER-3
ALC/CC	DEPOT-1
ALC/CA	DEPOT-2
ABW/CC	TINKER-1
ABW/CV	TINKER-2
ABW (command staff)	STAFF-1
OSS CC/DO	THUNDERHAWK ONE/TWO
OSS/AOF	OPS 1 & OPS 2
ATCALS	METNAV, ATCALS
TRANSIENT ALERT	ALERT 72, 73, 74 & ALERT TOW
TRANSIENT ALERT (QAE)	TAILGATE
SECURITY FORCES	
CC	DEFENDER ONE SIERRA
Command and Operations	DEFENDER TWO SIERRA
AWACS Alert Area (Romeo Ramp)	ROMEO ONE SIERRA
AWACS Parking (Birdcage)	NOVEMBER ONE SIERRA, NOVEMBER FOUR SIERRA, NOVEMBER FIVE SIERRA
Patrol Units	PAPA ONE SIERRA, PAPA TWO SIERRA, PAPA THREE SIERRA, PAPA FOUR SIERRA, ZULU ONE SIERRA, ZULU TWO SIERRA
Physical Security	DEFENDER SEVEN SIERRA
Duty Flight Chief	DEFENDER NINE SIERRA
Navy Airfield Driver Training (SF)	SIERRA ONE SIERRA TRAINING
Navy Ramp	TANGO FOUR SIERRA
507 Parking Area	DELTA ONE SIERRA
SF Airfield Driver Training	SECURITY TRAINING

507 ARW	
Supervisor of Flying (SOF)	OKIE SOF
Staff	TANKER STAFF
Safety	RESERVE SAFETY
Maintenance	DUTY BOOMER, OKIE MAINTENANCE, OKIE SUPER, OKIE CONDOR, OKIE LIFE SUPPORT, OKIE RAVEN, SOONER MAINTENANCE, OKIE HAWK
Airfield Driver Training	RESERVE TRAINING
552 ACW COMMAND STAFF	SENTRY-1, SENTRY-2
552 ACW OPERATIONS GROUP	SENTRY OG
Supervisor of Flying	RAMROD
Safety	SENTRY SAFETY
Maintenance	SENTRY EAGLE, SENTRY HAWK SENTRY FALCON, SENTRY RAVEN SENTRY SPARROW
Airfield Driver Training	SENTRY TRAINING
Deicers	DEICER, DEICER SUPER
Crash Recovery	SENTRY RECOVERY
AGE	WHITE AGE, RED AGE
MEDICAL GROUP	MED NINETY EIGHT, MED NINETY NINE
Airfield Driver Training	MED TRAINING
72 ABW SAFETY	BASE SAFETY and BASE SAFETY BRAVO
USDA WILDLIFE SERVICES	USDA and WILDLIFE SERVICES
FIRE DEPARTMENT	
FD	TINKER FIRE CHIEF-1 & CHIEF-2 ENGINE-1 thru ENGINE-4 HAZMAT HIT-1 SQUAD-1 TRUCK-1 CRASH-1 thru CRASH-5 WATER-1 FIRE INSPECTOR-1 thru -3

FIRE TRAINING	
BRUSH-2, BRUSH-3	
DONKEY-1, FIRE SUPPLY	
Base Civil Engineer/Fire Marshal	FIRE MARSHAL
CE FAS	CE FAS
CE QAE	CE QUALITY
ENGINEERING SHOP	CE SURVEY, CE SURVEY 2 & CE ENGINEERS, CE ENGINEERS 2
Airfield Driver Training	THDR & ENGINEER TRAINING
READINESS	PHOENIX thru PHOENIX22
MOBILE COMMAND POST	PHOENIX READINESS
NAVY	
SCW-1/00	AJAX
SCW-1/01	AJAX LIMA
SCW-1/N3	AJAX OSCAR
MAINTENANCE	NAVY MAINTENANCE
VQ-3	IRONMAN
VQ-4	SHADOW
Airfield Driver Training	VQ3 TRAINING and VQ4 TRAINING
ALC MAINTENANCE	FOD BOSS
	ALC MAINTENANCE
	INDIA, LIMA, OSCAR, PAPA,
QUEBEC,	
	YANKEE AND ZULU MAINTENANCE
Airfield Driver Training	ALC TRAINING
FUELS	POL
Airfield Driver Training	POL TRAINING
ADT SECURITY TECH	ADT
ALUTIIQ/CE	
Operations Manager	CE OPS
Infrastructure Manager	INFRASTRUCTURE
Airfield Driver Training	CE TRAINING
Emergency Response Team	ERT
CE Mechanic	CE MAINTENANCE
Interior Electric	INTERIOR ELECTRIC
Power Production	POWER PRO
Entomology	ENTOMOLOGY
Liquid Fuels	LIQUID FUELS

Exterior Plumbers	UTILITY PLUMBER/LOCATOR
Pavements	PAVEMENT SHOP, RG SUPER, RG ELEVEN THRU RG SEVENTEEN
Sweeper	SCHWARTZ SWEEPER, GREEN SWEEPER, RG SWEEPER & CE SWEEPER
Exterior Electric	AIRFIELD LIGHTING, ELECTRIC SUPER, ELECTRIC 84 THUR 89 & ELECTRIC 95
IWTP	OCEAN WATER
Special Structures	CE STRUCTURE
Ice/Snow On-Site Supervisor	SNOW BOSS
Deicer Equipment	EPOKE & BATTS
Brooms	BROOM FIVE HUNDRED, BROOM SIX HUNDRED, & BROOM SEVEN HUNDRED
Rollovers	ROLLOVER EIGHT & NINE HUNDRED
Blower	SNOW BLOWER
ENVIRONMENTAL MANAGEMENT TRACE INC.	BASE EM, EM CONTRACTOR
Project Manager	TRACE MANAGER
Asst. Project Manager	TRACE ASSISTANT
QCI	TRACE QUALITY
Mechanic	TRACE MECHANIC
Tractor Operator	TRACE TRACTOR
Mower	MOWER THIRTY, MOWER FORTY, MOWER FIFTY, MOWER SIXTY, MOWER SEVENTY, MOWER EIGHTY
Work Order Crew	TRACE CREW
72 MSG/LGRDA	
Air Freight	AIR FREIGHT, ATOC TRUCK & ATOC LOADER
Terminal	PAX TERMINAL
72 MSG/LRG (Motor Pool)	
All Drivers	MUSTANG BUS, MUSTANG DRIVER, MUSTANG SEDAN & MOTOR POOL MAINTENANCE
Airfield Driver Training	MUSTANG TRAINING

72 ABW/SC

Abacus	BULLDOG FIVE, SIX, SEVEN & EIGHT
DRS (security sensor repair)	BISS FOUR, FIVE, SIX, & SEVEN
Airfield Driver Training	COMM TRAINING
Network Operations	SHEPPARD FOUR

***Current listing of call signs are kept at AM counter and ATC.**

BY ORDER OF THE SECRETARY OF THE AIR FORCE

AIR FORCE INSTRUCTION 13-213
4 FEBRUARY 2020
Incorporating Change 1, 24 March 2022

Certified Current, 20 November 2023

Nuclear, Space, Missile, Command, and Control

AIRFIELD DRIVING

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Pages: 59

This Department of the Air Force Instruction (DAFI) implements Air Force Policy Directive (AFPD) 13-2, *Air Traffic Control, Airfield, Airspace and Range Management*. This DAFI applies to all civilian employees and uniformed members of the United States Space Force, Regular Air Force, Air Force Reserve, and Air National Guard organizations (to include contracted locations) that administer an airfield driving program. At joint, shared-use, and overseas airfields, this DAFI applies to organizations that are operated and/or managed by the Department of the Air Force, as outlined in real estate documents or letters of agreement. It establishes responsibilities, procedures, and restrictions for the safe control and operation of vehicles and equipment on airfield ramps, aprons, taxiways, and runways. Compliance with the Attachments **2**, **3**, **4**, **5**, **6**, **7**, **8** and **9** in this instruction is mandatory. Ensure all records generated as a result of processes prescribed in this publication adhere to Air Force Instruction (AFI) 33-322, *Records Management and Information Governance Program*, and are disposed in accordance with the Air Force Records Disposition Schedule, which is located in the Air Force Records Information Management System. Refer recommended changes and questions about this publication to the office of primary responsibility (OPR) using the Air Force Form 847, *Recommendation for Change of Publication*; route Air Force Form 847 from the field through the appropriate functional chain of command. This DAFI may be supplemented at any level, however major or field command supplements to include interim changes to previously approved supplements must be routed to Headquarters Air Force Flight Standards Agency (AFFSA), Director of Airfield Operations (AO) for coordination prior to certification and approval. Unit (wing or base) supplements to this DAFI must be routed to the responsible major or field command OPR for AO for review and coordination prior to certification and approval. The authorities to waive wing or unit level requirements in this publication are

identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See DAFI 33-360, *Publications and Forms Management*, for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command and major or field command OPR for AO prior to submission to the appropriate tier waiver approval authority. The Air Force Flight Standards, Airfield Operations Directorate (AFFSA/XA) is the tier waiver approval authority for non-tiered compliance items or requirements in this DAFI. See **paragraph 1.2** for additional guidance concerning waivers to this DAFI. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Department of the Air Force. The reporting requirements in this DAFI are exempt from licensing with a report control symbol according to Air Force Instruction 33-324, *The Air Force Information Collections and Reports Management Program*.

SUMMARY OF CHANGES

This interim change revises AFI 13-213 by changing it to a DAFI, de-conflicting guidance and tier waiver authority for Foreign Object Damage (FOD) checks on Department of the Air Force (DAF) owned and/or operated airfields, clarifying wing or garrison airfield driving program manager's role and responsibility for ensuring unit program compliance and updating technical references. A margin bar (|) indicates newly revised material.

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Chapter 1

GENERAL INFORMATION

1.1. Scope and Purpose.

1.1.1. This Department of Air Force (DAF) Instruction provides guidance for developing an airfield driving program to provide safe ground vehicle operations and pedestrian control on DAF-owned and/or operated airfields. It outlines training requirements for all personnel (e.g., military, Department of Defense (DoD) civilians, contractors) who, as a part of their job, are required to drive on an airfield. Where applicable, the host wing commander or equivalent must ensure guidance outlined in the wing or base supplement to the DAFI addresses any unique applicability conditions (e.g., signed Memorandum of Agreement, Memorandum of Understanding, support agreement) to ensure compliance and support from non-DAF organizations or functions (e.g., other military services, federal or state agencies, host nation, contract, commercial companies or offices) that operate vehicles on DAF-owned and/or operated airfields. **(T-2).**

1.1.2. Personnel who operate a vehicle on the airfield need to be knowledgeable of and comply with the procedures outlined in this instruction and wing or base supplement.

1.1.3. In today's complex airfield environment, there are incidents involving aircraft, pedestrians, and ground vehicles at DAF airfields that lead to property damage and personnel injury. Therefore, strict adherence to the procedures in this instruction is essential to preventing aircraft-vehicle mishaps and personnel injury on the airfield.

1.1.4. **Shared-Use Airfields.** Airfield Management personnel at shared-use airfields (i.e. Air National Guard, Air Force Reserve units) should work with the civil airport manager to develop and implement an airfield driving program as applicable.

1.1.5. Contingency Locations. Contingency is defined as a situation requiring military operations in response to natural disasters, terrorists, subversives, or as otherwise directed by appropriate authority to protect United States interests. At contingency locations, outside the United States, the senior airfield authority (SAA) is delegated authority to waive Tier 3 compliance requirements in this instruction to support tactical or combat operations and situations. Authority shall not be further delegated. **(T-1).** The SAA ensures the following actions are accomplish prior to waiver approval:

1.1.5.1. Conduct a risk management assessment with the rationale for the waiver and explain (1) how complying with the requirement or compliance item impacts mission accomplishment, OR (2) cost of compliance (training, funds, equipment, facilities, guidance or manpower) creates unacceptable risk to a higher priority task; OR (3) expected cost of compliance outweighs the benefit; OR (4) personnel cannot comply with the requirement due to a lack of resources (training, funds, equipment, facilities, guidance or manpower). **Note:** Waiver may be approved for a period not to exceed the requested waiver period or 30 calendar days after the approving commander's deployment length, whichever is shorter. Because waivers are the expression of a specific commander accepting risk, approved waivers automatically expire 30 calendar days after a change unless the new commander renews the waiver.

1.1.5.2. Forward proposed waivers to the Air Force Forces (AFFOR) staff or equivalent for an operational review if time permits, or at the discretion of the SAA.

1.1.5.3. Refer to Air Force Tactics, Techniques, and Procedures (AFTTP) 3-4.4, *Contingency Airfield Operations* (CAO) for additional information. This AFTTP outlines how AFFOR open and operate a deployed or contingency airfield. This AFTTP volume also contains planning considerations for airfield management, air traffic control, and deployable air traffic control and landing systems (DATCALS) capabilities, procedures, forces, and equipment.

1.2. Waivers.

1.2.1. Units shall use the Air Force Form 679, *Air Force Publication Compliance Item Waiver Request/Approval* to process waivers to this instruction. (T-1).

1.2.2. All waiver requests to this instruction must be reviewed and coordinated on by the Wing or Garrison Airfield Driving Program Manager (ADPM), Airfield Operations Flight Commander (AOF/CC) or civilian equivalent, Wing Safety and major or field command OPR for AO prior to submission to the appropriate Tier waiver approval authority. **(T-1).**

1.2.3. Units must include a risk management assessment with the rationale for the waiver and explain (1) how complying with the requirement or compliance item impacts mission accomplishment, (2) cost of compliance (training, funds, equipment, facilities, guidance or manpower) creates unacceptable risk to a higher priority task; OR (3) expected cost of compliance outweighs the benefit; OR (4) personnel cannot comply with the requirement due to a lack of resources (training, funds, equipment, facilities, guidance or manpower). **(T-1).** If deemed necessary, submit additional data (e.g., letters of procedure, airspace maps, traffic patterns, airfield diagrams) to substantiate the waiver request. **Note:** Tier 1, 2, and 3 waivers may be approved for a period not to exceed the requested waiver period or 90 calendar days after the approving commander's tour length, whichever is shorter. Because waivers are the expression of a specific commander accepting risk, approved waivers automatically expire 90 calendar days after a change unless the new commander renews the waiver.

1.2.4. Units must provide an informational copy of all Tier 3 approved waivers to major or field command OPR for AO. **(T-2).**

1.2.5. The requesting office unit commander must forward a copy of the approved waiver (e.g., AF Form 679 or equivalent) to the Air Force Flight Standards, Airfield Operations Directorate (AFFSA/XA) workflow at **hqaffsa.xa@us.af.mil** within 30 calendar days of approval for situational awareness and process improvement considerations. **(T-1).**

1.2.6. Approved waivers become part of the approver's and requestor's official records and are appropriately filed in accordance with Air Force Instruction (AFI) 33-322. **(T-1).**

Chapter 2

ROLES AND RESPONSIBILITIES

2.1. Headquarters Air Force Flight Standards Agency.

2.1.1. Develops United States Air Force airfield driving operations, procedures, and training standards.

2.1.2. Utilizes the Air Force Safety Automated System to monitor and track airfield driving and controlled movement area violations.

2.1.3. Reviews and provides final disposition on waiver request(s) to this instruction.

2.1.4. Supports Air Force Runway Safety Action Team programs, in accordance with Air Force Manual (AFMAN) 13-204, Volume 1, *Management of Airfield Operations*.

2.1.5. Develops mandatory briefing and training items to provide education, training, and awareness on airfield driving and to enhance flight safety.

2.2. Major or Field Command OPR for Airfield Operations.

2.2.1. Supplements United States Air Force airfield driving guidance as applicable.

2.2.2. Reviews and evaluates airfield driving incidents, causes, observations and recommendations.

2.2.3. Conducts Air Force Runway Safety Action Team programs, in accordance with AFMAN 13-204, Volume 1.

2.3. Host Wing Commander or equivalent.

2.3.1. Ensures base or tenant agencies support the airfield driving program.

2.3.2. May reinstate airfield driving privileges in writing to perform mission essential duties following suspension or revocation of an individual's civilian driver's license and base driving privileges. Authority may be delegated in writing to a G-series ordered commander in the appropriate chain of command.

2.3.3. Approves publication of wing or base supplements to this instruction.

2.3.4. Requests an Air Force Runway Safety Action Team through the major or field command OPR for AO when there are recurring problems with runway incursions. See AFMAN 13-204, Volume 1 for additional information.

2.3.5. Reviews runway incursion and Controlled Movement Area Violation incidents and corrective actions taken.

2.3.6. Appoints a wing or garrison airfield driving program manager in writing. **(T-3).** Authority may be delegated in the wing or base supplement.

2.4. Operations Group Commander or equivalent.

2.4.1. Reviews Controlled Movement Area Violations and corrective actions taken.

2.4.2. Must convene a Runway Incursion Prevention Working Group (RIPWG) no later than 30 calendar days following the occurrence of three runway incursions (within a six-month period). **(T-2).** See **Attachment 2** for RIPWG requirements. **Note:** This requirement only applies to vehicle and pedestrian runway incursions. Aircraft runway incursions should be addressed by the Flight Safety office.

2.4.3. Approves the shape and increase or decrease in the size of the controlled movement area (CMA) with recommendations from airfield manager (AFM), wing or garrison airfield driving program manager (WADPM), AOF/CC, tower chief controller, and wing safety.

2.5. Unit Commander or equivalent.

2.5.1. Shall appoint qualified primary and alternate unit ADPMs and unit airfield driving trainers in writing in accordance with **paragraph 2.8** and **paragraph 2.9** **(T-3). Note:** Ensure an adequate number of unit ADPMs to satisfactorily manage the number of airfield drivers within an organization. Conversely, small organizations can combine or consolidate their airfield driving program. See **Attachment 4** for an example appointment letter.

2.5.2. Ensures replacement unit ADPMs are appointed in writing at least 30 calendar days prior to releasing the current unit ADPM. **(T-3).**

2.5.3. Certifies unit personnel complete the required training and testing requirements outlined in this instruction and wing or base supplement prior to obtaining an Air Force Form 483, *Certificate of Competency* to operate a vehicle on the airfield. **Note:** Unit commanders may delegate to unit ADPMs.

2.5.4. Limits the number of personnel authorized to drive on the airfield to the absolute minimum necessary to accomplish the mission.

2.5.5. Suspends a unit member's airfield driving authorization upon suspension or revocation of their civilian driver's license or base driving privileges. Notify the wing or garrison ADPM and unit ADPM of the individuals' suspension or revocation. **Note:** Process request for reinstatement of airfield driving authorization according to **paragraph 4.31**.

2.5.6. Participates in the RIPWG.

2.6. Airfield Operations Flight Commander (AOF/CC) or equivalent.

2.6.1. Assists in assigning an operational category classification (e.g. Operational Error, Pilot Deviation and Vehicle/Pedestrian) in the recommendation section of the Air Force Form 457 *United States Air Force Hazard Report* or narrative section of the Air Force Form 651, *Hazardous Air Traffic Report*.

2.6.2. Concurs or non-concurs with safety investigations on controlled movement area violations and runway incursions in accordance with Department of the Air Force Manual 91-223, *Aviation Safety Investigations and Reports.*

2.6.3. Notifies Major or Field command of controlled movement area violations and runway incursions the first available duty day following the incident.

2.6.4. Shall obtain major or field command OPR for AO coordination on wing or base supplements to this instruction prior to certification and approval. **(T-2).**

2.6.5. Participates in the RIPWG.

2.7. Wing or Garrison ADPM. The Wing or Garrison ADPM (WADPM) will:

2.7.1. Be a 1C771 (Airfield Management) with the 7-skill level (or civilian equivalent) and appointed in writing by the host wing commander or equivalent to provide overall airfield driving program management and oversight. **(T-3).** Authority may be delegated in the wing or base supplement. The preferred grade of the wing or garrison ADPM is technical sergeant/E-6 (or above) or civilian equivalent.

2.7.2. Develop a wing or base supplement to this instruction. **(T-2).**

2.7.3. Use **Attachment 5** (or electronic equivalent) to conduct and document training on a Unit ADPM prior to performing duties. **(T-3).**

2.7.4. Provide unit ADPMs a copy of the wing or base supplement to this instruction, training curriculum, and testing materials to manage unit airfield driving program. **(T-3).**

2.7.5. Conduct a review of the wing or base supplement to this instruction to include procedural guidance, training and testing materials, diagrams, figures, and any other supportive information for currency and accuracy at least annually. **(T-3).**

2.7.6. Conduct an annual self-assessment of Wing Airfield Driving program using the Self-Assessment Communicator (SAC) loaded into Management Internal Control Toolset (MICT). **(T-2).**

2.7.7. Conduct quality control measures to monitor the effectiveness of unit airfield driver training programs. See **Attachment 6**. **(T-3).**

2.7.8. Issue and maintain control and/or security of privately owned vehicle (POV) and government leased vehicle passes or decals. **(T-3).** For example, achieve control and/or security by changing pass or decal colors annually or by issuing new passes or decals annually. Regardless of what method used, annually validate and issue passes or decals. **(T-3). Note:** Authority must not be delegated outside airfield management. **(T-2).** Coordinate changes to vehicle passes or decals with the security forces squadron. **(T-3).**

2.7.9. Develop proactive approaches utilizing local resources, such as base paper, commander's access channel (TV), e-mail advisories, or unit briefings, in order to educate, inform and update personnel on airfield changes, trends and special events. **(T-3).** Examples include but are not limited to exercises, air shows, and static displays, driving violations, runway/taxiway closures and inclement weather driving conditions.

2.7.10. Notify the appropriate unit commander, ADPM and AOF/CC when an individual commits a controlled movement area violation. **(T-3).**

2.7.11. Maintain a Wing ADPM Continuity Binder or electronic equivalent outlined in **Attachment 9**. **(T-3).**

2.7.12. Conduct semi-annual meetings with Unit ADPMs to provide training, brief Controlled Movement Area Violations, or trends. **(T-3).** Use a Memorandum for Record (MFR) to document semi-annual meeting minutes. Maintain a file copy of the current calendar year in Tab J of the Wing ADPM Continuity Binder.

2.7.13. Coordinate on unit airfield driving lesson plans and tests. **(T-3).**

2.7.14. Ensure unit ADPMs provide appropriate training to temporarily assigned personnel**,** inspection and survey teams, and non-base assigned contractors based on type, location, time and duration of work. **(T-2).**

2.7.15. Provide classroom training as determined locally. **(T-3).**

2.7.16. Identify mission oriented protective posture training requirements in accordance with AFMAN 24-306, *Operation of Air Force Government Motor Vehicles*, Chapter 14 and publish in the wing or base supplement, as applicable. **(T-3).**

2.7.17. Participate in the RIPWG. **(T-3).**

2.7.18. Provide Unit ADPM a standardized spreadsheet (or electronic equivalent) to monitor and track unit personnel authorized to drive on the airfield. **(T-3).** The list of airfield drivers will include the individual's full name, rank, unit, AF Form 483 certificate number, restrictions (e.g. daytime or ramp only) and refresher training due date. **(T-3).**

2.7.19. Take immediate actions following a Controlled Movement Area Violation or Runway Incursion to correct any identified systematic problems and ensures interim control measures are applied until permanent corrections are made. **(T-3).**

2.7.20. Develop a local airfield diagram for the wing or base supplement to this instruction. **(T-3).** See **paragraph 4.34** for additional information.

2.7.21. Coordinate on locations designated for primary (initial) and secondary (follow-on, support) response agencies (e.g., crash recovery, security forces, and ambulance). **(T-3).**

2.7.22. Check each unit airfield driving program, to include a copy of the unit ADPM management internal control toolset (MICT) self-assessment communicator (SAC), for compliance with this publication and wing or base supplement at least annually **(T-3).** Report any trends, recommended improvement areas, and overall program effectiveness and compliance in writing to the unit commander. **(T-3). Note:** Wing or garrison ADPM is not required to gain access to a unit's MICT program. Provide ADPMs assigned to or working in non-DAF organizations and/or functions (e.g., other military services, federal or state agencies, host nation, contract, commercial companies or offices) a copy of the unit ADPM MICT SAC as applicable.

2.7.23. Develop a local airfield diagram or layout test to ensure individuals know the location of runways, taxiways, aprons, perimeter road, and airfield access points. **(T-1).** See **paragraph 3.3.1.1** for additional information.

2.7.24. Develop a written communication, general knowledge, and runway incursion on the wing or base supplement. **(T-1).** Include the OPR and currency date on each test. See paragraph **3.3.1.2-3.3.1.5** for additional information.

2.7.25. Disseminate taxiway and runway closures, construction activity, or other airfield hazards to unit ADPM. **(T-3).**

2.8. Unit ADPM or equivalent. The unit ADPM must:

2.8.1. Be at least staff sergeant/E-5 (or above) or civilian equivalent. **(T-3).**

2.8.2. Possess an AF Form 483. **(T-1). Note:** Unit ADPMs with members who require CMA access, must also have CMA access **(T-1).**

2.8.3. Administer the airfield driver's training program according to this instruction and wing or base supplement. **(T-2).**

2.8.4. Validate unit personnel completion of airfield driver training and certification prior to issuance of an AF Form 483. **(T-3).**

2.8.5. Limit airfield driver's access on or across runways to mission essential duties only. **(T-3).**

2.8.6. Identify, document, and track personnel requiring access to the CMA, Non-CMA, or restricted airfield driving as applicable (e.g., ramp only or daylight hours only) **(T-3).**

2.8.7. Ensure unit personnel who are not trained and certified to drive at night possess an AF Form 483 which indicates restricted access (i.e. "AUTHORIZED DAYLIGHT HOURS ONLY"). **(T-3).** If the individual later requires driving on the airfield at night, ensure the practical airfield familiarization training and practical driving check-ride is conducted and documented prior to updating the AF Form 483.

2.8.8. Ensure designated airfield driving trainers conduct and document practical day and night (as applicable) airfield familiarization training and practical driving check-ride on unit personnel prior to issuance of an AF Form 483. **(T-3).**

2.8.9. Ensure unit personnel authorized to drive on the CMA completed all required training requirements as outlined in **Chapter 3**, wing or base supplement and possess an AF Form 483 annotated "***Controlled Movement Area Access.***" **(T-2).**

2.8.10. Ensure unit personnel have a valid state or country driver's license to operate privately owned, government (may also require a government driver's license), or contractor owned or leased vehicles on the airfield. **(T-3).** At overseas locations, refer to major or field command directives for additional guidance.

2.8.11. Ensure unit personnel are qualified to drive the vehicle(s) they are operating on the airfield. **(T-3).** This includes any other additional training required to operate vehicles in various field conditions (e.g., blackout or night vision devices, mission oriented protective posture gear). Units with personnel operating vehicles on the airfield using mission oriented protective posture gear must have local operating procedures coordinated through the wing or garrison ADPM and approved by the requesting unit's squadron commander. **(T-3).** The local operating procedures must include the required training outlined in AFMAN 24-306, Chapter 14. **(T-1).**

2.8.12. Maintain current and accurate airfield driving training records, associated forms and listing of unit personnel authorized to drive on the airfield. **(T-3).**

2.8.13. Ensure personnel that have (or will have) duties requiring them to operate a vehicle on the airfield in a deployed or contingency environment are trained and possess a valid AF Form 483 prior to deploying. **(T-3).**

2.8.14. Schedule personnel that require access to the CMA for color vision testing according to the wing or base supplement to this instruction. **(T-3).** See **paragraph 3.4** for additional information.

2.8.15. Conduct and document annual refresher training on unit airfield drivers. **(T-2). Note:** Document completion of refresher training on the reverse side of the individual's AF Form 483. Maintain a copy of the most current refresher training completion date on file in the unit.

2.8.16. Ensure alternate Unit ADPMs and designated trainers give a practical day and night (as applicable) airfield familiarization training and practical driving check-ride to all new vehicle operators before they are allowed to drive vehicles on the airfield. **(T-3).**

2.8.17. Maintain an airfield driving program Continuity Binder (or electronic equivalent) in the format outlined in **Attachment 9**. **(T-3).**

2.8.18. Train unit airfield driver trainers on how to conduct and document training for newly assigned unit airfield drivers. **(T-3).**

2.8.19. Attend wing or garrison ADPM semi-annual meetings and briefings regarding airfield driving. **(T-3).**

2.8.20. Ensure temporarily assigned personnel, inspection and survey teams and non-base assigned contractors, that are hosted by the unit receive local airfield driving training as outlined in this instruction and wing or base supplement. **(T-2).**

2.8.21. Use the unit ADPM MICT SAC to conduct and document a self-assessment of the unit's airfield driving program at least annually. **(T-3).** Provide a copy to the wing or garrison ADPM upon request for functional oversight to determine overall program effectiveness and compliance with this publication and the wing or base supplement. **(T-3). Note:** Unit ADPMs should contact their local MICT representative(s) for assistance with being assigned the unit ADPM MICT SAC. ADPMs assigned to or working in non-DAF organizations or functions (e.g., other military services, federal or state agencies, host nation), contract (e.g., commercial companies or offices) can obtain a copy of the unit ADPM MICT SAC from the wing or garrison ADPM.

2.8.22. Develop procedures to disseminate airfield driving related information (i.e. articles, training, or slides) to unit airfield drivers. **(T-3).**

2.8.23. Conduct random spot checks on unit personnel for enforcement and compliance with the wing or base supplement. **(T-3).**

2.8.24. Provide classroom training as determined locally. **(T-3).**

2.8.25. Maintain current and accurate training and testing materials. **(T-3).**

2.8.26. Notify unit commander and wing or garrison ADPM in writing after an individual commits a violation and/or after suspending an individual's airfield driving privileges. **(T-3).**

2.8.27. Participate in the RIPWG. **(T-3).**

2.8.28. Annually validate the number of personnel authorized to drive on the airfield to include justification for individuals required to enter or cross the CMA. **(T-3).** Provide results to the wing or garrison ADPM via an email or memorandum for record (MFR).

2.8.29. Review current airfield information (NOTAMS, advisories and/or emails from wing or garrison ADPM for any taxiway closures, runway closures, construction activity, or other airfield hazards and disseminate this information out to unit drivers for their situational awareness. **(T-3).**

2.8.30. Ensure either (1) Department of the Air Force Visual Aid (DAFVA) 11-240, *USAF Airport Signs and Markings* or (2) Federal Aviation Administration Ground Vehicle Guide to Airport Signs & Markings Dashboard sticker; DAFVA 13-222; *Runway/Controlled Movement Area (CMA);* and airfield diagram are available for each vehicle operated on the airfield. **(T-3).**

2.9. Airfield Driving Trainers.

2.9.1. Must possess an AF Form 483 with the same level of access (i.e. Unit Airfield Driving Program Trainers with members who require CMA access, must also have CMA access) as the personnel the trainers are training. **(T-1).**

2.9.2. Conducts and documents practical day and night (as applicable) airfield familiarization training and the practical driving check-ride as outlined in this instruction and wing or base supplement.

2.9.3. Ensures unit personnel being trained have a valid state or country driver's license to operate the applicable vehicles prior to operating the vehicle on the airfield. **Note:** At overseas locations, refer to major or field command directives for additional guidance.

2.10. Airfield Drivers.

2.10.1. Possess a valid AF Form 483 or be escorted by a vehicle operator that possesses a valid AF Form 483. **Note:** A valid AF Form 483 must be in the driver's possession when operating a vehicle and/or non-vehicle equipment on the airfield. **(T-1).**

2.10.2. Comply with all governing directives and safety practices while driving on DAF-owned and/or operated airfields.

2.10.3. Review and understand airfield signage and markings.

2.10.4. Maintain situational awareness when driving on the airfield, especially in areas Air Traffic Control Tower has known visual blind spots. It is the personal responsibility of every vehicle operator or pedestrian operating on the airfield to check for approaching aircraft, visually observe the Air Traffic Control Tower, and recognize the location of runways, taxiway, and aprons.

2.10.5. Review current airfield information for any taxiway closures, runway closures, construction activity, or other airfield hazards.

2.10.6. Ensure appropriate vehicle lights (high beams, flashers, beacons, and strobes) are operational prior to driving in the operational area.

2.10.7. Use service roads whenever possible to minimize time spent on taxiways and runways.

2.10.8. Use correct terminology during radio transmissions.

2.11. Airfield Management (AM).

2.11.1. Serves as the OPR for the wing or base airfield driving program. **Exception:** At contract locations, the AOF/CC shall be designated as the OPR for the wing or base supplement. **(T-2).** The AOF/CC shall designate the airfield management contract officer representative (military or DoD civilian) as the point of contact for the wing or base supplement. **(T-2).** However, the contract airfield management office retains responsibility for development of the wing or base supplement to this instruction.

2.11.2. Conducts random spot checks for enforcement and compliance of the airfield driving program in conjunction with periodic airfield checks. Annotate spot checks on the Air Force Form 3616, *Daily Record of Facility Operations* or electronic equivalent.

2.11.3. Routinely monitors radios for proper radio terminology, phraseology and discipline. Immediately respond to and correct improper radio usage when notified by the air traffic control tower or through the monitoring of radio frequencies. Document corrective actions on an AF Form 3616 or electronic equivalent.

2.11.4. Imposes and publishes restricted driving routes as required.

2.11.5. Responds to reported or suspected airfield driving violations (e.g. Controlled Movement Area Violations, speeding, expired POV, runway incursions).

2.11.6. Participates in the RIPWG.

2.11.7. AFM, wing or garrison ADPM, and other designated airfield management (AM) representatives are responsible for determining certificate numbers and signing AF Form 483s. **Note:** Authority must not be delegated outside AM. **(T-1).**

2.12. Air Traffic Control Tower.

2.12.1. Controls all aircraft, vehicle, and approved pedestrian traffic on the CMA by two-way radio communications or, in the event of lost communications, by light gun signals. If use of light gun signals are unsuccessful when controlling vehicle or pedestrian traffic, contact Airfield Management to have vehicle and/or pedestrian traffic escorted off the CMA.

2.12.2. Reports known airfield and controlled movement area violations and problems with vehicle operator radio communications to airfield management. Assists airfield management in identifying and locating violators or any unauthorized personnel and vehicles.

2.12.3. Participates in the RIPWG.

2.13. Wing Safety.

2.13.1. Coordinates on wing or base supplement to this instruction.

2.13.2. Coordinates on lesson plans and tests for vehicle operations on the airfield.

2.13.3. Coordinates with AOF/CC, or appropriate AO representatives, in investigating airfield driving incidents, hazard air traffic report (HATR) and controlled movement area violation events.

2.13.4. Notifies the AOF/CC if air traffic control or airfield management services were suspected to be involved in HATR or controlled movement area violation events as outlined in DAFMAN 91-223, Chapter 9.

2.13.5. Participates in the RIPWG.

2.13.6. Reviews Controlled Movement Area violations for trends.

2.14. Security Forces Squadron.

2.14.1. Monitors airfield vehicle operations.

2.14.2. Enforces all traffic rules and directives on the airfield.

2.14.3. Ensures unauthorized vehicles are prohibited from operating on the airfield and informs Airfield Management of violations.

2.14.4. Detains all unauthorized POVs driving on the airfield and notifies Airfield Management.

2.14.5. Assists in escorting violators (as needed) to Airfield Management and issues appropriate citations for violations.

2.14.6. Provides assistance when requested by Airfield Management or the Air Traffic Control Tower to apprehend airfield driving violators (e.g. Controlled Movement Area Violation, speeding, expired POV, runway incursion) and remove unauthorized personnel from the airfield.

2.14.7. Participates in the RIPWG.

2.14.8. Coordinates with the wing or garrison ADPM to establish a designated response location in support of in-flight and ground emergencies or other emergency situations.

2.15. Hospital/Medical Treatment Facility.

2.15.1. Administers and documents color vision screening as determined in the wing/base supplement.

2.15.2. Coordinates with the wing or garrison ADPM to establish a designated response location in support of in-flight and ground emergencies or other emergency situations.

2.16. Civil Engineer Squadron.

2.16.1. Ensures contract personnel receive driver's training from the civil engineering's unit ADPM, AFM, wing or garrison ADPM or designated AM representative prior to the start of construction activities, if personnel are not escorted by a CMA and/or Non-CMA licensed driver.

2.16.2. Ensures training requirements and construction vehicle access roads, including access gates and haul routes are approved by the AFM or wing or garrison ADPM and are included in contract documents.

2.16.3. Ensures the location of Foreign Object Damage (FOD) checkpoints, when required, as well as personnel vehicle parking areas are included in contract documents.

Chapter 3

TRAINING CRITERIA AND TESTING

3.1. Training Curriculum. Locally developed airfield drivers training curriculum or materials (e.g., briefings, videos, computer based training, checklist(s), and lesson plans) must be prescribed by the wing or base supplement to this instruction. **(T-2).** Include an OPR and currency date on training curriculum or materials.

3.2. Training Criteria. Airfield driver's training shall include the following:

3.2.1. Airfield Driving Training Documentation and Certification Checklist (see **Attachment 7**) or electronic equivalent to document airfield drivers' training and certification on all newly assigned or employed personnel. **(T-3).** The checklist is available for download at the AFFSA Airfield Operations SharePoint® website **https://usaf.dps.mil/sites/affsa/SitePages/XAM.aspx.** Units may incorporate local requirements to Airfield Driving Training Documentation and Certification Checklist.

3.2.2. Refresher training annually or upon reissuance of the AF Form 483. **(T-1).** As a minimum, refresher training includes the runway incursion prevention test.

3.2.3. Completion of the Airfield Driving Computer-Based Training Course (accessible on the Air Force myLearning Website, **https://lms-jets.cce.af.mil/moodle/**) is a mandatory, one-time requirement. **(T-1).** Place the initial training date on the Airfield Driving Training Documentation and Certification Checklist (see **Attachment 7**) for personnel who previously completed the training.

3.2.4. Classroom training as determined in wing or base supplement.

3.2.5. Practical day and night (as applicable) airfield familiarization training. **(T-1).** At a minimum, the practical airfield drivers training involves taking the individual out on the airfield to show them how to get to and from their work areas. Trainers will use the Airfield Driving Training Documentation and Certification Checklist (see **Attachment 7**) to document completion of training. **(T-3).**

3.3. Testing Requirements. Base assigned personnel (e.g., military, DoD civilian or contractor) required to operate a vehicle on the airfield must pass all required tests prior to issuance of an AF Form 483. **(T-1).** Training and testing materials should be made available in the predominant host nation language as applicable. All tests shall be administered closed book. **(T-1). Note:** Written tests may be consolidated as long as the minimum test questions are covered and clearly defined by sections (e.g., General Knowledge, Communication, Runway Incursion Prevention, Airfield Diagram or Layout Test).

3.3.1. Authority to administer tests may be delegated to the unit ADPMs in the wing or base supplement to this instruction. At a minimum, testing requirements must include the following:

3.3.1.1. **Airfield Diagram/Layout Test. (T-1).**

3.3.1.1.1. Include identifying the location and description of holding position signs and markings, runway(s) and taxiway(s) on the airfield diagram/layout test.

3.3.1.1.2. Required minimum passing score is a 100%.

3.3.1.1.3. Use the Airfield Driving Training Documentation and Certification Checklist to document test results.

3.3.1.2. **Communications Test. (T-1).** Communication Test contains at least 5 questions with a minimum passing score of 100%. This test is mandatory for airfield drivers that required access onto the CMA. Use the Airfield Driving Training Documentation and Certification Checklist to document test results. At a minimum, the communications test is comprised of the following:

3.3.1.2.1. Basic communication principles.

3.3.1.2.2. Phonetic Alphabet.

3.3.1.2.3. Standard aviation phraseology.

3.3.1.2.4. Escort phraseology and procedures.

3.3.1.2.5. A simulation of radio communications between a vehicle operator and Air Traffic Control Tower. For example, initial radio contact, crossing active runway, or hold short instructions.

3.3.1.3. **General Knowledge Test. (T-1).** General knowledge test contains at least 10 questions with a minimum passing score of 80% (corrected to 100%). Use the Airfield Driving Training Documentation and Certification Checklist to document test results.

3.3.1.4. **Runway Incursion Prevention Test. (T-1).** Test contains at least 5 questions with a minimum passing score of 100%.

3.3.1.5. **Practical Driving Check-ride. (T-1).** At a minimum:

3.3.1.5.1. Drive the vehicle during the check-ride, when feasible.

3.3.1.5.2. Demonstrate the ability to operate a vehicle in all areas required for the duty position and/or work areas without assistance.

3.3.1.5.3. Identify the location of runway hold lines, runways and other CMA.

3.3.1.5.4. Demonstrate the ability to contact air traffic control tower prior to entering the runways and other CMA (*Runway and CMA drivers only*).

3.3.1.5.5. Use the Airfield Driving Training Documentation and Certification Checklist to document test results.

3.3.2. **Test Failures.** Failure to obtain a passing result, will require the following:

3.3.2.1. First failure: Material review and 24 hour period before retesting. **(T-3).**

3.3.2.2. Second failure: unit ADPM recommendation for retest and documentation of material review and remedial training. **(T-3).**

3.3.2.3. Third failure: Unit commander approval to retest or determine member is not eligible to drive on the airfield. **(T-3).**

3.3.2.4. Use the Airfield Driving Training Documentation and Certification Checklist to document test results. **(T-3).**

3.3.2.5. Additional time periods between a test failure or retest should be annotated in the wing or base supplement as applicable. **(T-3).**

3.4. Color Vision Requirements. Individuals that have a requirement to drive a vehicle on the CMA must pass a color vision test. **(T-1).** Contact the base hospital or medical treatment facility Optometrist for assistance in determining the best process for administering the color vision test to drivers that operate a vehicle on the CMA.

3.4.1. Individuals that fail to pass the color vision test can be issued a "ramp only" AF Form 483. **NOTE:** Access to the CMA must not be granted. **(T-1).**

3.4.2. Individuals that have an Air Force Specialty Code with a mandatory requirement for normal color vision are exempt from color vision test.

3.4.3. Unit ADPMs can use the Officer and Enlisted Classification Directory for Air Force Specialty Codes **https://www.afpc.af.mil/Classification/** to check vision requirements. Both products are available for viewing and download on the Air Force Portal.

Chapter 4

OPERATING PROCEDURES AND STANDARDS

4.1. General. This chapter outlines the general operating procedures and standards to ensure maximum safety precautions are taken while operating in the airfield environment. Waivers to this section should be at an absolute minimum.

4.2. Operating a Vehicle in the CMA.

4.2.1. No vehicle operator or pedestrian shall enter the CMA without specific approval from the air traffic control tower. **(T-1). Note:** Vehicles and pedestrians with a qualified escort meet this requirement. See **paragraph 4.23**.

4.2.2. Vehicle operators and/or pedestrians must read back all Air Traffic Control instructions verbatim. **(T-1).**

4.2.3. Vehicle operators and/or pedestrians must always monitor the appropriate radio frequency when in the CMA. **(T-1).**

4.2.4. Vehicle operators must use light emitting diode or rotating beacon lights and/or emergency or hazard warning flashers when driving in the CMA. **(T-1).**

4.2.5. Vehicles operating in the CMA on a daily basis will have a permanent radio mounted in the vehicle to communicate with the air traffic control tower. **(T-3).** A hand-held radio should only be used as a backup or when communication is required outside the vehicle. **Note:** Vehicle operators must conduct an operational test of the radio before entering the airfield. **(T-3).**

4.2.6. Vehicle operators and/or pedestrians operating on the CMA must use a distinct approved call sign (e.g., Airfield 1, Chief 1, Sweeper 1, or Transient Alert 1) coordinated by the wing or garrison ADPM to avoid duplicating, confusing, or different agencies using similar names. **(T-2).** To avoid confusion that could lead to runway incursions or controlled movement area violations, do not use a call sign that is part of air traffic control phraseology such as "Taxi" and/or the phonetic aviation alphabet. Additionally, call signs that incorporate the names and/or numbers of aircraft movement areas associated with the airfield environment must not be used (e.g., taxiway, ramp, alpha, bravo, or one-eight). **(T-2).** Call signs shall be annotated in the wing or base supplement to this instruction. **(T-2).**

4.2.7. Unconditional instructions (blanket approval) to vehicles requesting entry on the runway shall not be authorized. **(T-0).** See Federal Aviation Administration Order 7110.65, *Air Traffic Control* for additional information.

4.2.8. Restrict runway crossing to vehicle operators performing mission essential duties and then only to an absolute minimum. **Note:** When crossing a runway is required during flying operations, the preferred crossing point is the departure end.

4.3. Emergency removal or exit of vehicles and/or pedestrians in the event of vehicle or Air Traffic Control Tower radio failure.

4.3.1. Air traffic control tower will flash the runway edge lights on and off to alert vehicle operators and/or pedestrians on the runway that there is a problem and/or emergency that requires them to immediately exit the runway. **(T-2).**

4.3.2. All vehicle operators and/or pedestrians must exit the runway immediately. **(T-2).**

4.3.2.1. Contact Air Traffic Control Tower and Airfield Management immediately and advise off the runway and include any pertinent information that might affect safe runway operations.

4.3.2.2. If not able to communicate with Air Traffic Control Tower or Airfield Management via radio, use other means of communication such as a cellular phone (when available). Report incident to Airfield Management immediately.

4.4. Airfield Driving Visual Aids/Decals. All vehicles that operate on the airfield must contain the following Air Force Visual Aid/decals and diagrams:

4.4.1. DAFVA 11-240, *USAF Airport Signs and Markings.* **(T-2). Note:** The ground vehicle guide to airport signs & markings dashboard or visor sticker is the Federal Aviation Administration (FAA) equivalent to DAFVA 11-240 and may be used by units located at shared-use airfields.

4.4.2. DAFVA 13-222, *Runway/Controlled Movement Area (CMA) Procedures.* **(T-2).**

4.4.3. A current locally developed airfield diagram (provided by wing or garrison ADPM). **(T-2).**

4.4.4. Hot spots when depicted on a different airfield diagram. **(T-2).**

4.4.5. Decals may be permanently affixed in plain view of the driver or clipped to the inside of the sun visor on the driver's side of the vehicle so it can be flipped down for ready reference.

4.4.6. Decals may be permanently affixed in plain view of the driver or clipped to the inside of the sun visor on the driver's side of the vehicle so it can be flipped down for ready reference.

4.5. Airfield Signs.

4.5.1. **Mandatory Sign.** A mandatory sign has white legend on red background and provides an instruction that must be followed. They denote an entrance to a runway or critical area, or other situation such as a no-entry location. At controlled airfields (with active tower), aircraft and vehicles are required to hold at the holding position unless cleared by air traffic control. At uncontrolled airfields, the intent is that traffic may only proceed beyond the sign after appropriate precautions are taken by the pilot and vehicle operators.

4.5.2. **Taxiway Guidance and Informational Signs.** These include direction signs, destination signs, other informational signs, and boundary signs.

4.5.2.1. **Taxiway Direction Sign.** This sign has a black legend on a yellow background and always contain arrows oriented to the approximate direction of the turn. These signs indicate directions of other taxiways leading out of an intersection.

4.5.2.2. **Taxiway Location Sign.** This sign has a yellow legend on black background and identifies the taxiway on which an aircraft or vehicle operator is located.

4.5.2.3. **Destination Sign.** This sign indicates the general direction to a remote location.

4.5.2.4. **Boundary Sign.** This sign indicates important boundaries such as Instrument Landing System critical areas and runway approach areas.

4.5.2.5. Other signs are used to provide specific information such as noise abatement procedures, check points, and others.

4.5.3. **Runway Exit Sign.** A runway exit sign is located prior to the runway/taxiway intersection on the side and in the direction from which the aircraft is expected to exit.

4.5.4. Examples of mandatory and informational signs are included in **Attachment 3**.

4.6. Airfield Markings. Airfield markings vary greatly depending on location. The following are common markings present at most DAF owned and/or operated airfields.

4.6.1. **Runway Markings.** Runway centerlines are marked with retro-reflective white paint at uniform intervals in the center of the runway. Runway designations are white numeric characters that indicate the lateral position of the runway. Where applicable, the runway side stripe is marked with a solid white line running the length of the runway.

4.6.2. **Taxiway and Apron Markings.** Unless otherwise indicated, most taxiway, apron, and taxilane markings for both fixed and rotary-wing facilities are marked in retro-reflective yellow. All markings of any color on light-colored pavement are optionally highlighted by marking a black, non-reflective border.

4.6.3. Visual Flight Rules Hold Position. Visual flight rules hold position markings are located at least 100 feet from the edge of the runway on all taxiways leading to the runway and consist of four parallel yellow stripes (two solid and two dashed) perpendicular to the axis of taxiway centerline, extending across taxiway with the dashed lines on the runway side. These lines mark the boundary of the CMA. Vehicle operators and/or pedestrians shall not cross the runway hold position or proceed onto the runway without first obtaining permission from the air traffic control tower. **(T-1).**

4.6.4. **Instrument Hold Positions.** These markings are normally placed farther from the runway than the Visual Flight Rules hold position. These markings consist of two solid yellow lines, two feet apart, extending across width of taxiway, connected by pairs of solid yellow lines ten feet apart, on black background. Hold positions are used during Instrument Flight Rules conditions or instrument approach procedures. Instrument Flight Rules hold positions protect Instrument Landing System critical areas to ensure an aircraft's instrument reception is not disrupted during flight. These hold positions are used any time the weather falls below a ceiling less than 800 feet and/or visibility less than 2 miles.

4.6.5. Examples of airfield markings are included in **Attachment 3**.

4.7. Airfield Lighting.

4.7.1. Runway edge lights are white except for the last 2,000 feet (600 meters) on an instrument runway, which are yellow (caution zone indication to the pilot). The runway edge lights may be capable of providing small amounts of omnidirectional light.

4.7.2. Taxiway edge lights are blue.

4.7.3. Taxiway centerline lights are a system of aviation green in-pavement lights installed along the taxiway centerlines to provide alignment for aircraft.

4.7.4. Examples of airfield lighting are included in **Attachment 3**.

4.8. Vehicle speed limits on the airfield. No vehicle (including motorcycles, mopeds, bicycles or tricycles) shall be operated at a speed in excess of that deemed reasonable and prudent for existing traffic, road and weathers. **(T-2).** Emergency vehicles will not automatically assume the right of way. **(T-2). Note:** Vehicles responding to red balls (emergency airfield scenarios), exercises and precautionary landings are not authorized to exceed posted airfield speed limits. Speed limits on the airfields are designated as follows:

4.8.1. Vehicle Parking Areas — 5 miles per hour.

4.8.2. Vehicles in close proximity to aircraft (within 50 feet) — 5 miles per hour.

4.8.3. Aircraft towing speed — 5 miles per hour.

4.8.4. Blackout and/or night vision operations — 10 miles per hour.

4.8.5. Designated traffic lanes on the ramp or taxiway in congested areas or within 200 feet of aircraft parking areas — 15 miles per hour.

4.8.6. Aircraft Parking Ramp — 15 miles per hour.

4.8.7. Airfield or Perimeter Road — 15 miles per hour.

4.8.8. Aerospace Ground Equipment — 15 miles per hour.

4.8.9. During reduced visibility or when snow and ice are present on paved surfaces, reduce speed to 10 mph maximum. Defer vehicle operation when possible and limit to mission essential.

4.8.10. Snow and ice removal vehicles operate at a speed that facilitates safe operations.

4.8.11. "Follow Me" vehicles may exceed the 15 mph flightline speed limit when necessary to accommodate the safe taxiing speed of aircraft.

4.8.12. During emergencies, all emergency response vehicles, e.g., aerospace rescue firefighting equipment, ambulances, airfield management and security forces, may exceed speed limits only with due regard for the safety of persons and property

4.8.13. Taxiways:

4.8.13.1. General purpose vehicles — 15 miles per hour. **Exception:** Vehicle operators may exceed this speed limit when published in an approved wing or base supplement to this instruction.

4.8.13.2. Special purpose vehicles (e.g. tractors, tugs, forklifts, or sweepers).— 10 miles per hour.

4.8.14. Active Runways. Drivers should assume a prudent and reasonable speed depending on nature of business on the runway as well as weather conditions.

4.9. Vehicles operating in the immediate vicinity of an aircraft.

4.9.1. Do not park or drive any vehicle closer than 25 feet in front or 200 feet to the rear of any aircraft when engines are operating or are about to be started. Units should add additional safety distance based on assigned aircraft.

4.9.2. Do not operate vehicles within 25 feet of an aircraft unless providing an immediate service to that aircraft (e.g. fueling, servicing).

4.9.3. Do not operate a vehicle in front of a taxiing aircraft unless signaled to do so by the pilot or instructed by Air Traffic Control Tower. Do not operate a vehicle between an aircraft and its marshaller.

4.9.4. Vehicle operators must yield and give right of way to aircraft in motion. **(T-1).**

4.9.5. Ensure vehicles parked at the side of the aircraft are clear of the wing tips and clearly visible to personnel in the aircraft cockpit.

4.10. Parking and chocking vehicles on the airfield.

4.10.1. Never drive vehicles under any part of the aircraft.

4.10.2. Vehicles shall not be backed or parked within 25 feet of any aircraft, unless authorized for operations such as loading or unloading, servicing or towing. **(T-1).** A spotter shall be posted when backing a vehicle towards an aircraft. **(T-1).** Prepositioned wheel chocks shall be used to prevent vehicles backing into aircraft. **(T-1).**

4.10.3. Unattended vehicles shall be parked with the driver‘s side facing the aircraft and so it will not interfere with aircraft being towed or taxied. **(T-1). Note:** Local guidance should address procedures at locations where right-hand drive vehicles or equipment are utilized.

4.10.4. Ignition shall be turned off; keys left in the ignition; and the gear lever put in reverse gear for manual transmissions, and in ‘park’ for automatic transmissions. **(T-1).**

4.10.5. All vehicles parked and left unattended will have brakes set or chocks placed in front of and behind a rear wheel, or one chock placed between the tandem wheels of dual (tandem) axle vehicles. **(T-1).** Only alert and emergency vehicles responding to an alert or emergency are exempt from these requirements. **Note:** Aerospace ground equipment towing vehicles may be placed in neutral or park with parking brake set and engine left running during equipment hitching and unhitching operations. Turn off aerospace ground equipment towing vehicles when the driver seat is vacated for any other purpose.

4.11. Fixed and mobile obstacle distance requirements.

4.11.1. The lateral clearance distance from taxiway centerline to fixed or mobile objects is 200 feet. Do not leave vehicles parked or unattended within 200 feet of the taxiway centerline.

4.11.2. The lateral clearance distance from the apron boundary edge to fixed or mobile obstacle is based on the Air Force apron boundary criteria outlined in Unified Facilities Criteria 3-260-01, *Airfield and Heliport Planning and Design*, Table 6-1 Rule 15.

4.11.3. The lateral clearance distance from the runway centerline is 1000 feet. When operating within this area, do not park and leave a vehicle or equipment unattended.

4.11.4. Do not park aerospace ground equipment or vehicles within any runway, taxiway, taxilane, or apron obstacle clearance distances.

4.12. Control tower light gun signals. Air traffic controllers use a light gun as a backup system for communicating with aircraft or ground vehicles if their radios stop working. When a vehicle operator experiences a radio failure on a runway or taxiway, vacate the runway as quickly and safely as possible and contact the air traffic control tower or airfield management by other means, such as a cellular or mobile phone to advise of the situation. If this is not practical, then the driver, after vacating the runway, should turn the vehicle toward the tower and start flashing the vehicle headlights and wait for the controller to signal with the light gun. All vehicle operators must know and comply with light gun signals **(T-1).** Light gun signals are as follows:

4.12.1. **Steady Green Light:** "Cleared to cross," "Proceed," "Go".

4.12.2. **Steady Red Light:** "STOP! Vehicle will not be moved."

4.12.3. **Flashing Red Light:** "Clear taxiway/runway."

4.12.4. **Flashing White Light:** "Return to starting point."

4.12.5. **Red and Green Light:** "General warning. Exercise extreme caution."

4.13. Foreign Object Damage Prevention (FOD). All vehicle operators will:

4.13.1. Check tires for FOD after returning to pavement if driving on unimproved surfaces (for example, to avoid taxiing aircraft or if performing runway repairs). **(T-1)**.

4.13.2. Make every attempt to stay on paved surfaces and avoid driving on unimproved surfaces (e.g. dirt or grass). **(T-1).**

4.13.3. At a minimum, a FOD check will consist of the following:

4.13.3.1. Inspect the vehicle tires (pull forward to check tire in contact with pavement). **(T-1).**

4.13.3.2. Ensure all external vehicle components are secured. Secure all items loaded on payload vehicle, to include all tie-down device loose ends such as chains, ropes, packaging or other item that may become dislodged during movement while on the airfield. **(T-1).**

4.13.3.3. A thorough walk around of the vehicle to check for damaged, loose, or worn parts. **(T-1).**

4.13.4. Refer to DAFI 21-101, *Aircraft and Equipment Maintenance Management*, Chapter 11 and AFMAN 91-203, *Air Force Occupational Safety, Fire, and Health Standards*, Chapter 24 for additional information.

4.14. Use of cellular or mobile phones on the airfield.

4.14.1. Only use the hands-free capabilities of cellular or mobile phones while driving on the airfield (e.g., texting and driving or holding the phone in your hand to talk while driving is not authorized.)

4.14.2. The wearing of other portable headphones, earphones, or other listening devices while operating a motor vehicle is prohibited. Use of these devices impairs driving and prevents recognition of emergency signals, alarms, or radio calls.

4.15. Restricted Visibility or Night Driving Operations.

4.15.1. Do not point headlights toward taxiing aircraft or towing operations to prevent blinding pilot or tow vehicle operators.

4.15.2. Use flashing or parking lights at night when vehicles are temporarily parked on any part of the aircraft ramp. This does not apply to vehicles parked in a designated parking area.

4.15.3. Do not operate fueling and explosive loaded (laden) vehicles on the airfield when visibility is less than 300 feet unless approved by the host wing commander.

4.15.4. Do not operate vehicles on the airfield when visibility is less than 100 feet. **Exception:** Emergency and/or alert vehicles may be operated when necessary to accomplish the mission.

4.15.5. Use a walking guide with a flashing or luminescent wand during emergency movement of alert vehicles when visibility is under 50 feet.

4.15.6. Vehicle operator must stop and hold at instrument hold markings and/or signs when conditions are less than a reported ceiling of 800 feet or 2 miles visibility. **(T-1).**

4.15.7. Vehicle headlights shining towards a moving aircraft at night shall be turned off immediately to prevent affecting the pilot's night vision and will remain off until the aircraft is out of range. **(T-1).** However, vehicle parking lights or emergency flashers are turned on so its position is known. Headlights shall be turned on prior to moving the vehicle. **(T-1).**

4.16. Driving with Daytime Running Headlights. During restricted visibility, night time operations or in the vicinity of taxiing aircraft, must park vehicles with daytime running headlights in a safe location with headlights off, parking brake set, and emergency flashers on. **(T-1).**

4.17. Operating Non-Vehicular Equipment. Examples of non-vehicular equipment include segway, bicycle, tricycle, golf cart, all-terrain vehicle, mower, or aerospace ground equipment).

4.17.1. Non-vehicular equipment operators are required to know requirements in this instruction and wing or base supplement. Unless otherwise directed, personnel operating non-vehicular equipment are exempt from state and/or country driver's licensing requirements. However, personnel operating non-vehicular equipment must complete airfield driver's qualification training in accordance to this instruction. **(T-1).**

4.17.2. Tricycles parked on the airfield will have a braking device engaged to prevent inadvertent movement. **(T-1).** For night use, equip bicycles and tricycles with an operating headlight and reflectors or reflective tape. Equip non-vehicular equipment with forward and rear lamps if operated at night.

4.17.3. Place all non-vehicular equipment parked on the airfield so as not to impede aircraft or traffic flow.

4.18. Use of Perimeter, In-Field or other Airfield Roads. Runway(s), taxiway(s), or CMAs shall not be used for convenience. **(T-3).** To the max extent possible, utilize perimeter, in-field, or other airfield roads.

4.19. Runway Crossing Limitations. Limit runway crossing at locations known to have communication, signal problems, and/or air traffic control tower visual blind spots, as applicable.

4.20. Emergency Responses on or near the Runway(s).

4.20.1. All emergency response vehicles must have approval from the Air Traffic Control Tower to enter and/or cross CMA(s). **(T-1).**

4.20.2. Primary (initial) and secondary (follow-on, support) response agencies are determined by wing or base supplement. Follow-on, support response agencies will standby in a designated area (e.g., ramp or taxiway) until called forward by the Fire Chief or on-scene (incident) commander. **(T-3).**

4.21. Vehicle Traffic Control Devices or Lights Located on Taxiways and Runways. When the vehicle traffic control device and/or light is activated, vehicle operators must come to a complete stop until the device and/or light is turned off. **(T-1).** Vehicle operators must visually check for crossing aircraft or vehicles before proceeding. **(T-1).**

4.22. Airfield Driving During Blackout Conditions.

4.22.1. Units operating vehicles on the airfield using night vision devices must have local operating procedures coordinated through the wing or garrison ADPM and approved by the requesting unit's squadron commander. **(T-3).** The local operating procedure must include the items below and require vehicle operators to follow the guidance outlined in AFMAN 24-306, *Section 12D—Vehicle Operations Using Night Vision Devices and Operations Under Blackout (BO) Conditions.* **(T-3).**

4.22.1.1. Driver and assistant driver responsibilities.

4.22.1.2. NVD-related accident reporting procedures.

4.22.1.3. Airfield driving and night vision device (NVD) licensing procedures. **Note:** Annotate "NVD Qualified" on the AF Form 483.

4.22.1.4. Qualification and annual refresher training requirements.

4.22.1.5. NVD instructor qualification requirements.

4.22.2. Use hazard warning flashers or infrared strobe mounted on the vehicle's roof during periods of reduced airfield lighting (or blackout conditions) so the air traffic control tower and aircrew can observe vehicles on the airfield. **Note:** Vehicles must maintain two-way radio communications with the air traffic control tower while operating within the CMA. **(T-1).**

4.22.3. Designate vehicle routes. Do not mix nonparticipating vehicles with participating NVD vehicles on any CMA. **Note:** Vehicle operations should be kept to a minimum during periods of reduced airfield lighting configurations.

4.23. Vehicle escorts and convoys on the CMA and Non-CMA.

4.23.1. All escorted personnel must be visible at all times by, and in close proximity to, the escort official. **(T-2).** The escort official is responsible for relaying air traffic control tower control instructions and/or communication for the escorted group.

4.23.2. Escort officials must be trained and certified to drive on the airfield. **(T-1).** Escort officials may only provide escort into the CMA if they are CMA qualified. **Note:** Airfield management does not provide escorts for airfield construction projects and/or activities generated via submission of base civil engineer work request, or customer service calls.

4.24. Vehicles equipped with supplemental traction devices.

4.24.1. Tire chains may only be used on airfield pavements after obtaining coordination and approval from AFM, wing safety, and civil engineer. The requesting agency conducts a risk assessment with the above agencies when evaluating the need for tire chains to minimize pavement damage and FOD.

4.24.2. Vehicles equipped with studded tires are not permitted to operate on the airfield without prior coordination with the AFM, wing safety, civil engineer, Transportation, and host wing commander (or equivalent) approval. Publish the list of approved units and vehicles and areas authorized to use studded tires in the wing or base supplement.

4.25. Vehicular traffic over in-ground fuel pit covers. Do not stop, park or drive vehicles over any portion of in-ground fuel pit covers.

4.26. Jet blast hazard areas. Remain alert for jet blast hazard indicators such as operational aircraft anti-collision lighting and/or undercarriage (landing gear) lighting turned on or the presence of jet engine start observers, fire guards, or aircraft marshallers.

4.26.1. Remain at least 25 feet to the front and 200 feet to the rear of aircraft with engines running.

4.26.2. Remain clear of taxiing traffic and do not pass within 200 feet behind aircraft with engines running.

4.26.3. Do not operate vehicles within 100 feet of a helicopter with rotors in motion. **Note:** Vehicle operators must use extreme caution when driving in the vicinity of helicopters conducting hover checks. **(T-1).**

4.27. Disabled Vehicle.

4.27.1. When a vehicle has a malfunction that prevents operation under its own power, use every means to alert taxiing aircraft in the vicinity. At a minimum, the ground vehicle operator conduct the following:

4.27.1.1. Leave the vehicle parking lights or emergency flashers on.

4.27.1.2. If the vehicle has two-way radio capability, make the following transmission: "All parties BREAK, BREAK-This is (call sign) with an emergency for Airfield Management, Tower, and Maintenance Operations Center." State the nature of the problem and report your position on the airfield.

4.27.2. Operators of other radio-equipped vehicles (e.g. security forces, civil engineer, or transportation) should make every effort to assist with removing the disabled vehicle from the airfield, especially if the vehicle is located on parking aprons, taxiways, or runway.

4.27.3. If a vehicle is not equipped with a two-way radio, stay with the vehicle and continue attempts to alert any taxiing aircraft or other vehicles in the vicinity.

4.27.4. In the event of a disabled vehicle on the CMA, immediately notify Air Traffic Control Tower and Airfield Management by any means possible to coordinate expeditious removal of the disabled vehicle from the CMA.

4.27.4.1. Do not leave vehicles unattended in the CMA.

4.27.4.2. Remove disabled vehicle using any method in the quickest and safest way possible.

4.28. Temporarily assigned personnel, Inspection and Survey Teams, and non-base assigned contractors.

4.28.1. Do not grant temporarily assigned personnel, inspection and survey teams and non-base assigned contractors access to the CMA unless they have completed all training and testing requirements outlined in this instruction and wing or base supplement.

4.28.2. Temporarily assigned personnel, inspection and survey teams and non-base assigned contractors must possess an AF Form 483 (or other Federal, DoD agency equivalent) and be trained on the wing or base airfield driving procedures to operate a vehicle on the airfield without an escort. **(T-1).**

4.28.2.1. The wing or garrison ADPM or as delegated in the wing or base supplement to the unit ADPM may provide a local briefing and/or training when temporarily assigned personnel, inspection and survey teams and non-base assigned contractors driving route(s) do not require access on or across the CMA.

4.28.2.1.1. Use **Attachment 8** to document the name and unit of the individual that received the local briefing and/or training.

4.28.2.1.2. Issue a temporary AF Form 483 with the restriction "Ramp Access Only" or "Non-CMA Only" and expiration date.

4.28.2.2. The wing or garrison ADPM or designated representative may provide local airfield driving training via handouts and/or PowerPoint® slides and airfield diagrams in lieu of practical training or briefing.

4.28.2.3. Maintain a MFR signed by the unit commander (or equivalent) or contractor lead and approved by the wing or garrison ADPM (or as delegated) in lieu of **Attachment 8.** Include the following on the MFR:

4.28.2.3.1. Individual's full name and rank.

4.28.2.3.2. Home unit AF Form 483 certificate number.

4.28.2.3.3. The effective dates of the temporary duty assignment or site visit.

4.28.2.3.4. The statement: "Access on or across the CMA is not authorized."

4.28.3. The local briefing and/or training materials should be made available in host nation language where applicable.

4.28.4. If the unit ADPM accomplishes the local training and/or briefing, forward an information copy to the wing or garrison ADPM.

4.28.5. Maintain a file copy of **Attachment 8** and/or signed MFR in accordance with Air Force Records Distribution Schedule (RDS), Table 33-42, Rule 04.00.

4.29. POV and Government Leased Vehicle Passes.

4.29.1. POV on the airfield are discouraged and are restricted to an absolute minimum.

4.29.2. Prior to requesting issuance of a vehicle pass, unit commanders and/or host unit commanders should exhaust all means of obtaining a government owned vehicle. This includes, but is not limited to, signing-out a government owned vehicle from transportation and/or vehicle operations for one-time use.

4.29.3. Company and/or contractor representative vehicle passes are issued to fulfill contractual obligations only. Requests for vehicle passes by temporarily assigned personnel are coordinated through unit ADPM and forwarded to the wing or garrison airfield driving program for approval.

4.29.4. Each POV owner, user or operator must possess a valid driver's license or host nation driver's license and current AF Form 483. **(T-1).**

4.29.5. Request for a vehicle pass or decal are endorsed by the individual's unit commander or company, contractor representative. At a minimum, the MFR or local form or electronic equivalent contains the following information:

4.29.5.1. Owner or User.

4.29.5.2. Organization or Company.

4.29.5.3. Duty Phone.

4.29.5.4. Vehicle Make, Model, Year, Color, License Plate Number and State where vehicle is registered.

4.29.5.5. Pass or Permit number.

4.29.5.6. Area of Operation(s) and/or location.

4.29.5.7. Justification.

4.29.5.8. Effective period or dates.

4.29.6. POV and government leased vehicles passes or decals are differentiated in the wing or base supplement.

4.29.7. Maintain vehicle passes or decals supportive information in accordance with Air Force RDS, Table 13-01, Rule 01.00.

4.29.8. A valid (active commercially-obtained insurance at or above State law minimums for the state where the installation is located) is required to operate a POV on DAF-owned and/or operated airfields.

4.29.9. Refer to DAFI 31-101, *Integrated Defense* for additional restrictions concerning operation of POVs in areas containing PL 1-3.

4.30. Reporting, Enforcement and Violation Consequences.

4.30.1. Unit Commanders and above, Unit ADPMs, Airfield Management and Security Forces Squadron personnel are authorized to temporarily suspend airfield driving privileges.

4.30.2. Airfield Management personnel are authorized to suspend and/or revoke an individual's airfield driving privileges, regardless of unit affiliation. In the event of any airfield driving violation, Airfield Management personnel:

4.30.2.1. Escort individuals off of the airfield.

4.30.2.2. Confiscate individual's AF Form 483.

4.30.2.3. Obtain statement(s) from individual(s) suspected of committing an airfield driving violation(s).

4.30.2.4. Document and report the incident to the wing or garrison ADPM, AFM and AOF/CC.

4.30.3. **Consequences (Non-CMA).** (e.g. speeding, expired POV, no AF Form 483 in possession).

4.30.3.1. First Offense. Incur a warning (minimum) or loss of airfield driving privileges for a period of up to 30 calendar days.

4.30.3.2. Second Offense. Loss of airfield driving privileges for a period of 60 calendar days.

4.30.3.3. Third Offense. Loss of airfield driving privileges for a period of six months.

4.30.4. **Consequences (CMA).**

4.30.4.1. First Offense. Incur loss of airfield driving privileges for a minimum of 30 calendar days.

4.30.4.2. Second Offense. Loss of airfield driving privileges for six months or permanent revocation if within a 12-month time period.

4.30.4.3. Third Offense. Loss of airfield driving privileges for one year or permanent revocation.

4.31. Reinstatement of an AF Form 483.

4.31.1. Prior to reinstatement of airfield driving privileges, individuals will complete all training criteria and testing requirements outlined in **Chapter 3** of this instruction. **(T-3).**

4.31.2. Upon completion of airfield driver training, Unit Commanders request reinstatement of airfield driving privileges in writing to the Unit Commander responsible for Airfield Management, or as delegated.

4.32. Reporting and documenting Controlled Movement Area Violation events. See **Attachment 1** for Controlled Movement Area Violation and Runway Incursion definition.

4.32.1. For an actual or suspected runway incursion, the individual's AF Form 483 is surrendered to Airfield Management and airfield driving privileges are temporarily suspended until an investigation and retraining is completed.

4.32.2. The wing or garrison ADPM will notify the unit commander of the individual who committed a runway incursion within three duty days of the alleged incident. **(T-3).**

4.32.3. Controlled Movement Area Violation events are reported to Wing Safety as outlined in AFMAN 91-223, Chapter 9.

4.32.4. The wing or garrison ADPM and wing safety review the unit's airfield driving program within three duty days to which personnel that commit a controlled movement area violation are assigned. Place emphasis on how the unit trained the individual and their compliance with this instruction and wing or base supplement. The wing or garrison ADPM reports results to the unit commander.

4.32.5. Include the following information in the narrative section of the AF Form 651 and/or AF Form 457:

4.32.5.1. Individual's information (e.g., grade, job title, organization, temporary duty assignment, or base assigned).

4.32.5.2. Individual's experience working on or near the airfield and date trained.

4.32.5.3. If individual was authorized on the airfield and/or CMA.

4.32.5.4. If individual completed all training required to operate a vehicle on the airfield.

4.32.5.5. Approximate location where the controlled movement area violation occurred (e.g., runway or taxiway intersection, distance from threshold or overrun.)

4.32.6. The wing or garrison ADPM maintains a copy of the AF Form 651s and/or AF Form 457s, actions taken, results and supporting documentation in accordance with Air Force RDS, Table 13-06, Rule 15.00 (see Air Force Instruction 91-202, *The US Air Force Mishap Program* and DAFMAN 91-223.) A copy of the final runway incursion Air Force Safety Automated System (AFSAS) report may be obtained from wing safety.

4.33. Reporting and documenting Non-CMA airfield driving incidents and/or violations.

4.33.1. The wing or garrison ADPM will report airfield driving incidents and/or violations to the unit commander and the unit ADPM within three duty days. **(T-3).** Include the following:

4.33.2. Name and grade of the individual, unit, duty phone, unit commander or unit ADPM.

4.33.3. Details of incident and/or violation (including date, time, location, nature, or other pertinent facts).

4.34. Airfield Diagram. The Airfield Diagram needs to be legible when printed on 8.5" x 11" paper for placement in vehicles. Depict the following items as a minimum:

4.34.1. Location and a detailed description of runways, taxiways, ramps or aprons, visual flight rules, and instrument holding position signs and markings.

4.34.2. Airfield access points.

4.34.3. Restricted area boundaries and/or entry control points.

4.34.4. Control area boundary.

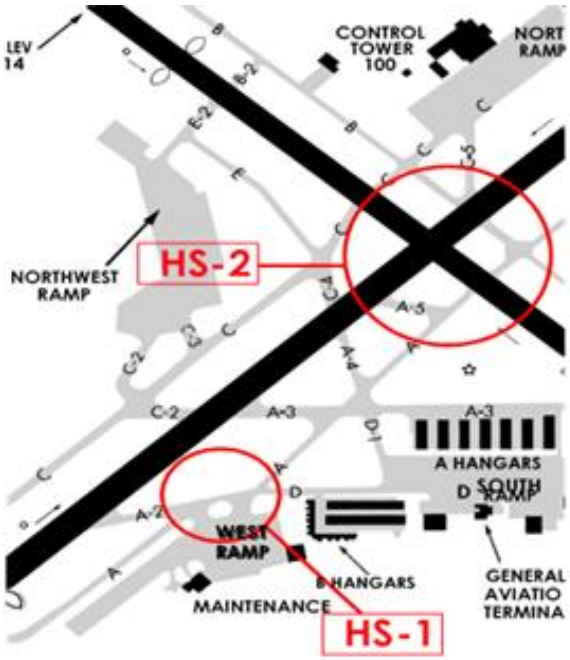
4.34.5. Vehicle traffic lanes and traffic flow.

4.34.6. Critical area boundaries for precision navigational aids (i.e. Instrument Landing System, Precision Approach Radar, Localizer, or Precision Obstacle Free Zone) if applicable.

4.34.7. Location of Airfield Management and Air Traffic Control Tower.

4.34.8. Hot spots (as determined locally). **Note:** A different diagram may be used to depict hot spots. See **Figure 4.1** for an example.

Figure 4.1. Hot Spots.



4.34.9. Limited or no visibility with the Air Traffic Control Tower blind spots (as applicable).

4.34.10. Communication —dead spots.

4.34.11. Complex runway and/or taxiway intersections.

4.34.12. Other confusing or ambiguous areas identified on airfield.

4.34.13. Include a legend on the airfield diagram to illustrate symbols used.

4.34.14. Jet Blast Hazard areas.

4.34.15. Other areas that pose a hazard to vehicle operators (as determined locally).

4.34.16. CMAs.

Chapter 5

RADIO COMMUNICATIONS PHRASEOLOGY, DISCIPLINE AND TECHNIQUES

5.1. General.

5.1.1. Radio communications are a critical link in the Air Traffic Control system. The single, most important thought in communications with the Air Traffic Control Tower is understanding. It is essential to acknowledge each radio communication with controllers by using the appropriate call sign.

5.1.2. Brevity is important, therefore, radio transmissions are kept as brief as possible. However, controllers need to know what you want to do before they can properly carry out their control duties. The vehicle operator should know and understand what the controller wants them to do.

5.1.3. Proper radio communications phraseology, discipline, and techniques. The words "clear" or “clearance” must not be used in communication with air traffic control tower. **(T-1). Exception:** Vehicle operators may reply “Loud and Clear” in response to an air traffic control tower request for radio transmission quality or clarity.

5.1.4. Vehicle operators must be vigilant and monitor air traffic control radio communications frequencies on the airfield for situational awareness, especially when operating on an active runway. **(T-1).**

5.2. Radio Techniques.

5.2.1. Listen before transmitting. Be cognizant of other radio transmissions, multiple transmitters may override and/or block out other receiver messages.

5.2.2. Think before keying the transmitter; know exactly what you need to say before you say it.

5.2.3. Hold the microphone close to your lips and, after pressing the “microphone button,” a slight pause may be necessary to be sure, the first word is transmitted clearly. Speak in a normal, conversational tone.

5.2.4. When releasing the microphone button, wait a few seconds before calling again. The controller may be looking for you on the airfield, transmitting on a different frequency, or scanning the runway to enable your request.

5.2.5. Be alert to the sounds or the lack of sounds in the receiver. Check your volume and frequency to make sure that your microphone is not stuck in the transmit position. Frequency blockage can, and has, occurred for extended periods due to unintentional transmitter operation. This type of interference is commonly referred to as a “stuck mike,” and controllers may refer to it in this manner when attempting to correct the problem.

5.2.6. Ensure that you are within the performance range of your radio equipment and the ground station equipment. Refer to the airfield diagram to determine possible radio blind spots.

5.2.7. Use caution when using a vehicle mounted and/or handheld radio and operating a vehicle at the same time. When possible, use the radio when the vehicle is safely parked.

5.3. Phraseology. Vehicle operators must contact the Air Traffic Control Tower controller every time they proceed onto or leave the CMA. **(T-1).** When proceeding onto a CMA, advise the controller of three things: **WHO** you are, **WHERE** you are, and **WHAT** your intentions are. Always acknowledge all communications so ground control and other persons know that the message was received. Always give aircraft and Air Traffic Control transmissions priority unless an emergency exists. Very High Frequency and Ultra High Frequency transmissions are reserved for the primary use of aircraft and Air Traffic Control Tower personnel. A typical runway crossing transmission sequence is as follows:

Table 5.1. Sample Runway Crossing Phraseology.

VEHICLE OPERATOR:	*"JACKSONVILLE TOWER, AIRFIELD ONE."*
Air Traffic Control Tower:	*"AIRFIELD ONE, JACKSONVILLE TOWER."*
VEHICLE OPERATOR:	*"JACKSONVILLE TOWER, AIRFIELD ONE REQUEST TO CROSS (runway) AT point/intersection).*
Air Traffic Control Tower:	*"AIRFIELD ONE, CROSS (runway) AT (point/intersection). or "AIRFIELD ONE, HOLD SHORT OF (runway)."*

5.3.1. Vehicle operators must read back Air Traffic Control Tower instructions verbatim. **(T-1).** If you are unsure of what the controller has transmitted, or if you do not understand an instruction, you MUST ask the controller to repeat the instructions (or say again) before taking any action. **(T-1).** Good communication only occurs when each party knows and understands what the other is saying.

Table 5.2. Sample Read back Instructions.

VEHICLE OPERATOR: **Note:** Airfield 1 visually scans the runway prior to entry, and then proceeds across the runway	*"AIRFIELD ONE UNDERSTANDS APPROVED TO CROSS (runway) AT (point/intersection). WILL REPORT WHEN OFF." Or "AIRFIELD ONE, HOLDING SHORT (at location)."*
VEHICLE OPERATOR:	*"JACKSONVILLE TOWER, AIRFIELD ONE CROSSING COMPLETE, OFF (runway) AT (location)."*
Air Traffic Control Tower:	"*AIRFIELD ONE, ROGER."*

5.3.2. If vehicle operators are issued hold short instructions, they must provide a read back to the Air Traffic Control Tower. **(T-3).** See example below.

Table 5.3. Sample Hold Short Instructions.

Air Traffic Control Tower:	*"AIRFIELD ONE PROCEED VIA TAXIWAY CHARLIE, HOLD SHORT OF RUNWAY TWO SEVEN."* *or* *"AIRFIELD ONE PROCEED VIA CHARLIE, HOLD SHORT OF RUNWAY TWO SEVEN."*
VEHICLE OPERATOR:	*"AIRFIELD ONE, ROGER."*
Air Traffic Control Tower:	*"AIRFIELD ONE, READ BACK HOLD INSTRUCTIONS."*
VEHICLE OPERATOR:	*"AIRFIELD ONE, PROCEEDING VIA CHARLIE, WILL HOLD SHORT OF RUNWAY TWO SEVEN."*

5.4. Common Use Phrases. **Table 5.4.** provides the meaning of commonly used radio phraseology.

Table 5.4. Common Use Phrases.

What Is Said:	What It Means:
Acknowledge	Let me know you have received and understand this message.
Advise Intentions	Let me know what you plan to do.
Affirmative	Yes.
Correction	An error has been made in the transmission, and the correct version follows.
Go Ahead	Proceed with your message only. **Note:** Use of this phrase does not authorize requestor to “Go Ahead” with, or carry out, their request.
Hold/Hold Short	Phrase used during ground operations to keep a vehicle or aircraft within a specified area or at a specified point while awaiting further clearance from air traffic control.
How do you hear me?	Question relating to the quality of the transmission or to determine how well the transmission is being received.
Immediately or without delay, Expedite	Phrase used by Air Traffic Control when such action compliance is required to avoid an imminent situation.
Negative	"No" or "permission not granted" or "that is not correct."
Out	The radio conversation is ended, and no response is expected.
Over	My radio transmission is ended, and I expect a response.
Read Back	Repeat my message to me.
Roger	I have received all of your last transmission.
Stand By	The controller or pilot should pause for a few seconds, usually to attend to other duties of a higher priority. Also means to wait as in "stand by for clearance." The caller should reestablish contact if a delay is lengthy.
Unable	Indicates inability to comply with a specific instruction, request, or clearance.
Verify	Request confirmation of information.
Wilco	I have received your message, understand it, and will comply with it.

5.5. Phonetic Aviation Alphabet. Because some letters have similar sounds, like B and P, the international aviation industry uses the following words to reduce confusion. For example, Taxiway “B” would be referred to as Taxiway Bravo on the radio. Know and use the following Phonetic Aviation Alphabet:

Table 5.5. Phonetic Aviation Alphabet.

A	ALPHA	**N**	NOVEMBER
B	BRAVO	**O**	OSCAR
C	CHARLIE	**P**	PAPA
D	DELTA	**Q**	QUEBEC
E	ECHO	**R**	ROMEO
F	FOXTROT	**S**	SIERRA
G	GOLF	**T**	TANGO
H	HOTEL	**U**	UNIFORM
I	INDIA	**V**	VICTOR
J	JULIETT	**W**	WHISKEY
K	KILO	**X**	X-RAY
L	LIMA	**Y**	YANKEE
M	MIKE	**Z**	ZULU

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Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFPD 13-2, *Air Traffic Control, Airfield, Airspace and Range Management,* 3 January 2019

DAFI 33-360, *Publications and Forms Management,* 1 December 2015

AFMAN 13-204 Volume 1, *Management of Airfield Operations*, 22 July 2020

DAFI 21-101, *Aircraft and Equipment Maintenance Management,* 16 January 2020

AFMAN 24-306, *Operation of Air Force Government Motor Vehicles,* 30 July 2020

DAFI 31-101, *Integrated Defense,* 25 March 2020

AFI 33-322, *Records Management and Information Governance Program*, 23 March 2020

AFI 33-324, *The Air Force Information Collections and Reports Management Program*, 22 July 2019

DAFMAN 48-123, *Medical Examinations and Standards,* 8 December 2020

AFI 91-202, *The US Air Force Mishap Prevention Program,* 12 March 2020

AFMAN 91-203, *Air Force Occupational Safety, Fire, and Health Standards,* 11 December 2018

DAFMAN 91-223, *Aviation Safety Investigations and Reports,* 14 September 2018

Air Force *Enlisted Classification Directory* (AFECD), 31 October 2017

Air Force *Officer Classification Directory* (AFOCD), 31 October 2017

DAFVA 11-240, *USAF Airport Signs and Markings,* 4 August 2021

DAFVA 13-222, *Runway/Controlled Movement Area (CMA) Procedures,* 30 July 2009

UFC 3-260-01, *Airfield and Heliport Planning and Design*, 4 February 2019

FAA Order 7110.65Z, *Air Traffic Control*, 17 June 2021

FAA AC 150/5340-1M, *Standards for Airport Markings,* 10 May 19

Federal Aviation Administration *Pilot Controller Glossary*

Prescribed Forms

AF Form 483, *Certificate of Competency*

Adopted Forms

AF Form 457, *United States Air Force Hazard Report*

AF Form 651, *Hazardous Air Traffic Report (HATR)*

AF Form 3616, *Daily Record of Facility Operation*

AF Form 679, *Air Force Publication Compliance Item Waiver Request/Approval*

AF Form 847, *Recommendation for Change of Publication*

Abbreviations and Acronyms

ADPM—Airfield Driving Program Manager

AF—Air Force

AFECD—Air Force Enlisted Classification Directory

AFFSA—Air Force Flight Standards Agency

AFFSA/XA—Air Force Flight Standards Agency Airfield Operations Directorate

AFI—Air Force Instruction

AFM—Airfield Manager

AFMAN—Air Force Manual

AFOCD—Air Force Officer Classification Directory

AFPD—Air Force Policy Directive

AFSAS—Air Force Safety Automated System

AO—Airfield Operations

AOF/CC—Airfield Operations Flight Commander

CMA—Controlled Movement Area

DAF—Department of the Air Force

DAFI—Department of the Air Force Instruction

DAFVA—Department of the Air Force Visual Aid

DoD—Department of Defense

FAA—Federal Aviation Administration

FOD—Foreign Object Damage

HATR—Hazardous Air Traffic Report

MFR—Memorandum for Record

MICT—Management Internal Control Toolset

NVD—Night Vision Device

OPR—Office of Primary Responsibility

POV—Privately Owned Vehicle

RDS—Records Disposition Schedule

RIPWG—Runway Incursion Prevention Working Group

SAA—Senior Airfield Authority

SAC—Self-Assessment Communicator

UFC—Unified Facilities Criteria

WADPM—Wing or Garrison Airfield Driving Program Manager

Terms

Airfield—An area prepared for the accommodation (including any buildings, installations, and equipment) of landing and take-off of aircraft.

Airfield Driving Program Manager (ADPM)—An individual appointment by the unit commander to administer the organization's airfield driving program.

Airfield Driving Trainer—An individual appointment by the unit commander to provide airfield driving training.

Airfield Facilities—Includes: runways, taxiways, parking and servicing areas, Air Traffic Control facilities, Airfield Management, navigational aids, aircraft fire suppression and rescue services and airfield lighting systems.

Airfield Management (AM)—A function that conducts airfield inspections and checks for safety and compliance with planning and design criteria. Plans, organizes and directs airfield activities to include airfield construction and repairs, airfield driving program, snow and ice removal operations, or procures, maintains, and produces information on safe operation of aircraft through the national and international airspace system such as flight information publications, aeronautical charts and maps, Notice to Airmen, local airfield and navigational aid status, and weather information. Process domestic and international flight plans.

Airfield Manager (AFM)—Works directly for the AOF/CC and manages airfield management facilities to ensure effective support to the base flying mission and transient aircrews.

Airfield Operations Flight Commander (AOF/CC)—Responsible for the overall operation/services provided by the Airfield Operations Flight in support of the wing flying mission and in compliance with United States Air Force and Federal Aviation Administration guidelines.

Air Force Runway Safety Action Team—Composed of AFFSA and/or major or field command OPR for AO functional experts used to analyze, report and determine corrective actions required to reduce the number of controlled movement area violations on the airfield. Air Force Runway Safety Action Team functional experts evaluate all pertinent areas that are a part of, or affect, the negative trend or unsafe condition.

Air Force Safety Automated System (AFSAS)—is a web-enabled single integrated mishap and analysis reporting system for aviation, ground, weapons, space, human factors and nuclear mishaps.

Approach End of Runway—The first portion of the runway available for landing. If the runway threshold is displaced, use the displaced threshold latitude and longitude as the approach end of runway.

Controlled Movement Area (CMA)—As defined in Airfield Operation Instructions, any portion of the airfield requiring aircraft, vehicles and pedestrians to obtain specific air traffic control tower approval for access (normally via two-way radio contact with the air traffic control tower). Controlled movement areas include but are not limited to areas used for takeoff, landing and as required taxiing of aircraft. This definition is used in lieu of "movement area" as defined in the Federal Aviation Administration pilot controller glossary. Also called controlled movement area.

Controlled Movement Area Violation Event—An airfield infraction caused by aircraft, vehicles, or pedestrians entering the control movement area without specific air traffic control tower approval. This definition includes runway incursions and infractions caused by communication errors. Refer to DAFMAN 91-223 paragraph 9.1 for reportable hazardous air traffic report reporting procedures and for reportable controlled movement area violation events.

Departure End of Runway—The end of runway available for the ground run of an aircraft departure. The end of the runway that is opposite the landing threshold, sometimes referred to as the stop end of the runway.

Foreign Object Damage—Any damage to an aircraft, engine, aircraft system, component, tire, munitions, or support equipment caused by a foreign object(s) which may or may not degrade the required safety or operational characteristics of the aforementioned items.

Government Owned Vehicles—Vehicles that are owned or leased by the Unites States government.

Ground Vehicle Traffic Lane—A defined and marked lane on the flightline used for the movement of vehicle traffic.

Host Wing/Garrison Commander (or equivalent)—The individual with ultimate responsibility for operating the airfield.

Hot Spot—A location on an airfield (e.g., runway, taxiway) with a history or potential risk of collision or runway incursion, and where heightened attention by pilots, vehicle operators and pedestrians is necessary.

Light Gun—A handheld directional light signaling device which emits a brilliant narrow beam of white, green, or red light as selected by the tower controller. The color and type of light transmitted can be used to approve or disapprove anticipated pilot actions where radio communication is not available. The light gun is used for controlling traffic operating in the vicinity of the airport and on the airport movement area.

Major or Field Command—For the purpose of this publication, includes all United States Air Force Major Commands plus, the Air National Guard Readiness Center, Air Force Reserve Command, Direct Reporting Units, and Field Operating Agencies. Major or Field Command also refers to the OPR for AO in this instruction.

Mission Oriented Protective Posture—A flexible system of protection against chemical, biological, radiological, and nuclear contamination in which personnel are required to wear only that protective clothing and equipment appropriate to the threat level, work rate imposed by the mission, temperature, and humidity.

Parking Ramp/Apron—Areas where aircraft are parked, loaded and unloaded and serviced between flights. Vehicles and aircraft operate in close proximity in these areas, so it is vital to maintain a safe distance between the vehicle and aircraft. Always yield to aircraft and never drive under an aircraft or its wings. Slow speed and extreme caution are required in these areas.

Perimeter Road—A road around the runway perimeter designed to connect the access roads.

Privately Owned Vehicle—A vehicle that is owned or leased by a private party.

Protected Area—The protected area of a surface intended for landing or takeoff include the area inside the runway hold position marking. (e.g., holdline) on paved taxiways or ramps and the designated runway safety area.

Ramp—Either concrete or asphalt (depending on the weight of the aircraft and the sub-base of the ground beneath) used to park aircraft or equipment.

Restricted Area—An area on the airfield designated for the use by aircraft/equipment requiring security protection level. Marked with signs prior to entering, Red Lines indicate the boundaries.

Risk Management Assessment—A decision-making process to systematically evaluate possible courses of action, identify risks and benefits, and determine the best courses of action for any given situation.

Runway—A defined rectangular area on an airfield prepared for the landing and takeoff of aircraft.

Runway Hold line—A designated boundary intended to protect the runway environment. Found at the point a taxiway/runway intersect and runway/runway intersect.

Runway Incursion—Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft. Runway incursions have the potential to result in aircraft endangerment and loss of life. While there are several factors involved in a runway incursion, the leading causes of these incidents result from failure to follow procedures, inadequate vehicle operator training, and loss of situational awareness. These are further classified into three operational categories:

Operational Error—A failure of the air traffic control system that results in loss of separation.

Pilot Deviation—The action of a pilot that results in the violation of air traffic control instructions, DAF instructions, DAF manuals or Federal Aviation regulations.

Vehicle/Pedestrian Deviation—Any entry or movement on the CMA by a vehicle (including aircraft operated by non-pilots) or pedestrian that has not been authorized by air traffic control.

Runway Incursion Prevention Working Group (RIPWG)—This group provides a forum for analyzing and discussing each runway incursion to determine corrective actions and strategies to prevent future occurrences.

Spot Check—A spot check is conducted randomly for the purpose of enforcement and compliance with airfield driving procedures. Spot checks include but are not limited to the accuracy and currency of the driver's Air Force Form 483 and the availability and currency of the local airfield diagram, Department of the Air Force Visual Aids (e.g., DAFVA 11-240, DAFVA 13-222).

Taxilane—Ramp space between rows of parked aircraft used to maneuver aircraft to and from parking spots and taxiways.

Taxiway—A paved surface for taxiing aircraft from parking ramp to runway.

Unit—For the purpose of this publication, the term unit is equivalent to a squadron, also known as the basic unit in the United States Air Force organizational structure. For the United States Space Force, the term unit is typically equivalent to a Delta. The United States Space Force has squadrons subordinate to Deltas.

Attachment 2

RUNWAY INCURSION PREVENTION WORKING GROUP (RIPWG)

A2.1. Program Objectives. The main objective of a RIPWG is to analyze each runway incursion and corrective actions taken in an effort to prevent future occurrences.

A2.2. Program Scope. A RIPWG is used to evaluate the airfield driving operating procedures and/or standards and airfield configuration (to include signs, marking, lighting) to determine if corrective actions are needed. The RIPWG functional experts assess all pertinent areas that are a part of, or affect, the negative trend or unsafe condition.

A2.3. Attendees. The RIPWG includes Operations Support Squadron Commander, AOF/CC, AFM, wing or garrison ADPM, tower chief controller, wing safety, unit commanders, unit ADPMs and other organizational leadership as determined locally.

A2.4. RIPWG. The RIPWG will:

A2.4.1. Develop strategies to prevent the reoccurrence of runway incursions. **(T-3).** Examples include but are not limited to:

A2.4.1.1. Increase or improve local training or testing materials.

A2.4.1.2. Implement mandatory briefings to all airfield drivers, aircrew and air traffic control personnel, as applicable.

A2.4.1.3. Limit runway crossings or limit crossings to certain taxiways and/or road intersections.

A2.4.1.4. Increase penalty for controlled movement area violations.

A2.4.1.5. Alter the shape or increase the size of the controlled movement area.

A2.4.2. Determine if additional signage, markings, and lighting are needed in high-risk areas. **(T-3). Note:** Coordinate with major or field command OPR for AO prior to implementing new procedures or purchasing airfield support systems such as signs, marking and lighting. Examples of additional signs, markings, and lighting projects include the following:

A2.4.2.1. Installing “Stop, Do Not Enter, Contact Air Traffic Control Tower” signs and markings at runway hold lines and roads leading to the runway.

A2.4.2.2. Increasing visibility of runway hold position markings by increasing the width of the yellow stripes from six to 12 inches. **Note:** This option requires coordination with civil engineer and wing safety and a work order request to change is implemented uniformly over the entire airfield.

A2.4.2.3. Painting runway hold position signs on pavement prior to the runway hold position markings. (See Federal Aviation Administration Advisory Circular 150/5340-1, *Standards for Airport Markings*). **Note:** This option requires coordination with civil engineer and wing safety and a work order request to change is implemented uniformly over the entire airfield.

A2.4.2.4. Painting Federal Aviation Administration enhanced taxiway centerline marking prior to the runway hold position markings. **Note**: This option requires coordination with civil engineer and wing safety and a work order request to change is implemented uniformly over the entire airfield.

A2.4.2.5. Installing runway guard lights if applicable.

A2.4.2.6. Installing runway status lights (normally associated with a Category II/Airport Surveillance Detection Equipment).

A2.4.2.7. Installing Location Signs.

A2.4.3. Consider procuring vehicle-tracking devices to include global position system, ground radar, or video surveillance. **(T-3). Note:** Coordinate with major or field command OPR for AO prior to the procurement and/or use of new systems or technology.

A2.4.4. Consider installation of additional FM radio repeaters for air traffic control and the base station or ramp net. **(T-3).**

A2.4.5. Ensure an airfield waiver is processed and approved for non-standard criteria or configuration. **(T-3).**

A2.4.6. Provide a summary of the RIPWG analysis and recommendations during the next Airfield Operations Board. **(T-3).**

A2.4.7. Publish minutes of the RIPWG and provide an informational copy to the major or field command OPR for AO within 30 calendar days. **(T-3).**

Attachment 3

AIRFIELD SIGNS, MARKING, AND LIGHTING

Figure A3.1. Airfield Signs, Marking, and Lighting Part 1.

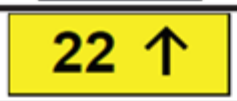
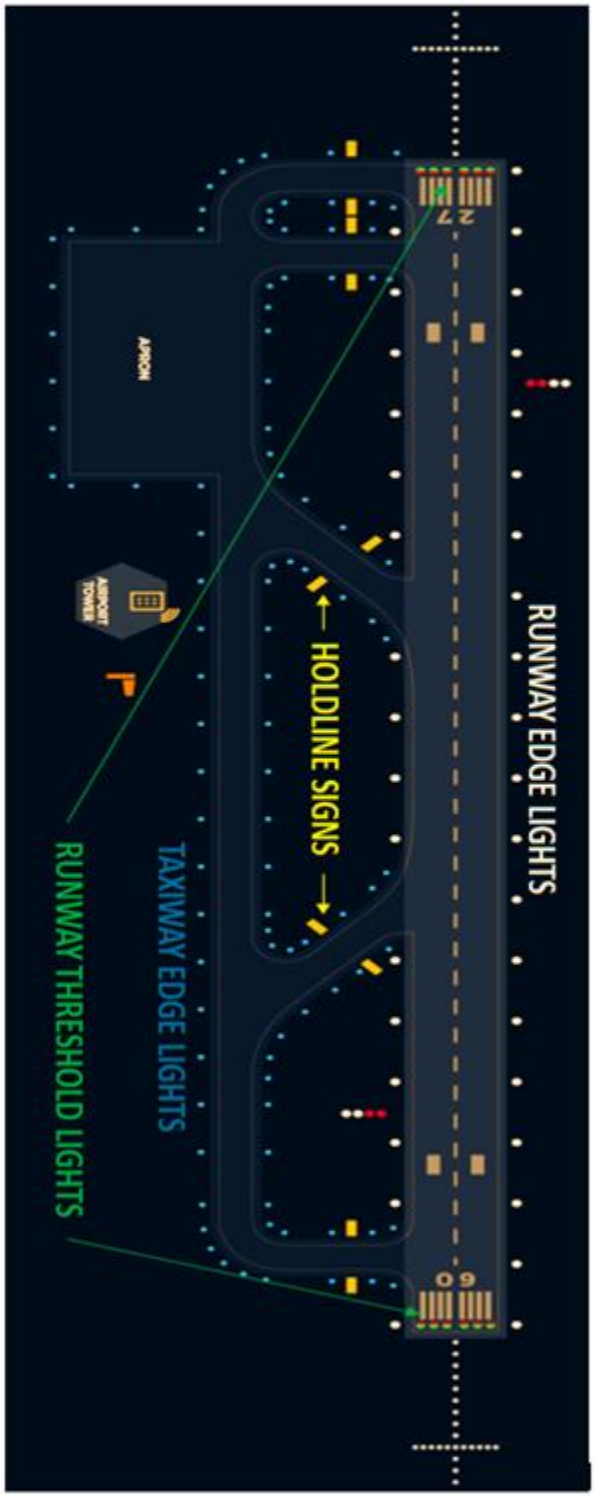
EXAMPLE	TYPE OF SIGN
	Mandatory: Hold position for taxiway/ runway intersection
	Mandatory: Holding position for runway/runway intersection
	Mandatory: Holding position for runway approach area
	Mandatory: Holding position for ILS critical area/precision obstacle free zone
	Mandatory: No entry
	Taxiway Location
	Runway Location
	Runway Safety Area / OFZ and Runway Approach Area Boundary
	ILS Critical Area/POFZ Boundary
	Direction: Taxiway
	Runway Exit
	Outbound Destination

Figure A3.2. Airfield Signs, Marking, and Lighting Part 2.

APRON ↗	Inbound Destination
NHK TACAN CH90 BRG - 90 DIST - 2.3 NM	TACAN Checkpoint Sign
7	Distance Remaining
EXAMPLE	**TYPE OF MARKING**
	Holding Position
	ILS Critical Area/POFZ Boundary
	Taxiway/Taxiway Holding Position
	Non-Movement Area Boundary
	Taxiway Edge
	Dashed Taxiway Edge

Figure A3.3. Airfield Signs, Marking, and Lighting Part 3.



Attachment 4

UNIT AIRFIELD DRIVING PROGRAM MANAGER AND TRAINER(S) APPOINTMENT LETTER

Figure A4.1. Unit Airfield Driving Program Manager and Trainer(s) Appointment Letter.

[Date]

MEMORANDUM FOR 213 OSS/OSA

FROM: (Unit Commander Office Symbol)

SUBJECT: Appointment of Unit Airfield Driving Program Managers and Trainers

1. The following individuals are appointed as Unit ADPMs (primary/alternate) and trainers. Individuals have received training in accordance with Air Force Instruction 13-213 and applicable wing/base supplement. Both ADPM and Alt ADPM have the authority to certify personnel are qualified to drive on the airfield and will ensure completion and tracking of all airfield drivers training for unit assigned and temporarily assigned personnel.

NAME/Email	**OFFICE SYM**	**DP**	**483 #_____**
PRIMARY:			
ALTERNATE:			

2. The following individuals are appointed as Airfield Driving Program Trainers:

NAME/Email	**OFFICE SYM**	**DP**	**483 #_____**

3. This letter supersedes all previous letters, same subject.

XXXX X. XXXXX, Lt Col, USAF
Commander

Attachment 5

UNIT AIRFIELD DRIVING PROGRAM MANAGER TRAINING CHECKLIST

Table A5.1. Unit Airfield Driving Program Manager Training Checklist.

UNIT AIRFIELD DRIVING PROGRAM MANAGER CHECKLIST			
SECTION I TRAINEE INFORMATION (Completed by the wing or garrison airfield driving program manager)			
Name: (Last, First, MI)	Grade or Civilian equivalent	Unit/Office Symbol or Company Name	Duty Phone
SECTION II QUALIFICATION TRAINING (Completed by trainee and wing or garrison airfield driving program manager).			
	Date Completed	**Trainee Initials**	**WG ADPM Initials**
1. Unit Airfield Driving Program Manager (ADPM) duties and responsibilities.			
2. Appointment of unit trainers.			
3. Runway incursion prevention.			
4. **Governing Directives:**			
4.1. Air Force Manual 24-306, *Operation of Air Force Government Motor Vehicles.*			
4.2. AFMAN 91-203, *Air Force Occupational Safety Fire and Health Standards*, Chapter 24.			
4.3. Department of the Air Force Instruction 21-101, *Aircraft and Equipment Maintenance Management*, Chapter 11.			
5. Testing requirements to include testing security and compromise.			
6. Color vision testing requirements. See Department of the Air Force Manual 48-123, *Medical Examinations and Standards* for additional information.			
7. **Airfield Driver's Training:**			
7.1. Local Qualification.			
7.2. Refresher.			

8. Unit ADPM Continuity Binder.			
9. Reporting, Enforcement, and Violations Consequences.			
10. Vehicle Passes (privately owned and government leased).			
11. Controlled Movement Area (CMA) procedures and training for unit personnel.			
12. Temporarily assigned personnel and Non-based assigned contractors briefing and/or training requirements.			
13. Escort procedures.			
14. Procedures for issuing, revoking and reissuing an AF Form 483, *Certificate of Competency.*			
15. Participate with the unit ADPM on an actual training session and practical check ride.			
16. AF Form 483 Certificate #:			
SECTION III TRAINING CERTIFICATION (Completed by the unit airfield driving program manager and wing or garrison airfield driving program manager or designated representative).			
Unit Airfield Driving Program Manager			
I have received and completed all of the above training requirements and will comply with Department of the Air Force Instruction 13-213 and wing or base supplement.			
Name: (Last, First, MI):	Grade or Civilian equivalent:	Signature:	Date:
Wing or Garrison Airfield Driving Program Manager			
Name: (Last, First, MI):	Grade or Civilian equivalent:	Signature:	Date:
Note: A local form may be used as long as it includes all information listed above.			

Attachment 6

AIRFIELD MANAGEMENT QUALITY CONTROL MEASURES

A6.1. Airfield Management. Airfield Management should:

A6.1.1. Routinely monitor ramp net radio for proper terminology and phraseology and discipline.

A6.1.2. Conduct random spot checks for enforcement and compliance with **Chapter 3** of this publication and wing and base supplement.

A6.2. Spot Checks. At a minimum, a spot check includes the following:

A6.2.1. The availability and currency of the local airfield diagram.

A6.2.2. A check of the driver's Air Force Form 483 for accuracy and currency.

A6.2.3. The availability and currency of Air Force Visual Aids (e.g., DAFVA 11-240, DAFVA 13-222)

A6.3. Airfield Management. Airfield Management will:

A6.3.1. Report violations detected during spot checks to the wing or garrison ADPM. **(T-3).**

A6.3.2. Document actions taken on the AF Form 3616 or electronic equivalent.

A6.4. Wing or garrison ADPM. Wing or garrison ADPM will:

A6.4.1. Report and document results of spot checks in the "status of airfield driving" section of Airfield Operations Board. **(T-3).**

A6.4.2. Check each unit's airfield driving program for integrity and compliance. **(T-3).** See **paragraph 2.7.22** for additional information.

A6.4.3. Provide results to the unit's commander in writing and brief at the next quarterly Airfield Operations Board. **(T-3).**

Attachment 7

AIRFIELD DRIVING TRAINING DOCUMENTATION AND CERTIFICATION CHECKLIST

Table A7.1. Airfield Driving Training Documentation And Certification Checklist.

AIRFIELD DRIVING TRAINING DOCUMENTATION AND CERTIFICATION CHECKLIST			
SECTION I - TRAINEE INFORMATION (Completed by the Unit ADPM)			
Name: (Last, First, MI):	Rank, Civilian Grade or equivalent:	Unit/Office Symbol or Company Name	Duty Phone
SECTION II - QUALIFICATION TRAINING (Completed by the Trainee and Unit Trainer)			
	Date	**Trainee's**	**Trainer's Initials**
1. Trainee possesses a valid (List State of Issue) Driver's License (List restrictions).			
2. Trainee possesses a valid Government Driver's License.			
3. Airfield Driver Classroom Training (as determined locally)			
4. Airfield Driving Qualification Training Checklist/Curriculum. (Completion of this checklist).			
5. Local Airfield Familiarization. Training Outcome(s): Trainee must be familiar with knowledge of the local airfield environment.	**Date Completed**	**Trainee's Initials**	**Trainer's Initials**
5.1. Non-Movement Area Boundary Marking as applicable.			
5.2. Non-Standard Airfield Markings as applicable.			
5.3. Aircraft Arresting Gear Markings as applicable.			
5.4. Locations of airfield Navigational Aids and Visual Approach Aids.			
5.5. Location of Restricted Area and Entry Control Points.			
5.6. Location of Free Zones as applicable.			
5.7. Location of the Fire Department, Air Traffic Control Tower (ATCT) and Airfield Management.			
5.8. Location/use of traffic control device as applicable.			
5.9. Hazardous Jet Blast locations on the airfield.			
5.10. Runway(s) configuration (e.g. dimensions, location, designation). Also, explain and define runway approach end and departure end.			
5.11. Taxiway configuration (e.g. dimensions, location, designation).			

5.12. Controlled Movement Area Boundaries.			
5.13. Congested Areas.			
5.14. Hot Spots as required locally.			
5.15. ATCT and vehicle blind spots.			
6. Local Vehicle Operator Requirements. Training Outcome(s): Trainee must be knowledgeable on local procedures and requirement for operating a vehicle on the airfield.	**Date Completed**	**Trainee's Initials**	**Trainer's Initials**
6.1. Use of perimeter and infield roadways.			
6.2. Lateral distance requirements for mobile obstacles on an apron/ramp and taxiway.			
6.3. Speed limits for vehicles operating on an apron/ramp and taxiway.			
6.4. Procedures for reporting and removing FOD.			
6.5. Restricted visibility and/or night driving.			
6.6. Procedures for operating bicycles, tricycles, etc. on			
6.7. Use of traction control devices as applicable.			
6.8. Emergency Response Vehicle requirements.			
6.9. Vehicle Escort/Convoy driving procedures as applicable.			
7. Practical Day Airfield Familiarization Training. Training Outcome(s): Trainee must be knowledgeable of the airfield environment. At a minimum, the trainee must demonstrate the ability to operate a vehicle to and from their designated work areas.			
7.1. Practical Day Driving Check-ride			
8. Practical Night (as applicable) Airfield Familiarization Training. Training Outcome(s): Trainee must be knowledgeable of the airfield environment. At a minimum, the trainee must demonstrate the ability to operate a vehicle to and from their designated work areas.			
8.1. Practical Night Driving Check-ride (as applicable).			
9. Review Local AFI 13-213 supplement.			
10. USAF Airfield Driving CBT (Date Completed).			
11. Runway Incursion Prevention Training.			
12. Airfield Diagram/Layout Test [Score:]			
13. General Knowledge Test (written) [Score:]			
14. Runway Incursion Prevention Test [Score:]			
15. Communication Test [Score:]			

16. Demonstrate the ability to contact ATCT for approval to enter/exit the **CMA**. **Note**: Required for all personnel that require access on or across taxiways, helipad, and aprons located in the CMA.			
17. Demonstrate the ability to contact ATCT for approval to enter/exit the **runway**. **Note**: Required for all personnel that require access on or across taxiways, helipad and aprons located in the CMA.			
SECTION III - Color Vision Test for CMA drivers only. (Completed by Hospital/Medical Treatment Facility Optometry)			
Results: Pass / Fail (Circle one)			
Name: (Last, First, MI):	Rank, Civilian Grade or equivalent:	Signature:	Date:
SECTION IV - TRAINER CERTIFICATION (Completed by Authorized Airfield Driving Trainer)			
I certify the trainee has received all required qualification training requirement annotated above.			
Name: (Last, First, MI):	Rank, Civilian Grade or equivalent:	Signature:	Date:

I have received and completed all of the training requirement and will comply with my local base's Airfield Driving AFI 13-213 Supplement instructions. I am also fully aware that no vehicle or pedestrian shall enter a runway or other controlled movement area without approval from the Air Traffic Control Tower (ATCT).			
Name: (Last, First, MI):	Rank, Civilian Grade or equivalent:	Signature:	Date:
SECTION VI - UNIT CERTIFICATION (Completed by Unit Commander or Unit ADPM)			
I certify that the above trainee has successfully completed all training requirements to operate a vehicle on airfield.			
Check all applicable restrictions and/or special access.			
Ramp Only / Daylight Only	CMA Authorized	Other (Specify):	
Name: (Last, First, MI):	Rank, Civilian Grade or equivalent:	Signature:	Date:
SECTION VII - AIRFIELD DRIVING AUTHORIZATION (Completed by the Wing ADPM or designated			
Approved / **Disapproved**		**AF Form 483#:**	
Name: (Last, First, MI):	Rank, Civilian Grade or equivalent:	Signature:	Date:

NOTE: A local form may be used as long as it includes all information listed above.

Attachment 8

TEMPORARILY ASSIGNED PERSONNEL/NON-BASED ASSIGNED CONTRACTORS TRAINING CHECKLIST

Table A8.1. Temporarily Assigned Personnel/Non-Based Assigned Contractors Training Checklist.

TEMPORARILY ASSIGNED PERSONNEL/NON-BASED ASSIGNED CONTRACTORS TRAINING CHECKLIST			
SECTION I - TRAINEE INFORMATION (Completed by the Unit Airfield Driving Program Manager or Wing Airfield Driving Program Manager)			
Name: (Last, First, MI):	Rank, Civilian Grade or equivalent:	Unit/Office Symbol or Company Name	Duty Phone
SECTION II - QUALIFICATION TRAINING (Completed by the Trainee, Unit Airfield Driving Program Manager or Designated Trainer)			
	Date Completed	**Trainee's Initials**	**Trainer's Initials**
1. Explain the difference between mandatory/informational local airfield signs.			
2. Explain the different types of airfield marking (i.e. runway, taxiway, apron/ramp). Provide examples of local airfield markings.			
3. Explain the different types of airfield lighting systems (i.e. runway, taxiway, apron/ramp). Provide examples of local airfield lighting.			
4. Identify the speed limits for general/special purpose vehicles operating on aircraft parking aprons/ramps and taxiways.			
5. Identify the procedures for vehicle operating in the immediate vicinity of base assigned and transient (if applicable) aircraft.			
6. Explain the requirements for parking and chocking vehicles and/or equipment on the airfield.			
7. Identify the lateral distance requirements for mobile obstacles on taxiways and aprons.			
8. Discuss Foreign Object Damage (FOD) control/prevention measures for the airfield.			
9. Identify methods/practices to prevent a runway incursion.			
10. Explain the different types of airfield violations and their consequences.			
11. Identify the proper radio terminology and phraseology.			
12. Provide a local Airfield Diagram.			
13. Identify all restricted areas and entry control points.			
14. Identify all Control Movement Area boundaries.			
15. Identify Free zones, when applicable.			
16. Practical airfield familiarization training. At a minimum, familiarize individual on route(s) to and from the designated work area.			

17. Explain procedures for Night Driving, Reduced visibility and Inclement weather, when applicable.			
18. Explain procedures for reporting an accident or vehicles maintenance problems.			

SECTION III - TRAINING CERTIFICATION (Completed by Trainee, Unit Airfield Driving Program Manager and Wing Airfield Driving Program Manager, as required)

TRAINEE

I have received and completed all of the above training requirements and will comply with Air Force Instruction 13-213 and (if applicable) wing/base supplement. I am also fully aware that no vehicle or pedestrian shall enter a runway or other controlled movement areas without approval from the Air Traffic Control Tower.

Name: (Last, First, MI):	Rank, Civilian Grade or equivalent:	Signature:	Date:

UNIT AIRFIELD DRIVING PROGRAM MANAGER

I certify that the above individual has completed all training requirements outlined in Air Force Instruction 13-213 and (if applicable) wing/supplement. Check all applicable restrictions.

Ramp Only	**Daylight Hours**	**Other (Specify):**	
Name: (Last, First, MI):	Rank, Civilian Grade or equivalent:	Signature:	Date:

WING AIRFIELD DRIVING PROGRAM MANAGER OR DESIGNATED REPRESENTATIVE (as required)

Name: (Last, First, MI):	Rank, Civilian Grade or equivalent:	Signature:	Date:

NOTE: A local form may be used as long as it includes all information listed above.

Attachment 9

AIRFIELD DRIVING PROGRAM CONTINUITY BINDER

A9.1. TAB A. Unit Airfield Driving Program Manager appointment letter(s). At a minimum, the appointment letter must be signed by the current unit commander or equivalent and on file with the wing or garrison ADPM. **(T-3).**

A9.2. TAB B. DAFI 13-213, wing or base supplement.

A9.3. TAB C. Annual program assessment results.

A9.4. TAB D. Unit airfield driving program manager training documentation.

A9.5. TAB E. Current list of unit assigned airfield drivers. At a minimum, the list of airfield drivers include the individual's full name, grade (or civilian equivalent), unit, Air Force Form 483 certificate number, restrictions (e.g., daytime or ramp only) and refresher training due date.

A9.6. TAB F. Airfield driving computer based training, training curriculum, test and answer key.

A9.7. TAB G. Unit airfield driving requirements as applicable (e.g., fire trucks, fuel trucks, or k-loaders).

A9.8. TAB H. Airfield violations and corrective actions.

A9.9. TAB I. References (e.g., AFMAN 24-306, Section 12; AFMAN 91-203, Chapter 24; and DAFI 21-101, Chapter 11).

A9.10. TAB J. Miscellaneous information (e.g. Meeting Minutes, Digest Articles, RIPWG).

BY ORDER OF THE SECRETARY OF THE AIR FORCE

DEPARTMENT OF THE AIR FORCE INSTRUCTION 21-101

16 JANUARY 2020

Incorporating Change 1,

20 DECEMBER 2023

Maintenance

AIRCRAFT AND EQUIPMENT MAINTENANCE MANAGEMENT

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This publication implements Air Force Policy Directive (AFPD) 21-1, Maintenance of Military Materiel. It is the basic Department of Air Force Instruction (DAFI) for all weapon system and support equipment maintenance management guidance. It provides the minimum essential guidance and procedures to safely and effectively maintain, service, and repair weapon systems and support equipment. This publication applies to all military and civilian members of the United States Air Force (USAF), United States Space Force (USSF), Air Force Reserve (AFR), and Air National Guard (ANG) as well as those with contractual obligation to comply with Air Force publications. Supplements and addendums are written in accordance with (IAW) Department of the Air Force Manual (DAFMAN) 90-161, *Publishing Processes and Procedures*. Supplements must identify and document major command (MAJCOM), AFR, and ANG required deviations (applicability, variance, exception, and differences in organizational placement of responsibilities/processes) in their supplement and addendums with the abbreviation (DEV). Place the "DEV" entry after the paragraph number and directly preceding the affected text, such as "(AMC) (DEV) Use the..." or "(ADDED-AMC) (DEV) Use the...)." MAJCOMs supplements are submitted to the Air Force Maintenance Division (AF/A4LM) @ **AF.A4LM.Maintenance.Policy@us.af.mil** for approval. Supplements and addendums are to be

published in the e-Publishing website. The authorities to waive wing and unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, or T-3") number following the compliance statement. See DAFMAN 90-161 for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the requestor's commander for non-tiered compliance items. All approved waivers must be sent to AF/A4LM Maintenance Policy org box: **AF.A4LM.Maintenance.Policy@us.af.mil**, within 30 days of approval, for situational awareness and process improvement considerations. For questions on interpreting this instruction, first contact your MAJCOM maintenance functional activity. Refer recommended changes and questions about this publication through your assigned MAJCOM, AFR or ANG, to the Office of Primary Responsibility (OPR) using the Department of the Air Force (DAF) Form 847, Recommendation for Change of Publication; route DAF Forms 847 from the field through the appropriate functional chain of command. Ensure all records created as a result of processes prescribed in this publication adhere to AFI 33-322, Records Management and Information Governance Program, and disposed IAW the Air Force Records Disposition Schedule located in the Air Force Records Information Management System. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the AF.

SUMMARY OF CHANGES

This corrective action revises the following paragraphs: 10.3.1.; 10.3.3.3.3.; 10.11.1.; 10.11.2.1.1.; 10.12.; 10.13.1.; 10.13.1.1., 10.13.6.1 and 11.8.3.15. Additionally, this corrective action deletes **para 6.10.1.3.3.1**. Significant changes include the addition of Maintenance Cyber Discipline requirements, Decentralized Materiel Support, incorporation of four AFIs superseded above and establishes a Wing Avionics Manager Position requirement. Additionally, eTool and Worldwide Identification (WWID) management procedures were expanded to provide standardized enterprise requirements. MAJCOMs/ANG designated to establish Special Certification Roster (SCR) prerequisites to optimize workforce alignment to mission requirements.

SUMMARY OF CHANGES

This publication has been substantially revised and must be completely reviewed in its entirety. Significant changes include the addition of Maintenance Cyber Discipline requirements, Decentralized Materiel Support, incorporation of four AFIs superseded above and establishes a Wing Avionics Manager Position requirement. Additionally, eTool and Worldwide Identification (WWID) management procedures were expanded to provide standardized enterprise requirements. MAJCOMs/ANG designated to establish Special Certification Roster (SCR) prerequisites to optimize workforce alignment to mission requirements.

This publication has been revised and includes published guidance implemented under DAFI 21-101_DAFGM2022-01; Chapter 2, Roles and Responsibilities to support organizational structures where an MXG is not assigned (i.e., AFFORGEN deployed construct); waiver authorities to the appropriate level; accident investigation recommendations; audit corrective actions; recommended changes from the field; and updated references.

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Chapter 1

MANAGEMENT OVERVIEW, SUPPORTING CONCEPTS AND REQUIREMENTS.

1.1. Introduction. This instruction prescribes basic aircraft and equipment maintenance management policy implementation and procedures used throughout the United States Air Force (USAF) to perform Mission Generation (MG) functions.

1.2. Organization. AF organizations are structured according to AFI 38-101, *Air Force Organization*, or as authorized by the Director of Manpower, Organization & Resources (AF/A1M). Contracted maintenance functions are not required to organize IAW AFI 38-101 but will implement the organization as outlined in their proposal as accepted by the government. For the definition of "Lead Command" see AFPD 10-9, *Lead Command Designation and Responsibilities for Weapon Systems.*

1.3. Maintenance Concept. Per AFPD 21-1, organizational, intermediate, and depot maintenance capabilities for operational readiness will be maintained to ensure effective and timely response to peacetime operations, mobilizations, national defense contingencies, and other emergencies. **Note:** Guidance for the use of Additive Manufacturing to build replacement parts is prescribed in AFI 63-101/20-101, *Integrated Life Cycle Management*.

1.3.1. As a minimum each capability will be able to:

1.3.1.1. Organizational: launch and recover sorties, maintain, and repair materiel coded for organizational level repair.

1.3.1.2. Intermediate: repair materiel coded for organizational and intermediate level repair in back shops, centralized repair facilities, or both.

1.3.1.3. Depot-level Maintenance: Provides the capability to maintain materiel coded for organizational, intermediate and depot levels of maintenance. Includes maintenance requiring the overhaul, upgrading, or rebuilding of parts, assemblies, or subassemblies, and the testing and reclamation of equipment as necessary.

1.3.2. Organizational and intermediate-level maintenance is organized into two mutually exclusive networks, the Mission Generation Network (MGN) and the Repair Network (RN). The MGN is optimized for mission generation at the wing level and consists of authorized "on-equipment" and "off-equipment" maintenance capabilities required to launch, recover, configure, inspect, and repair AF systems and equipment. The RN supports the MGN by providing the maintenance required to fulfill operational needs outside the capability or capacity of MGN activities. The interface between the two networks takes place when the MGN activity relinquishes control of reparable assets to the RN activity (such as, supply counter turn-in) or changes an end item Purpose Identifier Code (PIC) from an operational activity to a repair network activity (such as, depot maintenance).

1.3.2.1. Most MGN units possess a complement of equipment and supplies necessary to perform on-equipment and off-equipment maintenance.

1.3.2.2. RN units may reside at bases that perform mission generation. RN requirements and processes are identified in DAFI 20-117, *Repair Network Management*.

1.3.3. MAJCOMs assigned combat coded fighter aircraft will coordinate with Mission Design Series (MDS) lead and using commands and the MAJCOM Operations Directorate (MAJCOM/A3) to develop and document standardized MDS and Primary Aerospace Vehicle (Aircraft) Authorized (PAA) specific utilization rate standards in their supplements to this instruction. At a minimum the rates will:

1.3.3.1. Consider aggregated and analyzed unit generation capability data to identify and document standard MDS turn patterns by PAA in their supplements to **Chapter 14**.

1.3.3.2. Account for standard avionics and weapons training configurations.

1.3.3.3. Account for standard Technical Order (TO) driven turn time inspections and Average Sortie Duration.

1.3.3.4. Include a process for supporting units in assessing shortfalls and developing action plans.

1.3.4. Requests for Assistance. If a maintenance activity requires assistance for evaluation, repair, or both, beyond unit capability, requests are made IAW DAFI 21-103, *Equipment Inventory, Status and Utilization Reporting*; TO 00-25-107, *Maintenance Assistance*; and TO 00-20-14, *AF Metrology and Calibration Program*, or automated process as approved by the MDS Program Manager (PM) (for example, C-130 Automated Inspection, Repair, Corrosion and Aircraft Tracking (AIRCAT), F-16 Technical Assistance Request). All requests for assistance must be coordinated through the originating MAJCOM and Lead Command as applicable.

1.4. Aircraft Maintenance Tactics, Techniques and Procedures (TTP). TTPs are developed from lessons learned and best practices that provide valuable reference documents to improve maintenance processes and procedures. Maintenance leaders should utilize the maintenance fundamentals TTP volumes (Aircraft, Munitions and Missile) to support mission generation effectively and efficiently. Maintainers who attend the USAF Advanced Maintenance and Munitions Operations School are trained in advanced operational, expeditionary, and tactical maintenance management concepts stemming from the alumni's development and formalization of TTPs. Maintenance Group Commanders (MXG/CC) should identify their Advanced Maintenance and Munitions Operations School graduates and utilize them as advisors and instructors to enhance mission capability. AFTTP 3-4.21V1, *Aircraft Maintenance*, can be found at: **https://www.e-publishing.af.mil** or **https://usaf.dps.mil/teams/TTP/SitePages/Home.aspx**. For additional information on Advanced Maintenance and Munitions Operations School and TTP development see Air Force Manual (AFMAN) 21-111, *Advanced Maintenance and Munitions Operations School*.

1.5. Aircraft and Equipment Readiness. Aircraft and equipment readiness is the maintenance mission. The maintenance function ensures assigned aircraft and equipment are safe, serviceable, and properly configured to meet mission needs. Maintenance actions include, but are not limited to, inspection, repair, overhaul, modification, preservation, refurbishment, troubleshooting, testing, analyzing condition, performance, and maintenance documentation. All levels of supervision need to place emphasis on safety, quality, and timeliness in the performance of maintenance. The concept of quality maintenance must be fostered by each supervisor and technician to ensure the integrity and skill of each maintainer is not degraded. To the greatest extent possible, maintenance is accomplished on a preplanned scheduled basis. Planning provides

the most effective and efficient use of people, facilities, and equipment; reduces unscheduled maintenance; and allows for progressive actions toward maintaining and returning aircraft and equipment to safe operating condition. Exploiting repair network capability and maintaining visibility of repair cycle assets throughout the maintenance cycle are also critical elements of the equipment maintenance program.

1.5.1. The Air Force has established strategic-level aviation support equipment management within the 440 SCOS: Aviation Support Equipment Management Flight (ASEMF). The ASEMF has the responsibility to align with the integration of Aviation Support Equipment Maintenance Information System (AvSE MIS), also referred to as Defense Property Accountability System (DPAS) Maintenance and Utilization (M&U) Module capabilities. As AvSE MIS (DPAS M&U) comes online and units migrate assets into the new system, ASEMF will start to stand up and data mine available metrics on AvSE from AvSE MIS. These efforts combined (AvSE MIS and ASEMF) give the AF the greatest return to increasing one element of overall readiness in support of the National Defense Strategy (NDS).

1.5.2. Preventive Maintenance. AF units implement and manage the tasks specified in the scheduled recurring maintenance program for their assigned aircraft and associated support equipment (SE). Preventive maintenance is achieved through the inspection requirement concepts described in TO 00-20-1, *Aerospace Equipment Maintenance Inspection, Documentation, Policy, and Procedures*, and applicable weapon system -6 TO.

1.5.3. MAJCOMs that conduct Mission Generation Assessments or similar weapon system logistic evaluations in order to validate unit readiness will:

1.5.3.1. Provide units a standardized assessment report containing, at a minimum, positive, negative, and areas for improvement feedback to facilitate cross tell to like units.

1.5.3.1.1. Analyze unit generation processes to capture and communicate best practices.

1.5.3.1.2. Analyze unit generation performance to identify and communicate noteworthy trends.

1.5.3.2. Directorates of Logistics, Engineering & Force Protection (MAJCOMs A4s) will semi-annually report their top three trends and causal factors to the Logistics Board to facilitate debate to identify and mitigate potential limiting factors. Submit MAJCOM top three trends to the AF/A4LX workflow no later than 30 days prior to each Logistics Board meeting for consolidation at: **AF.A4LX.Workflow@us.af.mil**.

1.6. Maintenance Discipline. It is the responsibility of all maintenance personnel to comply with all written guidance to ensure required repairs, inspections, and documentation are completed in a compliant, safe, timely, and effective manner. Supervisors are responsible for enforcing and establishing a climate that promotes maintenance and supply discipline. Unless expressly stated otherwise in a particular instruction, waiver, or deviation in this DAFI granted by the appropriate authority, all Airmen must follow AFIs. AFIs do not provide optional guidance, and failure to comply with DAFIs can result in disciplinary action as described in AFI 1-1, *Air Force Standards*. Civilian personnel who violate punitive publications may also be subject to disciplinary action. See DAFMAN 90-161 for more detailed information on the use of punitive language in publications.

1.6.1. Compliance Terminology. For the purposes of this instruction, the following definitions apply:

1.6.1.1. Must, Will - Indicates mandatory requirements. **Note:** "Will" is also used to express a declaration of purpose for a future event.

1.6.1.2. Should - Indicates a preferred method of accomplishment.

1.6.1.3. May - Indicates an acceptable or suggested means of accomplishment.

1.6.2. Use of TOs and TO Supplements. All personnel will enforce compliance with technical data. **(T-2)** Use of prescribed technical data to maintain aircraft and equipment is mandatory and will be conducted and managed IAW TO 00-5-1, *Air Force Technical Order System*.

1.6.3. AFTO Form 492, *Maintenance Warning Tag*. The Air Force Technical Order (AFTO) Form 492, *Maintenance Warning Tag*, is used as prescribed in technical data, local procedures, or both, to flag a condition that could cause damage or injury if ignored. Refer to TO 00-20-1 for additional guidance. **Note:** The AFTO Form 492 is replacing the AF Form 1492, *Warning Tag* referenced in DAFMAN 91-203, Air *Force Occupational Safety, Fire, and Health Standards*. Use of the AF Form 1492 is authorized until supplies are exhausted.

1.7. Communications Security (COMSEC)/Controlled Cryptographic Item (CCI). The Air Force CCI Central Authority is AFLCMC/HNC, Cryptologic and Cyber Systems Division (CCSD), Joint Base San Antonio-Lackland, Texas.

1.7.1. COMSEC/CCI will be managed, and personnel trained IAW AFMAN 17-1302-O, *Communications Security (COMSEC) Operations* and AFI 23-101, *Air Force Material Management*. Ensure all serially controlled and serially tracked COMSEC/CCI information is entered into the Maintenance Information System (MIS) IAW TO 00-20-2, *Maintenance Data Documentation*. **Note:** AFMAN 17-1302-O is accessible through the AF e-Pubs Warehouse Management System (WMS) at **https://wmsweb.afncr.af.mil/wms**.

1.7.1.1. Maintain serial number inventory accountability for all COMSEC/CCI issued or removed to Facilitate Other Maintenance (FOM).

1.7.1.2. Questions concerning COMSEC/CCI can be directed to the AF CCI Central Authority (**aflcmc.hncls.cciworkflow@us.af.mil**).

1.7.2. Maintenance Cybersecurity Discipline.

1.7.2.1. Maintaining positive maintenance cyber discipline practices of Department of Defense (DoD) Information Technology (IT) is critical to sustaining the mission. Department of Defense Instruction (DoDI) 8500.01, *Cybersecurity*, defines both hardware and software that is physically part of, dedicated to, or essential in real-time to the mission assurance of special purpose weapon systems. DoD IT is the most common IT encountered in flightline environments and includes (but is not limited to) electronic tools, aircraft, and associated support equipment. The culture of positive cybersecurity awareness and actions necessary to sustain cyber resiliency is required by all maintenance personnel to mitigate allusive cyber threats and optimize enduring mission generation capabilities.

1.7.2.1.1. All users perform an integral role in prevention, detection, and reporting suspected corrupted software of DoD IT which includes Information Systems (IS) and

Platform Information Technology (PIT), which is an electronic platform with information technology for a specific function. See **Table 1.1**.

Table 1.1. Tiered Interface Examples.

TIER	Type of Interface	Examples	Applicable TOs
1	On-Board	EC-130, XX-135, E-3, E-8	Device TO
2	Directly Connected	F-22 PMA, F-35 PMA, Viper MLV, CAPRE, CETS, DTADS	Device TO
3	Indirectly Connected	Test Eqpt., Support Eqpt., ATS, ATE, AIS, VDATS	TO 33-1-38
4	Not Connected	eTools	TO 00-5-1

1.7.2.1.1.1. All users must consult airframe Security Classification Guides, TO 33-1-38, *Cybersecurity for Automatic Test Equipment and Support Test Equipment (ATE/STE)*. TO 33-1-38 provides guidance for Cybersecurity Incident Reporting and refers users to applicable technical manuals, instructions, and publications when determining the classification of cybersecurity incidents and vulnerability documents.

1.7.2.1.2. Authorized and unauthorized uses of IT and PIT. All users must have the ability to distinguish between authorized and unauthorized uses.

1.7.2.1.2.1. Authorized uses must be vetted through a formal cybersecurity assessment process and be directed in specific TO guidance. **(T-2)** The governing TOs or equivalent publications specifically define authorized uses.

1.7.2.1.2.2. Unauthorized uses include connecting any hardware, uploading, or downloading software, or media not explicitly defined by TOs. This includes but is not limited to personal devices, phones, tablets, computers, Universal Serial Bus drives, and similar devices.

1.7.2.1.2.3. DoD IT, derivative AF Publications, and TOs provide users guidance on Automated Computer Program Identification Number System devices acquired from local Communications Squadrons and media obtained from DoD contractors.

1.7.2.1.2.4. All users will follow the applicable TO when directly or indirectly connecting computers and equipment to the aircraft or support equipment and when uploading or downloading data. **(T-2)**

1.7.2.1.2.5. All users will immediately discontinue use, report, and turn into the appropriate functional authority IT and PIT (WAM, Wing Cybersecurity Office, and the Mission Defense Teams/Cyber Squadron, if assigned) that are suspect for containing malicious software, malicious code, software bugs or unauthorized use. **(T-2)**

1.7.2.1.2.6. All users will complete Maintenance Cyber Discipline Training annually in MyLearning. **(T-2)**

1.7.2.1.3. MDS Lead Commands in coordination with the applicable PM will develop MDS and Support Equipment (SE) cyber threat mitigation methods and procedures for Organizational and Intermediate level maintenance activities. The methods and procedures must detect malicious code, report cyber incidence and issues, and remediate the incidence and issue affecting the MDS or SE. **Note:** Mitigation plan should be developed per DoDI 8500.01; TO 33-1-38, DoD 8570.01, *Information Assurance Workforce Improvement Program*; Military Standard (MIL-STD)-38784A, *General Style and Format Requirements For Technical Manuals*; 17- series AFIs.

1.7.2.1.3.1. The cyber threat mitigation methods must include MDS and SE specific training requirements. **(T-2) Note:** Training requirements could include training aids, for example, computer-based training on how the flightline maintainer should scan support equipment for malicious software.

1.7.2.1.3.2. Lead Commands must ensure current MDS and SE specific malicious code definitions are available to ensure positive cyber threat mitigation management support is available. **(T-2)**

1.7.2.1.3.2.1. MAJCOM and ANG will report system-specific cyber incidents to the applicable MDS Lead Command.

1.7.2.1.3.2.2. MAJCOM and ANG will follow airframe Security Classification Guides, TOs, and applicable technical manuals when providing "cross tell" to inform their subordinate units about system-specific cyber incidents, threats, and issues.

1.7.3. eTools.

1.7.3.1. eTools are portable electronic devices (such as laptop computer, handheld device) that operate in a disconnected mode and are certified to inter-operate on AF networks. eTools are mission critical: the primary purpose is for viewing electronic technical publications and in some cases are used to exchange maintenance data with approved MIS at the point of maintenance. eTools are procured IAW DAFMAN 17-1203, *Information Technology (IT) Asset Management (ITAM)*. **Note:** eTools do not include electronic devices and test equipment issued and configuration managed by a system PM (aircraft test and support equipment).

1.7.3.2. MAJCOM/ANG A4s will develop and implement standardized guidance on the management, use, storage, configuration, content update, security, and cyber hygiene processes necessary to support the approved use of all assigned eTools consistent and IAW the weapon system MDS specific technical orders and threat specific Air Force and DoD cyber publications.

1.7.3.3. The MAJCOM/ANG A4 guidance will include any assigned command-wide cyber threat awareness and mitigation strategies with reference to supporting publications, technical orders, and MAJCOM eTool OPR contact information in their supplement or addendum to this DAFI.

1.8. Environmental Compliance. It is the responsibility of all maintenance personnel to comply with all written guidance to ensure compliance with hazardous material, hazardous waste management and air emissions record keeping as required for environmental compliance IAW AFI

90-821, *Hazard Communication (HAZCOM) Program*, installation Environment, Safety, and Occupational Health Management System/Environment Management System (ESOHMS/EMS) policy/guidance and applicable environmental requirements and guidance.

1.9. Publications. Units may tailor procedures to the unique aspects of their own maintenance operation and publish directives, instructions, supplements, addendums, and, for functional areas, Operating Instructions (OI) IAW DAFMAN 90-161.

1.9.1. Develop, control, and maintain functional and emergency action checklists. At a minimum, each checklist is titled, dated, and coordinated with the wing safety office. Functional checklists are not to be used in place of or to circumvent technical data for operation, servicing, inspection or maintenance of aircraft, aircraft systems, munitions, and all other equipment supporting aircraft and munitions maintenance.

1.9.2. Methods and Procedures Technical Orders (MPTOs): Due to the close relationship between MPTOs and this DAFI, all changes and revisions to the MPTOs cited in **Attachment 1,** References of this DAFI will be routed from Air Force Material Command (AFMC) to AF/A4LM for content review for conflicts and policy gaps identification and mitigation prior to submission for publication.

1.10. Maintenance Training. Maintenance training provides initial, recurring, and advanced proficiency, qualification, or certification skills needed by a technician to perform assigned duties. Maintenance training includes combat and sortie generation skills not normally integrated into peacetime operations (such as, Multi-Capable Airmen, munitions handling, and external fuel tank build-up, hot refueling). Maintenance training carries an equal priority with the operational training mission. For maintenance training policy and guidance, refer to AFI 36-2650, *Maintenance Training* and MAJCOM supplements.

1.11. Modification Management. A modification proposal is a recommendation to change the operation, use, or appearance of AF equipment. Modifications (temporary, permanent, or safety) to AF aircraft or equipment are expressly prohibited without PM approval. **Note:** PM is used in this publication as defined in AFPD 63-1, *Integrated Life Cycle Management*. Refer to AFI 63-101/20-101, for modification management procedures.

1.11.1. Modifications to Munitions. All proposed modifications to aircraft-carried munitions include AFI 63-101/20-101 and SEEK EAGLE certification IAW AFI 63-101/20-101 and Air Force Pamphlet (AFPAM) 63-129, *Air System Development Process and Procedures*. All modifications to AF nuclear munitions or their associated support and training equipment are nuclear certified IAW AFI 63-125, *Nuclear Certification Program*. All modifications to AF conventional munitions or their associated support and training equipment are certified IAW DAFI 91-205, *Non-Nuclear Munitions Safety Board*.

1.12. Maintenance Information System (MIS). MIS refers to automated maintenance information systems that support and enable maintenance business processes. The MIS is used to document maintenance actions and track fleet health. The information entered into the MIS is accomplished IAW TO 00-20-2 and matches the content of the aircraft forms. MIS data entries do not have to be accomplished by the same individual who documented the aircraft forms, but employee numbers, man numbers, and User IDs of individuals accomplishing the actual work are entered into the MIS. Red Ball maintenance is documented IAW **Chapter 11**. Data integrity is the

responsibility of every member of the unit. All personnel are responsible for ensuring accuracy and completeness.

1.12.1. Units use the approved MIS for their assigned weapon system.

1.12.2. Serial numbers will be documented in the MIS for all serially controlled and tracked assemblies that are identified by an asterisk in the Work Unit Code (WUC) or Logistics Control Number (LCN) manual IAW TO 00-20-2.

1.13. General Safety Guidance. Maintenance personnel are exposed to a large variety of hazardous situations, machinery, equipment, and chemicals. Most hazardous situations can be avoided by following approved procedures, asking for assistance when needed, and using all required personal protective equipment (PPE).

1.13.1. Safety "Knock It Off" and Risk Management. Due to the inherent danger to life, limb, and property associated with maintenance operations, personnel are empowered to terminate an operation or situation which they perceive is unsafe or too dangerous. When supervisors or crew leaders become task-focused, junior personnel are often better able to assess the danger; however, deferring to the experience and judgment of the supervisor or crew leader, they may choose to remain silent, missing an opportunity to break the mishap sequence chain. Maintenance commanders and supervisors are responsible for fostering a culture in their units so that a simple, but recognizable "audible" from anyone can prevent a potential mishap. **Note:** See AFI 90-802, *Risk Management*, and DAFPAM 90-803, *Risk Management (RM) Guidelines and Tools* for additional information.

1.13.2. Visitors. Unit Commanders will not permit visitors to operate any AF equipment unless they are qualified to operate such equipment and are doing so in the performance of their assigned official duties. **(T-2)** Visitors will not be allowed in the flightline area if munitions operations are present IAW DESR6055.09_AFMAN 91-201, *Explosive Safety Standards*.

1.14. Duty Shifts and Rest Periods. MXG/CC or equivalent will establish minimum requirements that ensure units maintain an equitable distribution of supervision (Officer and Senior Non-Commissioned Officer (SNCO)) across all on-duty shifts in their supplement to this DAFI. **(T-3)**

1.14.1. During normal operations, maintenance personnel are scheduled for duty based on a 40-hour work week. Maintenance personnel duty hours are aligned to provide optimal mission support.

1.14.2. Personnel will not be scheduled for more than 12 hours of continuous duty time. **(T-3)** Duty time begins when personnel report for duty and ends when their supervisor releases them. Time spent in exercise or contingency deployment processing lines and in-transit counts toward the total duty day. SQ/CCs are the final approval authority for duty time extensions exceeding the 12-hour limit up to a maximum of 16 hours. **(T-3) Note:** Aircraft or detachment commanders assume this responsibility in Temporary Duty (TDY) or travel status.

1.14.3. Commanders and supervisors will provide a rest period after each shift. **(T-3)** A rest period is a block of time that gives a person the opportunity for 8 hours of uninterrupted sleep in a 24-hour period.

1.14.4. When handling, loading, or performing maintenance on nuclear weapons, conventional munitions, or egress explosives, personnel will follow requirements IAW AFMAN 21-200.

1.14.5. In alert force or standby duty situations where facilities are available for resting, established norms may be exceeded. Adjust rest periods to allow for 8 hours of uninterrupted sleep.

1.14.6. Commanders and supervisors will ensure individuals are afforded adequate duty rest periods and breaks to prevent fatigue or thermal injury. Stop anyone if fatigue may jeopardize safety. In all cases, aircraft commanders or supervisors ensure aircraft maintenance personnel are not required to perform duty when they have reached the point of physical or mental fatigue rendering them incapable of performing their assigned duties safely and reliably.

1.14.7. MAJCOM Commanders will assume the risk for any Flying Crew Chief (FCC) deviations from normal duty shifts, rest periods, and exceedance of the 16-hour maximum duty day. MAJCOM Commanders will publish risk-mitigation procedures in order to meet critical mission requirements.

1.15. Communications. Commanders will develop communication plans according to AF mission requirements. See **Chapter 11** for detailed communication requirements.

1.15.1. Effective maintenance accomplishment requires the ability to communicate across all facets of the maintenance operation efficiently and effectively. Communication technology (government issued Portable Electronic Devices (PED), Portable Maintenance Aid (PMA), radios, cell phones, computers, wireless internet) must be available to expedite personnel, equipment, material, and maintenance data throughout the maintenance complex. **(T-2)**

1.15.2. MAJCOMs will publish guidance for the use and control of personal communications devices (personal cell phones, tablets, and computers) on the flightline, in munitions areas, hangars, and other industrial work areas as required to mitigate cyber risk and ensure compliance with cyber and communication AFI requirements relevant to their operational environments.

1.15.3. Unit Commanders will enforce procedures that prohibit the introduction of government or personal cellular, personal communications system, Radio Frequency (RF), Infrared (IR) wireless devices, and other devices such as cell phones, tablets, and devices that have photographic or audio recording capabilities into areas (e.g., rooms, offices) where classified information is stored, processed, or discussed IAW AFMAN 17-1301, *Computer Security (COMPUSEC)*. Coordinate waiver requests with the applicable Approving Official (AO), and ensure adherence to Certified TEMPEST Technical Authority (CTTA) requirements IAW Department of Defense Directive (DoDD) 8100.02, *Use of Commercial Wireless Devices, Services, and Technologies in the DoD Global Information Grid (GIG)* written approval by the AF CTTA IAW NIST SP 800-53A Revision 4, *Assessing Security and Privacy Controls in Federal Information Systems and Organizations: Building Effective Security Assessment Plans*, and the Enterprise Authorizing Official (AO) IAW DAFI 31-101, *Integrated Defense (ID)* and AFMAN 17-1301.

1.16. Maintenance Repair Priorities. Maintenance repair priorities are listed in **Table 1.2**. This does not prohibit the Production Superintendent (Pro Super), in coordination with the Maintenance Operations Center (MOC), from changing the maintenance repair priority when warranted. During

tasked Operational Plan (OPLAN) or operational exercise, the pre-planned maintenance flow determines the job sequence. The maintenance repair priority and the Logistics Readiness Squadron (LRS) delivery priorities (listed in Air Force Handbook (AFH 23-123V, *Materiel Management Reference Information*) are normally identical. Raising or lowering maintenance repair priorities does not necessarily require a corresponding change in the LRS delivery priority. However, the Pro Super may authorize the use of a less responsive LRS delivery priority.

Table 1.2. Maintenance Repair Priority Designators.

PRIORITY	APPLICATION
1	Aircraft on alert status, war plan or national emergency missions, including related Aerospace Ground Equipment (AGE), munitions and Munitions Support Equipment.
2	Primary mission aircraft, related AGE, munitions, and munitions support equipment, for the first 8 work hours after landing or start of recovery or within 6 work hours of a scheduled launch, alert or test flight and during simulated generation or Operational Readiness Exercises (ORE). Air evacuation, rescue, weather (WX) mission aircraft, related AGE, munitions, and munitions support equipment. All transient support, and FAA aircraft. Flight or missile crew training simulator, other training equipment or related AGE required repair, which is impacting the mission by preventing or delaying student training.
3	Primary mission aircraft, engines, air launched missiles and related AGE, munitions and munitions equipment, and equipment undergoing scheduled or unscheduled maintenance, if not performed or repaired will prevent or delay mission accomplishment. Transient air vehicles not otherwise listed. Administrative aircraft within 8 hours of scheduled flight or on alert status with standby crews. Time change requirements for nuclear weapons. Repair cycle assets to satisfy a Mission Impaired Capability Awaiting Parts (MICAP) condition. Spares not available in supply. Critical end items and spares not available in supply. Routine maintenance of aircrew or missile-training simulator, or other training devices or related AGE or sites and aircraft or equipment used for maintenance training. Avionics shop electronic AGE and automated test stations.

4	Routine or extensive repair of primary air mission and related AGE and repair cycle assets. Administrative aircraft undergoing scheduled or unscheduled maintenance. Routine maintenance of AGE not otherwise listed above. War Reserve Materiel (WRM) items due maintenance or inspection. Inspection, maintenance, and Time Compliance Technical Order (TCTO) compliance of Mission Support Kit or Mobility Readiness Spares Package (MRSP) materiel. Extensive repair of aircrew or missile training simulators, other training devices, or related AGE. Inspection, maintenance, and TCTO compliance of munitions and munitions equipment, excluding spares excess to base requirements not listed above. Scheduled calibration and unscheduled repairs on Precision Measurement Equipment (PME) not listed above. Scheduled maintenance to include periodic inspections, routine TCTO, Master Configuration Lists (MCL) Grounding, and Time Change Items (TCIs). Primary mission Comprehensive Engine Management System (CEMS) or equipment including associated AGE undergoing extensive repair or modification.
5	Non-tactical or non-primary-mission aircraft undergoing extensive repair. Fabrication and repair of aeronautical items not carrying a higher priority. Bench stock requirements. Extensive repair of aircrew training devices. Time change requirements not listed above. Routine repair of AGE and repair cycle assets. Alternate and other CEMS or equipment, including associated AGE undergoing extensive repair or modification. Clearing routine delayed discrepancies on training equipment or AGE, and routine maintenance which will not impair or affect mission accomplishment. Equipment requirements.

6	Fabrication and repair of non-aeronautical items. Repair cycle asset shortages required to fill a peacetime operating stock authorization
7	Spares/repair cycle assets excess to base requirements.

1.17. Associate Unit Program/Total Force Integration (TFI). The USAF employs the Associate Unit/TFI program in some locations where RegAF and Air Reserve Component (ARC) units are collocated and share aircraft, equipment, facilities, and other resources IAW AFI 90-1001, *Planning Total Force Associations (TFAS)*, and MAJCOM supplements. For the purpose of this instruction, in an Active Association, the ANG or AFR owns the aircraft, and RegAF personnel will follow ANG or AFR maintenance policy. In an ARC association, AFR owns the aircraft, and ANG personnel will follow AFR guidance, or vice versa. In a classic association, RegAF owns the aircraft, and ANG or AFR personnel will follow RegAF maintenance policy. Type of association is determined by the Program of Record for the associated unit.

1.18. Performance-Based Activities. MAJCOMs may publish the basic responsibilities for managing performance-based activities.

1.18.1. If published MAJCOMs will:

1.18.1.1. Designate focal points for organizational, functional, and technical questions pertaining to each performance-based activity program.

1.18.1.2. Specify measurement areas and performance levels required for aircraft, systems, and equipment operated or maintained by performance-based activities.

1.18.1.3. Specify the forms, methods of documentation, and frequency of reporting used to assess performance-based activities and ensures these requirements are included in the Quality Assurance Surveillance Plan (QASP).

1.18.1.4. Ensure units with assigned Contracting Officer Representative personnel meet requirements in AFI 63-138, *Acquisition of Services*.

1.18.1.5. Ensure aircraft depot maintenance contracts, Statements of Work (SOW), and Performance Work Statements (PWS) are coordinated with the applicable MAJCOM Functional, to include Munitions.

1.18.2. Unit Commanders will:

1.18.2.1. Designate a focal point for all functional, technical, and contracting officer representative matters pertaining to performance-based activities. **(T-3)**

1.18.2.2. In coordination with the contracting officer and the Program Manager of Functional Services Manager, provide specific guidance to the performance-based activity to ensure proper maintenance discipline and flight worthiness of aircraft and subsystems. **(T-3)**

1.18.2.3. Develop and publish contingency procedures for support of continuing operations in the event of disruption, termination, or default of contracts. **(T-3)**

1.19. Changes to Technical Orders. Official TO updates are the only valid authority for maintaining TO accuracy and currency. To maintain this currency, the AF has instituted an enterprise electronic TO Recommended Change (RC) process.

1.19.1. The Enhanced Technical Information Management System (ETIMS) is the required system for Recommended Change management and this process replaces the AFTO Form 22, *Technical Manual (TM) Change Recommendation and Reply*, AFTO Form 252, *Technical Order Publications Change Request* and the DAF Form 847.

1.19.2. There are specific organizations that may require the deviations or exceptions for those who do not have access to ETIMS. Refer to TO 00-5-1 for specific guidance on the RC process.

Chapter 2

ROLES AND RESPONSIBILITIES

2.1. General. This chapter outlines responsibilities for commanders and key leaders involved in maintenance activities. Decisions made that increase risk to safety of flight will be communicated with operations. In units where there is not a military commander responsible for maintenance, the applicable civilian Director of Maintenance (DOM) will ensure compliance with all responsibilities in this instruction. For organizations without all commanders and key leaders assigned, MAJCOMs will identify equivalent positions of authority commensurate with the responsibilities of the leadership positions identified in this **Chapter** in a MAJCOM supplement to this instruction.

2.1.1. For the purpose of this instruction, contractor equivalents are as follows: A1C—aircraft servicer or apprentice/journeyman; SrA (1-year time-in-grade)—aircraft worker or field maintenance worker or higher; SSgt—aircraft mechanic or field maintenance mechanic or higher; TSgt—senior mechanic or craftsman; MSgt—lead mechanic; SMSgt/CMSgt/maintenance officer—foreman, branch chief or higher. MAJCOMs may determine grade and skill level equivalents for civilians.

2.1.2. The functional authority to determine the need and design for civilian uniforms, under the purview of maintenance is delegated to the MAJCOMs/ANG. As such, all functional authority requirements set forth in AFI 36-128, *Pay Settings and Allowances* will also reside at the respective MAJCOM. The routing requirements for final approval of uniform requests and the establishment of uniform allowances will be IAW AFI 36-128.

2.2. Wing Commander (WG/CC) Responsibilities. The WG/CC allocates resources to meet all mission requirements. The WG/CC will:

2.2.1. Ensure that maintenance organizations are not overtasked with augmentation duties outside maintenance functional areas. **(T-2)**

2.2.2. Conduct a "Wing Standup" meeting. **(T-3)** The MAJCOM/ANG will establish “Wing Standup” meeting frequency that synchronizes communications necessary to optimize fleet readiness and mission generation capability in their supplement to this DAFI.

2.2.3. Ensure a coordinated wing or base instruction is developed that implements procedures to control tools, equipment, electronic devices, and establishes cyber discipline and reporting requirements that provide operational guidance across all wing or base agencies dispatching to aircraft runway, taxiways, parking, and maintenance areas. **(T-2)**

2.2.3.1. Ensure home station Base Support Plans (BSP) include contingency bare base, comm-out, and cyber-out operating procedures. Periodically exercise operations (as part of scheduled local exercises) in this simulated deployed environment to validate equipment, personnel, and processes provide the required mission generation capability. **(T-2)**

2.2.3.1.1. Develop and maintain local cyber abatement and status reporting procedures that optimize cyber resiliency and the ability to mitigate and recover from cyber threats affecting assigned mission or sortie generation operations. **(T-2)**

2.2.3.1.2. Ensure Wing Cybersecurity Office directs Wing cybersecurity compliance per AFI 17-101, Risk Management Framework (RMF) for Air Force Information

Technology (IT), specifically to address cybersecurity assurance of Wing aircraft and support equipment categorized as Operational Technology (OT). **(T-2) Note:** Currently known as Platform Information Technology (PIT).

2.2.4. Ensure maintenance and operations develop a joint annual maintenance and Flying Hour Program (FHP) that establishes a balance between the requirement for sorties and maintenance capability. **(T-2)**

2.2.4.1. Establish a joint MXG and OG planning and scheduling cycle to ensure the best use of aircraft, equipment, and personnel to accomplish short-term sortie production and long-term fleet health. **(T-3)**

2.2.4.2. Approve the weekly; monthly, quarterly, and annual flying or test schedules IAW **Chapter 14**. **(T-3)**

2.2.4.3. DELETED.

2.2.5. Vector future leaders to attend the Senior Leader Mission Generation (SLMG) Course following the course description and criteria listed in **Chapter 11**. **(T-2)**

2.2.6. Ensure a Crashed, Damaged, or Disabled Aircraft Recovery (CDDAR) capability exists for assigned active airfields and runways IAW **Chapter 11** and develop a wing publication IAW DAFMAN 90-161 containing specific responsibilities for all applicable base support agencies. **(T-2)**

2.2.6.1. Collaborate with Fire Emergency Services, Wing Safety, CES, LRS, SFS, MDS, OSS, and other on-/off-base agencies to develop a publication IAW DAFMAN 90-161, that assigns specific responsibilities and procedures to implement a sustainable CDDAR program IAW TO 00-80C-1. Ensure wings with GSU/auxiliary fields outline support requirements in their publication.

2.2.7. Identify specific responsibilities and outline unique materiel management support requirements necessary to optimize wing level maintenance and mission generation operations. Establish processes and responsibilities for maintenance units and work centers without material management support in a local publication. **(T-2)**

2.2.8. Approve hot refueling site certification(s). **(T-3)**

2.3. Wing Vice Commander (WG/CD) Responsibilities. The WG/CD (or equivalent) will:

2.3.1. Manage the Foreign Object Damage (FOD) and Dropped Object Prevention (DOP) Programs. **(T-2)** The WG/CD is the FOD/DOP Prevention Program Manager and will appoint a FOD/DOP Prevention Monitor(s) IAW **Chapter 11**.

2.3.2. Ensure the wing safety office, base operations, and emergency services actively participates in development and coordination of base functional and emergency action checklists. **(T-2)** Ensure content includes and complies with all required safety standards, evacuation distances and MDS specific hazards (such as, egress systems, Hydrazine). **(T-2)** Ensure checklists address all known hazards associated in responding to mishaps, adverse weather, natural disaster, and other emergency responses. **(T-2) Note:** Review, update, and coordinate functional and emergency action checklist with using units every two years.

2.3.3. Chair the FOD/DOP meeting, if required, and will determine minimum required attendees. **(T-3)** The purpose of this meeting is to identify negative trends and develop and execute action plans to resolve them.

2.4. Maintenance Group Commander (MXG/CC) Responsibilities. In addition to the responsibilities listed below, the MXG/CC or equivalent must ensure compliance with the maintenance requirements and programs of this instruction. **(T-3)** Approved variations in the MXG organization does not relieve the MXG/CC of compliance with all the requirements of this DAFI. In organizational structures where an MXG/CC is not assigned (i.e., AFFORGEN deployed construct), all 2.4.1. paragraphs will move up to the WG/CC and all 2.4.2. paragraphs will move down to the Mission Generation Force Element (MGFE) leader, delegable to the senior maintenance leader. Additionally, all 2.4.3. paragraphs' responsibilities will remain with the home unit's MXG/CC, or WG/CC in the absence of an MXG/CC, and any guidance or documentation necessary to support the mission will be brought with the unit.

2.4.1. The MXG/CC will:

2.4.1.1. Ensure standardization of maintenance discipline, procedures, organizational structures, compliance, and management philosophy. **(T-3)**

2.4.1.2. Establish a radiation protection program IAW AFI 48-109, *Electromagnetic Field Radiation Occupational & Environmental Health Program,* when applicable.

2.4.1.3. Designate a focal point for all functional, technical, and COR matters pertaining to performance-based activities. **(T-3)** Refer to **Chapter 1**.

2.4.1.4. Ensure munitions are accounted for IAW DAFMAN 21-201, *Munitions Management*, AFMAN 21-200, *Munitions and Missile Maintenance Management*, AFMAN 21-203, *Nuclear Accountability Procedures*, and AFI 20-110, *Nuclear Weapons-Related Materiel Management*.

2.4.1.5. Ensure a nuclear surety program is implemented (if applicable) IAW DAFI 91-101, *Air Force Nuclear Weapons Surety Program*, and nuclear munitions are maintained, handled, and accounted for IAW AFMAN 21-204, *Nuclear Weapons Maintenance*, AFMAN 21-203.

2.4.1.5.1. For units possessing Nuclear Certified Equipment (NCE), the MXG/CC will ensure personnel are trained in the proper use of nuclear flagwords, mishap, and deficiency reporting instructions IAW AFMAN 91-221, *Weapons Safety Investigations and Reports* and DAFI 91-204, *Safety Investigation and Reports*.

2.4.1.6. Establish CDDAR capability IAW **Chapter 11** and applicable MDS technical data. **(T-2)** The MXG/CC will ensure resources and trained personnel are available to perform responsibilities of the CDDAR Program. **(T-3)**

2.4.1.7. Sustain a Transient Alert (TA) function (if required). **(T-3)** The MXG/CC will establish procedures and furnish necessary personnel and facilities for handling transient aerospace vehicles to ensure that servicing, inspection, and maintenance are consistent with the mission of each transient aerospace vehicle. **(T-3)** Special consideration should be given to medical or air evacuation aerospace vehicle, emergency missions, and special missions.

2.4.1.7.1. Approve FCF requirements, submitted by the TA Section NCOIC/Chief to off-station TA and off-station QA sections. **(T-3)**

2.4.1.7.2. For transient alert, the MXG/CC may direct the WS Personnel to arm, de-arm, and unload an aircraft on which they are not certified and/or qualified if appropriate technical data and support equipment is available. **(T-3)**

2.4.1.7.2.1. The host MXG/CC or authorized representative may delegate this responsibility to the transient aircraft commander/pilot for new or experimental aircraft. **(T-3)**

2.4.1.8. Direct QA to develop/manage local OTIs IAW TO 00-20-1 and this instruction for Aircraft Grounding. **(T-3)**

2.4.1.9. Endorse TCTO notification messages to MAJCOM when anticipated problems will prevent compliance within prescribed time limits. **(T-3)**

2.4.1.10. Ensure a read file or equivalent exists for distributing maintenance crosstalk messages, QA newsletters, Higher Headquarters (HHQ) and local policy announcements, technical notifications, and other important maintenance information to all assigned airman. **(T-3)**

2.4.1.11. Ensure direct mission generations support focuses on readiness and the unit's ability to execute daily and deployed flying operations simultaneously. **(T-3)**

2.4.1.12. Chair the FOD meeting in the absence of the WG/CD. **(T-3)**

2.4.1.13. Ensure maintenance requirements (such as, aircraft turnaround, alternate fuel cell, hot refueling, end-of-runway (EOR) check area, engine run spots, explosive load (cargo) areas) are included in the base parking plan. **(T-3)**

2.4.1.14. Communicate constraints with OG to decide what portion of the mission to support and to what degree if conflicts arise between operational requirements and maintenance capability. **(T-3)**

2.4.2. The MXG/CC will:

2.4.2.1. Appoint an MXG Environmental Coordinator IAW AFI 32-7001, *Environmental Management.* Refer to AFI 90-821, installation ESOHMS/EMS policy, guidance, and applicable environmental requirements and guidance, DAFMAN 91-203, and AFMAN 32-7002, *Environmental Compliance and Pollution Prevention*, for additional guidance.

2.4.2.2. Establish and support a Data Integrity Team (DIT). **(T-3)**

2.4.2.3. Ensure the Maintenance Standardization and Evaluation Program (MSEP) requirements are implemented IAW **Chapter 6**. **(T-3)**

2.4.2.4. Establish measures that ensure all maintenance personnel are assigned IAW the Duty Title Tool, are available, and utilized to accomplish critical maintenance tasks necessary to integrate maintenance capabilities that optimize Aircraft Availability (AA). **(T-3)** Maximize utilization of 7-skill level maintenance personnel in the grade of E-5 to E-7 in direct mission generation roles and minimize their use in staff positions or non-maintenance duties. **(T-3)** Note: Consider utilization of Civil Service MXG/SQ Unit

Program Coordinators to consolidate programs to maximize availability of sortie generation maintainers on the flightline to maximize AA.

2.4.2.5. Implement an effective Corrosion Prevention and Control Program IAW TO 1-1-8, Application and Removal of Organic Coatings, Aerospace and Non-Aerospace Equipment; TO 35-1-3, Corrosion Prevention and Control, Cleaning, Painting, and Marking of USAF Support Equipment; TO 1-1-691 Cleaning and Corrosion Prevention and Control, Aerospace and Non-Aerospace Equipment.

2.4.2.6. Ensure effective use of the assigned AF Engineering and Technical Services (AFETS), Contractor Engineering and Technical Services (CETS), and contracted Field Service Representatives (FSRs) IAW **Chapter 11**.

2.4.2.7. Ensure the applicable section "safes" all static display aircraft/systems IAW the applicable 00-80-series and weapon system-specific TOs.

2.4.2.8. Ensure the MXG Oil Analysis Program (OAP) complies with **Chapter 11**. **(T-3)**

2.4.2.9. Ensure Engine Health Management Plus (EHM+) duties are performed IAW AFMAN 20-116 for EHM products managed by Air Force Life Cycle Management Center AFLCMC/LP. If EHM data is not managed by AFLCMC/LP, ensure Contractor Logistics Support (CLS) provided EHM products are managed according to respective contract. **(T-3)**

2.4.2.10. Appoint a hot refueling/hot defueling OPR for the Wing (WG) and designate an OPR for hot refuel training (if applicable). **(T-3)**

2.4.2.11. Ensure unit personnel collect and report Aircraft Structural Integrity Program (ASIP) data IAW DAFI 63-140, *Aircraft Structural Integrity Program and Air and Space Equipment Structural Management*, and **Chapter 11**. **(T-3)**

2.4.2.12. Ensure aircraft and equipment sunshades are maintained IAW **Chapter 15**. **(T-3)**

2.4.2.13. Ensure management of the Weight and Balance (W&B) program IAW **Chapter 6**. **(T-3)**

2.4.2.14. Coordinate with the Operations Group (OG) and establish Functional Check Flight (FCF), Operational Check Flight (OCF), and High-Speed Taxi Check programs. **(T-3)**

2.4.2.15. Implement the Hangar Queen Program IAW **Chapter 11**. **(T-3)**

2.4.2.16. Ensure compliance with Identification Friend or Foe Program or equivalent IAW **Chapter 11** (if equipped). **(T-3)**

2.4.2.17. Provide Subject Matter Expertise (SME) support for the development of the wing or installation instruction to control tools, equipment, and electronic devices from all wing agencies dispatching to aircraft parking, runway, taxi areas, and aircraft maintenance areas IAW **Chapter 2** and **Chapter 8**. **(T-3)**

2.4.2.18. Ensure Air Force Repair and Enhancement Program (AFREP) is managed IAW **Chapter 11**. **(T-3)**

2.4.2.19. Establish procedures to ensure assigned units have sufficient eTools available for technical order viewing. **(T-3)**

2.4.2.20. Develop procedures and assign responsibilities to ensure aircraft, aircraft system forms, equipment forms, and MIS documentation are complete, accurate, and are thoroughly reviewed each shift. **(T-3)** Documented procedures as a minimum will include:

2.4.2.20.1. The process for recovering aircraft, aircraft systems from extensive maintenance events, and down time ((cannibalization (CANN), local depot maintenance (MX)) include independent screening and validation that all maintenance actions (IPIs, operational checks, configuration management, W&B, serial number (S/N) tracking (COMSEC/CCI and other significant items as designated by an asterisk in the applicable WUC/LCN Manual)) and AFTO Form 95, *Significant Historical Data*, have been accurately documented in the forms, MIS, or both before being scheduled for a sortie or mission. **(T-3)**

2.4.2.20.2. The process for determining if an OCF or FCF is required. **(T-3)**

2.4.2.21. Ensure that when no 2W1X1 weapons AFSCs are assigned and units are required to install/remove chaff/flare on unique mission aircraft, personnel will be trained and qualified to perform these tasks IAW procedures outlined in AFMAN 21-206, *Aircraft Armament Systems Management*, and **Chapter 11** and approved by the WWM.

2.4.2.22. Ensure storage, physical security, corrupt systems quarantine procedures, and cyber threat mitigation management of MXG assigned PIT and eTools is supported and sustained. **(T-3)** If deployed without an MXG/CC, corrupted systems and cybersecurity issues will be coordinated with the WG/CC.

2.4.2.23. Ensure personnel are trained and appointed as Aircraft Battle Damage Evaluators IAW **Chapter 11**. **(T-3)**

2.4.2.24. Establish minimum requirements that ensure units maintain an equitable distribution of supervision (Officer and Senior Non-Commissioned Officer (SNCO)) across all on-duty shifts. **(T-3)**

2.4.2.25. Ensure compliance with the local Impoundment Program. **(T-3)**

2.4.2.26. Be the Impoundment Release Authority, along with the MXG/CD. **(T-3)**

2.4.2.27. Designate Impoundment Authorities and track them on the SCR. **(T-3)**

2.4.2.28. Determine the need for an FCF for an uncommanded flight control movement. **(T-3)**

2.4.2.29. Coordinate with all wing organizations that work in or enter any maintenance area under his or her responsibility to ensure they have documented tool/equipment control procedures. **(T-3)**

2.4.2.30. Approve all locally manufactured, developed, or modified tools and equipment. **(T-3)**

2.4.2.31. Coordinate to ensure direct mission generations support focuses on readiness and the unit's ability to execute daily and deployed flying operations simultaneously. **(T-3)**

2.4.2.32. Approve items identified in **Table 11.1.**, **Note 1**. **(T-2)** The MXG/CC at their discretion, may delegate approval authority to MXG Squadron Commanders. **(T-3)**

2.4.2.33. Coordinate with the OG/CC or WG/CC to develop procedures to ensure pilots and aircrew members account for all equipment and personal items after each flight and ensure any items that become lost during flight are documented in the aircraft AFTO Form 781A. **(T-3)**

2.4.2.34. Approve CANN Authorities (CA). **(T-3)**

2.4.2.35. Designate qualified TSgts or higher, civilian equivalent, fully qualified/certified contractors, or AFETS/CETS personnel to serve as engine run certifying officials IAW criteria established in **Table 11.1**. **(T-3)**

2.4.2.36. Select maintenance, TD, or AFETS/CETS personnel as instructors, and ensure instructors maintain blade blending proficiency and certification requirements. **(T-3)**

2.4.2.37. Approve and track Hot Pit certifying officials on the SCR. **(T-3)**

2.4.2.38. Ensure CDDAR mobility UTC equipment requirements are available to deploy and accounted for on an AS (if applicable). **(T-3)**

2.4.2.38.1. Coordinate functional and emergency action checklist with Fire Emergency Services, Wing Safety, and the Airfield Operations Flight in developing adverse weather procedures for protecting aircraft and equipment IAW DAFMAN 91-203, DAFI 10-2501, *Air Force Emergency Management Program*, and MDS-specific technical data. **(T-3)**

2.4.2.38.2. In coordination with the MSG/CC, determine unit vehicle/equipment requirements beyond those authorized in the AS(s) to provide 24/7 CDDAR response/runway clearing capability. **(T-3)** Units must identify vehicles and SE designated to support CDDAR recovery in a local publication to ensure 24-hour availability. **(T-3)**

2.4.2.38.3. Ensure as a minimum, units with a CDDAR requirement possess sufficient equipment to accomplish a recovery of the assigned MDS aircraft. **(T-3)**

2.4.2.38.4. Establish an IFE response capability. **(T-3)**

2.4.2.38.5. Participate in CDDAR training exercises. **(T-3)**

2.4.2.38.6. Manage CDDAR equipment to minimize duplication of resources. **(T-3)**

2.4.2.38.7. Ensure an annual CDDAR equipment inventory is completed and an inventory report containing DPAS Property Accountability (PA) inventory of CDDAR equipment that indicates excess, or shortage items is completed, signed by MXG/CC or equivalent, and sent to the MAJCOM CDDAR OPR, NLT 30 Sep. **(T-3)**

2.4.2.39. Ensure EM is the wing focal point for both the ET&D, Engine Health Management (EHM+) and Condition Based Maintenance Plus (CBM+) program when applicable. **(T-3)**

2.4.2.40. Review and approve the assessment of the wing's ability to execute the FHP, in coordination with the OG/CC, prior to submission to the WG/CC. **(T-3)**

2.4.2.41. Review first look packages before being presented to the WG/CC. **(T-3)**

2.4.2.42. Formalize the next month's flying and maintenance plan prior to presenting it to the WG/CC for approval NLT the third scheduling meeting of the preceding month. **(T-3)**

2.4.2.43. Review the weekly, monthly, quarterly, annual flying or test schedules IAW **Chapter 5** and **Chapter 14**. **(T-3)**

2.4.2.44. Ensure effective management of the Engine Trending and Diagnostic (ET&D) program IAW AFMAN 20-116, *Propulsion Life Cycle Management for Aerial Vehicles*.

2.4.2.45. Focus unit MSEPs on problem areas where improvements are needed. **(T-3)**

2.4.2.46. Ensure maintenance actions for Ground Instructional Training Aircraft (GITA)/Training Aircraft Aids (TAA) are documented IAW TO 00-20-1.

2.4.2.47. Ensure repair cost evaluations are performed and appropriate levels of review and repair authorization are established in squadrons, flights, and repair sections IAW TO 00-20-3, *Maintenance Processing of Repairable Property and The Repair Cycle Asset Control System*, TO 00-25-240, *Uniform Repair/Replacement Criteria for Selected USAF Support Equipment* (SE), and TO 35-1-24, *Air Force Economic Repair/Replacement Criteria For Selected Warner Robins Logistics Complex* (ALC) *Managed Support Equipment* (SE).

2.4.2.48. Collaborate with the WG/CC and forward a recommendation to the MAJCOM if an initial OTI sampling indicates the discrepancy is widespread and has the potential for personal injury and/or further equipment damage. **(T-3)**

2.4.2.49. Approve requests for assistance IAW **Chapter 1** after they are coordinated with Plans, Scheduling, and Documentation (PS&D), Quality Assurance (QA), and all applicable maintenance organizations. **(T-3)**

2.4.2.50. Appoint a Wing Corrosion Manager (2A7X3, 2A7X5) to implement local requirements, ensure implementation of MAJCOM directed requirements and act as the focal point for communicating with external stakeholders. **(T-3)**

2.4.2.51. Be the approval authority for cannibalization of egress explosive components and/or seats to ensure system integrity and validation of explosive CAD/PAD listing. **(T-3)**

2.4.2.52. Establish a Memorandum of Understanding (MOU) for organizational level Maintenance Interoperability or Aircraft Cross-servicing with joint forces or partner nations, if requested. See DAFI 25-301, *Aircraft Cross-Servicing Agreements*, for further guidance.

2.4.2.53. If applicable, establish a Primary, Alternate, Contingency, and Emergency (PACE) plan(s) to conduct operations in a contested, degraded, or operationally limited environment. (T-3) Note: Use AFTTP 3-4.21V1, *Aircraft Maintenance*, Attachment 10, *Contested, Degraded, and Operationally Limited Operations*, as a guide for development of PACE plan and AFI 90-802, *Risk Management*.

2.4.3. The MXG/CC will:

2.4.3.1. Approve and publish In Process Inspection (IPI) listings every two years IAW **Chapter 6**. **(T-3)**

2.4.3.2. Approve MXG Key Task List (KTL) and Routine Inspection Lists (RIL). **(T-3)**

2.4.3.3. Implement MAJCOM Lead the Fleet (Pacer) Program for engine type IAW AFMAN 20-116. **(T-2)**

2.4.3.4. Ensure aircraft possessed by AFMC for depot maintenance are not cannibalized without coordination through the MAJCOM functional manager who will then request approval from the applicable Air Logistics Complex (ALC) Maintenance Group Commander/Director and Program Manager. **(T-2)**

2.4.3.5. Establish local procedures for management and maintenance of assigned GITA and TAA to ensure they remain useful and safe within guidelines stated in **Chapter 11**, AFI 84-103, *Department of the Air Force Heritage Program*, DAFI 21-103, and 23-series publications. **(T-3)**

2.4.3.6. Appoint a Wing Avionics Manager (WAM) or designated representative to act as the maintenance focal point for wing avionics related programs. **(T-3) Note:** See **Chapter 11** for WAM responsibilities.

2.4.3.7. Determine the Routine Inspection List (RIL) frequency if not mandated by the MAJCOM. **(T-3)**

2.4.3.7.1. Approve Maintenance Supervision inputs and suggested changes to the RIL submitted from QA. **(T-3)**

2.4.3.7.2. Approve the Evaluation and Inspection (E&I) Plan. **(T-3)**

2.4.3.7.3. Establish AQLs for tasks/inspections not included on the MAJCOM AQL listing. **(T-3)**

2.4.3.7.4. Establish quarterly meetings to review a summary of MSEP data. **(T-3)**

2.4.3.8. Oversee GITA/TAA IAW **Chapter 11**. **(T-2)**

2.4.3.8.1. Develop an installation publication or supplement to define the scope of training functions for GITA/TAA use, functional responsibility for funding, operations, maintenance, and records management. **(T-3)**

2.4.3.8.2. Ensure maintenance support of GITA/TAA used for training. **(T-3)** Units that do not have organic maintenance capability will establish a Support Agreement or MOA assigning maintenance responsibility for GITA/TAA training use. **(T-3)**

2.4.3.8.3. Ensure explosive components are removed that are not required to support training requirements.

2.4.3.8.4. Place retained systems and subsystems not currently being used for training into extended storage IAW applicable technical data.

2.4.3.8.5. Ensure standard maintenance practices regarding inspection appearance, cleanliness, ground safety, and prevention of corrosion are met. Corrosion control procedures are outlined in TO 1-1-691.

2.4.3.8.6. Develop and prepare inspection technical data check lists for use in inspecting the condition and safety of equipment before use and ensure inspections are performed. **(T-3)**

2.4.3.8.7. Prepare a separate memorandum for each GITA/TAA, addressed to the appropriate PM for the aircraft and inform them of the systems and subsystems that will be maintained in operational configuration. **(T-3)**

2.4.3.8.8. Report air and space vehicle inventory IAW DAFI 21-103 as required for ground trainers. Aircraft used for ground trainers are exempt from status and utilization reporting.

2.4.3.8.9. Ensure proper coordination and documentation of parts removed from training aircraft are accomplished.

2.4.3.8.10. Designate a GITA/TAA Manager as an additional duty. **(T-3)**

2.4.3.9. Ensure all items being repaired by AFREP have been approved by the appropriate repair authority. **(T-3)**

2.4.3.9.1. Assign an AFREP Manager. **(T-3)**

2.4.3.10. Chair a maintenance and FHP planning meeting quarterly, NLT 14 days before the next quarter. **(T-3)**

2.4.3.11. Establish Minimum Equipment Levels (MELs) for essential maintenance assets to include engines, pods, AGE, vehicles, advocate and reconcile authorized shortfalls and overages. **(T-2)** Coordinate with the applicable MAJCOM functional to advocate with the respective Program Manager to address any requests to change authorized quantities. **(T-3)**

2.4.3.12. Establish the group maintenance awards and recognition program to meet AF and MAJCOM requirements refer to **https://access.afpc.af.mil/Trophies/searchtrophies.aspx**. **(T-3)**

2.4.3.13. Ensure an orientation program is developed and conducted for all personnel newly assigned to MXG maintenance or equivalent maintenance activities IAW AFI 36-2650.

2.4.3.14. Develop a MXG Impoundment Program and ensure compliance with the procedures IAW **Chapter 7**. **(T-3)**

2.4.3.15. Establish written procedures to review and clear “repeat”, “recur”, and “cannot duplicate” (CND) discrepancies. **(T-3)**

2.4.3.16. Approve the Dedicated Crew Chief (DCC) program, when implemented.

2.4.3.17. Review and coordinate the AGE MEL annually with applicable Maintenance Supervision. **(T-3)** The MXG/CC approves the identified types and quantities of AGE for the MEL.

2.4.3.18. Develop and implement a standardized Impound Official training course and Impoundment Program. **(T-3)**

2.4.3.19. Appoint an Identification Friend or Foe Program Manager for Identification Friend or Foe systems cryptographically keyed by MXG personnel. **(T-3)**

2.4.3.20. Appoint a Radar Warning Receiver/Radar Threat Warning Manager (if equipped as required). **(T-3)**

2.4.3.21. Develop a 10-year facility plan specifying maintenance, upgrade, and replacement projections for the group's facilities. **(T-3)**

2.4.3.22. Ensure aircraft shelters at bases are maintained, unless otherwise stipulated in contracting arrangements, IAW **Chapter 11**. **(T-2) Note:** If an aircraft shelter is used for other than its designed purpose, the using activity will maintain it.

2.4.3.23. Establish and document MXG local manufacture procedures and controls in a supplement to this instruction. **(T-3)**

2.4.3.24. Appoint a Stock Record Account Number (SRAN) Engine Manager (EM) or a Unit Engine Manager (UEM) to accomplish duties outlined in TO 00-25-254-1, *Comprehensive Engine Management System* (CEMS) (D042) *Engine Status, Configuration, and TCTO Reporting Procedures*.

2.4.3.25. Establish written guidance on individual responsibilities and specific procedures for Cannibalization (CANN) actions IAW **Chapter 11**. **(T-3)**

2.4.3.26. Publish directives outlining procedures covering the manufacture of items source coded local manufacture. **(T-3)**

2.4.3.27. Ensure the MT develops and manages an effective engine run certification program. **(T-3)**

2.4.3.28. For calibration limitation Approval Certification Program, appoint maintenance, TD, or PMEL personnel as instructors, and ensure requisite certification and proficiency requirements are tracked in the MIS by course code.

2.4.3.29. For engine management, appoint a qualified 2A6X1, minimum 7-skill level, (or civilian equivalent) technician to manage the EHM+ and CBM+ program IAW AFMAN 20-116 for EHM products managed by AFLCMC/LP. If EHM data is not managed by AFLCMC/LP, ensure Contractor Logistics Support (CLS) provided EHM products are managed according to respective contract.

2.4.3.30. Ensure the Aero Club is operated IAW DAFI 34-101, *Department of the Air Force Morale, Welfare, and Recreation (MWR) Programs and Use Eligibility*, when assigned.

2.4.4. - 2.4.58. DELETED.

2.5. Deputy Maintenance Group Commander (MXG/CD). In organizational structures where an MXG/CC or MXG/CD is not assigned, (i.e., AFORGEN deployed construct), **paragraph 2.5.1** will move up to the WG/CC commander to ensure effective communication across all units.

2.5.1. Establish maintenance production/scheduling meeting. **(T-3)** This meeting is to verify aircraft and equipment utilization, scheduled maintenance requirements, evaluate predictive maintenance forecast, establish work priorities, and coordinate schedule changes. It should synchronize communications necessary to optimize fleet readiness and mission generation capability.

2.5.1.1. -2.5.13. DELETED.

2.6. MXG Senior Enlisted Leader (SEL) Responsibilities. In addition to the Group SEL responsibilities outlined in Brown Book, *The Enlisted Force Structure*, the MXG SEL is

responsible to the MXG/CC and will advise and assist the MXG/CC on their responsibilities as outlined in this **Chapter**. In organizational structures where an MXG is not assigned (i.e., AFORGEN deployed construct), the following responsibilities will remain with the home unit's SEL and any guidance/documentation necessary to support the deployed operation will be brought with the unit. The MXG SEL will:

2.6.1. Conduct a quarterly manning meeting with Squadron SELs and Wing Weapons Manager (WWM) to review MXG manning status, Duty Title Tool usage, and ensure manning resources are strategically distributed to provide the greatest possibility for mission success. **(T-3)** The MXG SEL is the focal point for ensuring squadron SELs receive adequate manpower management training.

2.6.1.1. Meeting will consist of a review and evaluation of the impact on the MXG of personnel actions such as: work center/organizational manpower Authorization Change Requests (ACR), AFSC changes, re-training, special duty requests, special assignment actions (SWAP, Palace Chase), SEI balance, overseas Date Eligible for Return from Overseas extensions/In Place Consecutive Overseas Tour (IPCOT) requests, physical profile changes and personnel rotation plans as applicable to enhance mission effectiveness. **(T-3)**

2.6.1.2. MXG SEL will provide the MXG/CC coordinated manning recommendations that develop enlisted individual experience and knowledge for consideration. **(T-3)**

2.6.2. Ensure all AFSC 2A and 2W maintenance personnel are only assigned authorized duty titles. **(T-3)** Reference the Duty Title Tool: **https://usaf.dps.mil/teams/10820/medac/2A_DTT/SitePages/Home.aspx**, and the AFSC 2W1 Standardized Duty Titles located at **https://usaf.dps.mil/teams/11262/HAF/HAF-A4LW/Standardized%20Duty%20Titles** for all assigned AFSC 2W1X1 and 2W100 positions.

2.7. Wing Weapons Manager. See AFMAN 21-206 for duties and responsibilities.

2.7.1. - 2.7.28. DELETED.

2.8. Squadron Commander (SQ/CC) Responsibilities. The SQ/CC will:

2.8.1. Ensure compliance with AFI 90-821, DAFI 91-202, *The US Air Force Mishap Prevention Program*, DAFMAN 91-203 and other publications necessary to perform the commander functions assigned to the squadron.

2.8.2. Establish and administer squadron training programs IAW AFI 36-2650 and DAFMAN 36-2689, *Training Program*; monitor upgrade training, Personnel Reliability Program (PRP) status, and qualifications of assigned work center personnel; and ensure MAJCOM Mandatory Course List requirements are met (if applicable). **(T-3)**

2.8.3. Ensure upgrade training and maintenance qualification programs emphasize quality and are not primarily focused on meeting minimum upgrade time frames. **(T-3)**

2.8.3.1. Ensure all maintenance personnel who utilize DoD Information Technology have received appropriate Maintenance Cyber Discipline Training. **(T-3)**

2.8.4. Monitor all personnel working outside of their primary AFSC to ensure that it does not degrade mission accomplishment. **(T-3)**

2.8.5. Establish a squadron Vehicle Control Program IAW AFI 24-302, *Vehicle Management*.

2.8.6. Establish and manage squadron FCC program IAW **Chapter 11** (if applicable).

2.8.7. Protect and secure munitions as outlined in DAFI 31-101. The SQ/CC will ensure Intrusion Detection Systems requirements are identified when required to store munitions IAW DoDM 5100.76 and DAFI 31-101.

2.8.8. Appoint equipment custodians to manage the Custodian Authorization/Custody Receipt Listing (CA/CRL) (R14) of assigned equipment IAW AFI 23-101 and DAFMAN 23-122, *Materiel Management Procedures*.

2.8.9. Ensure personnel and equipment are identified and prepared to deploy for taskings IAW AFI 23-101, AFI 10-403, *Deployment Planning and Execution*, DAFI 36-3802, *Force Support Readiness Programs*, and AFMAN 10-409-O, *Support to Adaptive Planning*.

2.8.10. Recommend personnel for QA duty positions. **(T-3)**

2.8.11. Designate Flight CC/Chiefs. **(T-3)**

2.8.12. Ensure the UMD is consistent with the approved organizational structure. **(T-3)**

2.8.13. Coordinate support from the local communication squadron or equivalent functional entity to ensure proper eTools configuration (operating system, virus checkers) are maintained. **(T-3)** The SQ/CC will coordinate with lead TODO/Functional System Administrator to resolve TO requirements that are not being satisfied. **(T-3)**

2.8.13.1. Ensure licenses, certification, maintenance, and security of eTools (hardware and software) is conducted IAW 33/17-series AFIs, TO 31S5-4-ETOOL-1, and **Chapter 8**.

2.8.14. Ensure members assigned to the DIT are qualified to accurately assess the Maintenance Data Documentation. **(T-3)**

2.8.15. Ensure maintenance is only performed by personnel who are trained, qualified, and certified, unless under the direct supervision of a trainer or certifier. **(T-3)**

2.8.16. Ensure procedures are followed to properly turn in recoverable and consumable items IAW AFI 23-101. **(T-3)**

2.9. Maintenance Supervision Responsibilities. Maintenance Supervision consists of the Director of Operations (DO) and Maintenance Superintendent (MX SUPT). Maintenance Supervision advises the SQ/CC on technical matters, leads a mission-focused maintenance effort, and manages resources necessary to accomplish the mission. They provide necessary administration to manage assigned responsibilities and control maintenance through Pro Supers, Flight CC/SUPT, and Section NCOICs/Chiefs. The MX SUPT is responsible to the DO. Maintenance Supervision will:

2.9.1. Ensure adequate levels of supervision and manning are balanced across all shifts to accomplish the mission safely and efficiently. **(T-3)**

2.9.2. Ensure timely and accurate engine data is provided to the EM element for all engines IAW **Chapter 14**. **(T-3)**

2.9.3. Enforce procedures to prevent FOD and dropped objects IAW **Chapter 11**. **(T-3)**

2.9.4. Monitor and recommend updates to local IPI requirements and recommendations to QA IAW **Chapter 6**. **(T-3)**

2.9.5. Ensure a sufficient number of personnel are qualified to perform mission critical tasks listed on the SCR **Table 11.1** in **Chapter 11**. **(T-3)** Review and/or recommend individuals for addition to the SCR. **(T-3)** Approve individuals for addition to the SCR. **(T-3)** Review and approve individuals for addition to the SCR. **(T-3)**

2.9.6. Ensure aircraft systems and equipment are available to support unit training objectives. **(T-3)**

2.9.7. Ensure distribution of maintenance cross-tell messages, QA newsletters, policy announcements, technical notifications, and other important maintenance information to all members of the organization. **(T-3)**

2.9.8. Review and evaluate management and production effectiveness. **(T-3)** Maintenance Supervision will analyze personnel and equipment performance history. **(T-3)** Initiate management actions to meet new workloads or correct reported/perceived deficiencies. **(T-3)**

2.9.9. Ensure an annual maintenance plan is developed and reconciled with the flying schedule and flying requirements to ensure maintenance can support the annual flying hour/test program. **(T-3)**

2.9.9.1. Participate in the maintenance planning cycle. **(T-3)**

2.9.9.2. Utilize a sortie production model or equivalent for the assigned MDS (if available). **(T-2)**

2.9.10. Ensure a squadron SERENE BYTE or PACER WARE response capability is available to support reprogramming requirements IAW DAFMAN 10-703, *Electromagnetic Warfare Integrated Reprogramming* (if applicable).

2.9.11. Ensure a squadron Corrosion Control Program is implemented and managed IAW TO 1-1-8, TO 35-1-3, TO 1-1-691, MDS-specific TOs and MAJCOM instructions.

2.9.12. Ensure squadron ASIP responsibilities are accomplished IAW **Chapter 11** and DAFI 63-140.

2.9.13. Develop written procedures in coordination with the WWM, Weapons Safety Manager, and Airfield Management to establish EOR inspection procedures as required by aircraft specific -6 TO, MAJCOM directed requirements and **Chapter 11**.

2.9.13.1. Ensures sufficient personnel, equipment, and facilities are assigned, maintained, and available to properly perform EOR inspections IAW **Chapter 11**.

2.9.13.2. Ensure EOR procedures for transient aircraft are developed IAW TO 00-20-1 and MAJCOM directives.

2.9.14. Review and support the monthly Weapons Load Training (WLT) schedule. **(T-3)**

2.9.15. Ensure deferred maintenance, Pilot Reported Discrepancy, and back-ordered parts are properly managed. **(T-3)**

2.9.16. Review supply products to monitor supply discipline. **(T-3)**

2.9.16.1. Maintenance Supervision will manage DIFMs IAW AFI 23-101. **(T-3)**

2.9.16.2. Monitor and reconcile changes in base-level repair capabilities under their supervision as they occur with the LRS/Material Management activities IAW AFI 23-101.

2.9.17. Ensure lost, damaged, destroyed, or stolen government assets are dispositioned IAW DoD 7000.14-R, *DoD Financial Management Regulation*, Vol 12, **Chapter 7**, Financial Liability for Government Property Lost, Damaged or Destroyed (Formerly Report of Survey).

2.9.18. Ensure Special Purpose Recoverable Authorized Maintenance (SPRAM) accounts are established IAW DAFI 21-103, **Chapter 9**, and maintained IAW AFI 23-101.

2.9.19. Ensure reporting of materiel deficiencies IAW TO 00-35D-54, *USAF-Deficiency Reporting, Investigating, and Resolution*.

2.9.20. Monitor requirements for CTK, special tools, and SE and take necessary action to ensure availability, as required IAW **Chapter 8**.

2.10. Flight Supervision. Flight Supervision consists of the Aircraft Maintenance Unit (AMU) Officer in Charge (OIC)/Superintendent and Flight Commander/Flight Superintendent (Flight CC/Chief). Flight Supervision will:

2.10.1. Provide management and oversight and ensure each section is adequately resourced to efficiently execute their mission. **(T-3)**

2.10.2. Manage, distribute, and adjust the flight's manning to support the maintenance plan across all shifts. **(T-3)**

2.10.2.1. Distribute all levels of supervision based on manning and workload to supervise all duty periods. **(T-3)**

2.10.2.2. Identify imbalances between authorizations and the number of personnel assigned, or between authorized and assigned skill levels or grades to SQ/CC and Maintenance Supervision. **(T-3)**

2.10.2.2.1. Review unit DOC Statements, OPLANs, unit-tasked UTC requirements for personnel and equipment then compare requirements to UMD to identify existing shortfalls. Scrutinize critical AFSCs qualifications and equipment based on their impact on mission generation. Document and report personal and equipment deficiencies through the chain of command and monitor until resolved. **(T-3)**

2.10.2.3. Manage additional duties, leaves, ancillary training, and rotate/assign manning across shifts to balance the workload and minimize negative impacts on the workforce. **(T-3)**

2.10.3. Execute the squadron's Mishap Prevention Program for the flight/work center IAW **Chapter 1** and DAFI 91-202.

2.10.3.1. Ensure all personnel obtain the required safety training, and document it on the AF Form 55, Employee Safety and Health Record, or equivalent IAW DAFI 91-202.

2.10.4. Coordinate occupational and environmental health risk assessments with Bioenvironmental Engineering IAW AFMAN 48-146, *Occupational & Environmental Health Program Management*, to identify, assess and evaluate process hazards in the workplace and identify controls. **(T-3)**

2.10.4.1. Monitor and ensure environmental and applicable health requirements, physicals and respirator training, initial and recurring requirements are accomplished when required for assigned personnel IAW AFMAN 48-146; AFI 48-137, *Respiratory Protection Program*; and AFI 48-127, *Occupational Noise and Hearing Conservation Program.*

2.10.5. Ensure organizational compliance IAW the installation ESOHMS/EMS Program. **(T-3)**

2.10.6. Advocate use of the TO improvement program and ensure work center TO files are maintained IAW TO 00-5-1.

2.10.7. Ensure Materiel Potentially Presenting an Explosive Hazard requirements in DAFMAN 21-201 and TO 11A-1-60, *General Instructions Inspection of Reusable Munitions Containers and Scrap Material* Generated from Items Exposed to or Containing Explosives, are complied with when certifying items associated with explosives such as: Multiple Ejector Rack, Triple Ejector Rack, pylons, launchers, rafts, bomb racks, ejection seats, fire suppression bottles, and gun systems and components.

2.10.7.1. Ensure associated items are explosive free prior to being turned in to LRS or the Defense Logistics Agency Disposition Services (DLADS).

2.10.8. Review deferred maintenance in the MIS and coordinate with the Pro Super to schedule and/or validate task accomplishment. **(T-3)**

2.10.9. Ensure operator inspections and user servicing requirements are accomplished on all assigned support equipment IAW TO 00-20-1.

2.10.10. Ensure records of inspection, lubrication, and maintenance of industrial equipment are maintained IAW TO 00-20-1, TO 34-1-3, *Machinery and Shop Equipment*, to include documentation of records maintained in a MIS.

2.10.11. Ensure proper calibration, use, care, handling and transportation of Test Measurement and Diagnostic Equipment (TMDE) IAW TO 00-20-14 and AFMAN 21-113, *Air Force Metrology and Calibration (AFMETCAL) Program Management*, and applicable Calibration Measurement Summaries.

2.10.12. Evaluate maintenance quality, personnel qualifications, and training of assigned personnel. **(T-3)**

2.10.13. Review/update flight IPI requirements listing every two years and route through Maintenance Supervision. **(T-3)**

2.10.14. Ensure only designated personnel identified in the MIS verify MICAPs/Urgency of Need Designator 1A and JA requirements. **(T-3)**

2.10.15. Select personnel to perform special certification tasks IAW **Chapter 11** and **Table 11.1** and forward names to Maintenance Supervision for approval and addition to the SCR. **(T-3)**

2.10.16. Ensure training requirements are executed to support established training plan and individual AFSC Career Field Education and Training Plans (CFETP) IAW DAFMAN 36-2689and AFI 36-2650.

2.10.17. Ensure Cross Utilization Training requirements are identified as required by the unit mission IAW AFI 36-2650.

2.10.17.1. Ensure Cross Utilization Training does not interfere with upgrade/qualification training. **(T-3)**

2.10.18. Review Maintenance Management Analysis (MMA), QA, and other management reports to determine appropriate management actions to meet new workloads, target deficiencies, and identify and correct root causes. **(T-3)**

2.10.19. Develops maintenance and flying schedules and execute scheduled maintenance plans. **(T-3)**

2.10.20. Establish flight/AMU-specific emergency action procedures to respond to disaster control and severe weather and forward to MOC. **(T-3)**

2.10.20.1. Review unit responsibilities pertaining to aircraft/SE movement and personnel evacuation IAW DAFI 10-2501. **(T-3)**

2.10.21. Manage the flight/AMU's participation in the FOD and DOP program IAW **Chapter 11**.

2.10.22. Oversee the flight/AMU's FCC/Dedicated Crew Chief (DCC) Program (if applicable). **(T-3)**

2.10.23. Establish and enforce a flight/AMU Precious Metals Recovery Program, as applicable, IAW AFI 23-101 and TO 00-25-113, *Conservation and Segregation of Critical Alloy and Precious Metal Bearing Parts and Scrap*.

2.10.24. Assign section supervisors IAW this instruction and the UMD. **(T-3)**

2.10.25. Ensure proper asset management by reviewing MIS data records, the Repair Cycle Asset Management Listing (D23) and other pertinent products to minimize shortfalls. **(T-3)**

2.10.25.1. When applicable, ensure warranty items are loaded in MIS according to applicable directives. **(T-3)**

2.10.25.2. Ensure Deficiency Reports (DR) are accomplished IAW TO 00-35D-54.

2.10.26. Ensure repairable/non-repairable parts are promptly processed through repair channels within the required time frame IAW AFI 23-101.

2.10.26.1. Team with Decentralized Materiel Support (DMS) Flight Service Center to conduct a quarterly reconciliation of all DIFM assets and follow up on delinquent DIFMs and document action taken to correct identified discrepancies. **(T-3)**

2.10.26.2. Immediately identify lost, damaged, destroyed, or stolen assets that require a financial liability investigation IAW DoD 7000.14-R, Vol 12, **Chapter 7**, *Financial Liability for Government Property Lost, Damaged or Destroyed* (Formerly Report of Survey) and forward to Maintenance Supervision for review and processing. **(T-3)**

2.10.27. Approve requirements for bench stocks IAW qualification criteria in DAFMAN 23-122. **(T-3)**

2.10.28. Consolidate lists of items received in supply requiring functional check, operational programming, user calibration or corrosion control/painting. **(T-3)**

2.10.28.1. Submit listing to the LRS Materiel Management Flight IAW TO 00-20-3. **Note:** Does not include TMDE IAW TO 00-20-14.

2.10.29. Coordinate all AGE requirements through the AGE Flight Chief to ensure support capability and eliminate unnecessary duplication of equipment. **(T-3)**

2.10.30. Report cyber threats, incidents, and issues per Wing cyber status reporting procedures. **(T-3)**

2.10.30.1. Consult airframe Security Classification Guides, TOs, and/or applicable technical manuals, instruction and publication when addressing or reporting cybersecurity threats, incidents, and issues. **(T-3)**

2.10.31. Ensure Nuclear Weapons-Related Materiel (NWRM) is controlled IAW AFI 20-110.

2.11. Production Superintendent (Pro Super). Senior NCO responsible for squadron maintenance production. The Pro Super directs the overall maintenance effort of their unit. The Pro Super will be a SNCO or civilian equivalent. **(T-3)** Squadron specific Pro Super responsibilities are outlined in their respective chapters of this DAFI.

2.12. Section NCOIC/Chief. The Section NCOIC/Chief is responsible to the Flight CC/SUPT or AMU OIC/SUPT for the leadership, supervision, and training of assigned personnel. The Section NCOIC/Chief is a first-line manager and supervisor of maintenance production and is the technical authority and advisor in that area. When sections are subdivided, element leaders perform the appropriate functional responsibilities. The Section NCOIC/Chief will:

2.12.1. Establish a Work Center Safety Program IAW DAFI 91-202, DAFMAN 91-203, and include any locally prescribed safety requirements (if applicable).

2.12.2. Monitor, track, and ensure occupational safety, fire prevention, and occupational and environmental health requirements are accomplished for assigned personnel IAW DAFMAN 91-203.

2.12.2.1. Ensure Job Safety Training is documented IAW DAFI 91-202, (AF Form 55 or equivalent) for each assigned individual.

2.12.3. Ensure maintenance is performed by personnel who are trained, qualified, and certified, unless under the direct supervision of a trainer or certifier. **(T-3)**

2.12.4. Advocate use of the TO improvement program and ensure work center TO files are maintained according to TO 00-5-1. **(T-3)**

2.12.5. Establish procedures and ensure configuration control for all applicable software required for the sections assigned systems. **(T-3)** Section NCOIC/Chief will:

2.12.5.1. Access Computer Program Identification Number System (CPINS) in ETIMS or equivalent system. **(T-3)**

2.12.5.2. Ensure technicians check ETIMS/equivalent system for software updates for assigned systems. **(T-3)**

2.12.5.3. Ensure software configuration control is maintained IAW TO 00-5-16, *Management of Computer Program Identification Number System (CPINS)* and equivalent systems are maintained by use of AF approved and authorized publications.

2.12.6. Perform production and supervisory inspections. **(T-3)**

2.12.7. Validate classified parts/materiel are managed IAW AFI 23-101. **(T-3)**

2.12.8. On a daily basis review, monitor, and correct, as needed, the work center's scheduled and deferred events in the MIS. **(T-3)**

2.12.8.1. Close, reschedule, or defer all events beyond their scheduled start date and time (Integrated Maintenance Data System (IMDS)-CDB screen #100/380 and Field Maintenance Command and Control (FMxC2) Screen #8035/8069/67150). **(T-3) Note:** G081 was renamed to FMxC2 August 2022.

2.12.9. Review transcribed AFTO Form 781-series forms, work center MIS data entries for the previous day, and all preceding non-duty days, for job accuracy and completeness (IMDS-CDB Screen #100 and FMxC2 Screen #9154). **(T-3)**

2.12.10. Validate scheduled aircraft document reviews using applicable MIS/records check package and automated aircraft forms IAW **Chapter 14**.

2.12.11. Develop and manage the Work Center Training Program. **(T-3)**

2.12.11.1. Evaluate the quality of maintenance, training, and personnel qualifications, track training requirements and ensure training documentation is complete and accurate. **(T-3)**

2.12.11.2. Conduct On-the-Job training (OJT)/certifying as required. **(T-3)**

2.12.12. Review and recommend changes for maintenance tasks requiring IPIs to the Flight Supervision. **(T-3)**

2.12.13. Review, evaluate, and take corrective action based on QA and other inspection reports. **(T-3)**

2.12.14. Ensure all required work center publications necessary for the work center to meet its functional requirements are current and available for use. **(T-3)**

2.12.15. Ensure section personnel coordinate all flightline maintenance with the Flightline Expediter. **(T-3)**

2.12.16. Manage CTK and supply programs (such as, bench stocks, and operating stocks) IAW **Chapter 8** and **Chapter 9**. **(T-3)** Section NCOIC/Chief will:

2.12.16.1. Ensure sections are organized with tools, equipment, and materiel as close to the Point of Maintenance as possible, as approved by the Flight Supervision, without jeopardizing accountability and control procedures. **(T-3)**

2.12.16.2. Ensure the Bench Stock Review Listing (M04) is reviewed monthly, and all recommendations are adjudicated to meet mission needs most efficiently. **(T-3)**

2.12.16.3. Ensure work centers team with Decentralized Materiel Support or LRS/materiel management activity, to properly identify and dispose of all unserviceable or excess consumable items IAW AFMAN 23-122. **(T-3)**

2.12.17. Ensure custodial responsibilities are accomplished on all assigned equipment IAW AFI 23-101, and DAFMAN 23-122. **(T-3)**

2.12.18. Manage the section's Repair Cycle Program. **(T-3)** The Section NCOIC/Chief will review the D23 and other pertinent supply products to ensure proper supply discipline daily. **(T-3)**

2.12.19. Establish procedures to control, store, and manage Alternate Mission Equipment (AME); Maintenance, Safety, and Protective Equipment; and -21 equipment IAW DAFI 21-103. **(T-3)**

2.12.20. Identify items requiring calibration (does not include TMDE calibrated by the Precision Measurement Equipment Laboratory (PMEL)) or operational check before installation and provide a list of these items to the Flight Supervision. **(T-3)**

2.12.21. Recommend individuals for addition to the SCR to the Flight Supervision. **(T-3)**

2.12.22. Participate in and enforce the Bad Actor Program IAW TO 00-35D-54.

2.12.23. Manage Hazardous Materiel (HAZMAT) and Environment Safety and Occupational Health (ESOH) items IAW AFI 32-70XX-series instructions, and AFI 90-821.

2.12.23.1. Ensure HAZMATs are used IAW TOs and conform to indicated Military Specifications (MIL-Spec) and monitor the Qualified Products List/Qualified Product Database for changes to specified HAZMAT.

2.12.24. Ensure assigned NCE (applies to both nuclear and non-nuclear tasked units) comply with requirements outlined in AFI 63-125 and associated MAJCOM supplements.

2.12.25. Ensure Dull Sword reports are submitted for nuclear deficiencies IAW AFMAN 91-221 and DAFI 91-204.

2.12.26. Ensure aircraft -6 TO system, inspections, TCTOs and aircraft functional checks (except Isochronal (ISO), Phase (PH)/ Hourly Post-flight (HPO)) are accomplished as required to prevent overdue or over flight of equipment. **(T-3)**

2.12.27. Comply with TCTO performing work center requirements below:

2.12.27.1. Report all deficiencies in technical instructions and applicability to the TCTO managing agency and QA. **(T-3)**

2.12.27.2. Attend TCTO planning meetings. **(T-3)** Review the TCTO prior to the meeting and request clarification of any requirements from QA and the appropriate TCTO managing agency during the meeting.

2.12.27.3. Inventory TCTO kits for completeness prior to starting work. **(T-3)** If a discrepancy exists, contact the TCTO managing agency to resolve shortages.

2.12.27.4. Perform the inspection or modification procedures outlined in the TCTO and document results or findings in the MIS. **(T-3)**

2.12.27.5. If an inspection TCTO generates a requirement for parts, the performing workcenter will create a new Job Control Number (JCN) and enter the discrepancy in the AFTO Form 781A, Maintenance Discrepancy and Work Document, or applicable equipment record and order the required parts. **(T-3)** Inspection TCTOs are complete when the inspection is finished.

2.12.27.6. Order and maintain all HAZMAT required to comply with TCTOs and provide document numbers to the TCTO managing agency and supply TCTO monitor. **(T-3)**

2.12.27.7. Validate technical instructions and data on AFTO Form 82, *TCTO Verification Certificate*, when performing TCTO kit proofing IAW TO 00-5-15, *Air Force Time Compliance Technical Order Process*.

Chapter 3

AIRCRAFT MAINTENANCE SQUADRON (AMXS)/GENERATION SQUADRON.

3.1. General. The AMXS/Generation Squadron provides direct MGN support by consolidating and executing on-equipment activities necessary to produce properly configured, mission ready weapon systems to meet contingency or training mission requirements. AMXS personnel service, inspect, maintain, launch, and recover assigned/transient aircraft (if applicable).

3.2. Maintenance Supervision Responsibilities. In addition to common responsibilities outlined in **Chapter 2**, Maintenance Supervision will:

3.2.1. Ensure standardized procedures and organizations among units as applicable to optimize effectiveness. **(T-3)**

3.2.2. Establish hot brake response procedures in coordination with base support agencies, for example, Fire Emergency Services and CDDAR Team. **(T-2)**

3.2.3. Monitor the squadron FCC program, if applicable. **(T-3)**

3.2.4. Ensure personnel use and understand the purpose of the AF Form 2408, *Generation Maintenance Plan*, and the AF Form 2409, *Generation Sequence Action Schedule*, or electronic equivalent. **(T-3)**

3.2.5. Ensure an explosive safety and chaff/flare academics and loading program is established for units without a 2W1 AFSC assigned (when applicable) IAW DESR6055.09_AFMAN91-201.

3.2.6. Publish procedures covering the storage, control, and handling of starter cartridges (if applicable). **(T-3)**

3.2.7. Provide input to MMA for the monthly metrics report to MAJCOM. **(T-2)**

3.2.8. Develops the annual maintenance plan IAW **Chapter 14**.

3.3. Aircraft Maintenance Unit (AMU). AMUs may include the following sections: Aircraft, Specialist, Weapons, Debrief, Supply and Support. MAJCOMs may approve additional sections and AFSC make up within existing sections to efficiently meet unique weapon system maintenance support requirements. **Note:** Organization modifications must be approved IAW AFI 38-101. In a Generation Squadron, AMUs are obsolete, but responsibilities of the unit and duty positions remain.

3.4. AMU OIC/SUPT Responsibilities. Allocates personnel and resources to the production effort. In addition to the common responsibilities in **Chapter 2**, the AMU OIC/SUPT will:

3.4.1. Review Pilot Reported Discrepancies daily and ensure proper maintenance actions are taken. **(T-3)**

3.4.2. Review all aborts and ensure proper maintenance actions are taken. **(T-3)**

3.4.3. Monitor aircraft PH/ISO/Periodic (PE)/Home Station Check (HSC) flow. **(T-3)**

3.4.4. Ensure a sufficient number of personnel are engine run qualified to meet maintenance requirements IAW **Chapter 11**.

3.5. Production Superintendent (Pro Super). In squadrons with eight or fewer assigned aircraft, Pro Super and Flightline Expediter duties may be combined. The Pro Super has responsibilities for:

3.5.1. Make the final determination on aircraft status after reviewing aircraft forms. **(T-3)** Additionally, the Pro Super will review the forms after aircrew debrief. **(T-3)**

3.5.2. Sign the Exceptional Release (ER) IAW TO 00-20-1 when authorized by the MXG/CC IAW **Chapter 11** and **Table 11.1**.

3.5.3. Participate in developing and executing the monthly and weekly flying and maintenance schedules/plans. **(T-3)**

3.5.4. Manage the maintenance production effort by assigning priorities to meet the flying and maintenance schedules. **(T-3)**

3.5.5. Fully understand actions required by the squadron under OPLAN 8010 or contingency plans. **(T-3)**

3.5.5.1. Develop, ensure currency of, and direct the aircraft generation sequence. **(T-3)**

3.5.6. Fully understand and be prepared to implement specific disaster control duties and squadron responsibilities pertaining to aircraft/SE movement and personnel evacuation procedures developed IAW DAFI 10-2501 and emergency response guidebook. **(T-3)**

3.5.6.1. Pro Super will maintain a current copy of the on-base disaster map with cordon overlay and appropriate functional checklists outlining duties during disaster scenarios. **(T-2)**

3.5.7. Determine, track, and report aircraft/systems status IAW DAFI 21-103.

3.5.8. Establish and track Estimated Time In Commission (ETIC). **(T-3)**

3.5.9. Monitor unit CDDAR Program activities and local procedures designed to protect personnel and prevent further damage to aircraft, equipment, and other resources. **(T-3)**

3.5.10. Inform MOC of the maintenance effort and coordinate with MOC, Flightline Expediter, and other squadrons for support. **(T-3)**

3.5.10.1. Pro Super will provide MOC with aircraft/systems status updates as required. **(T-3)**

3.5.11. Verify aircraft/system is in an authorized status IAW MDS-specific Minimum Essential Subsystem List (MESL) or MDS equivalent and DAFI 21-103 prior to verifying MICAP conditions. **(T-3)**

3.5.12. Verify aircraft weapons/load configurations are authorized IAW AFI 63-101/20-101. **(T-3)**

3.5.13. Review Condition Based Maintenance (CBM+) component forecast to ensure proactive maintenance practices are accomplished.

3.6. Flightline Expediter. The Flightline Expediter ensures maintenance is accomplished and coordinates on all aircraft maintenance actions. Flightline Expediters manage, control and direct resources to accomplish maintenance. Flightline Expediters or equivalent will:

3.6.1. Remain on the flightline when maintenance personnel are performing flightline maintenance and launching/recovering aircraft. **(T-3)** Flightline Expediters engage in direct sortie generation activities and work directly for the production superintendent.

3.6.1.1. Not perform production inspections (such as, sign off "Red Xs" and perform IPIs) unless authorized by the SQ/CC. **(T-3)**

3.6.2. Coordinate with the Weapons Expediter, ensure requirements in DAFMAN 21-201 for flightline munitions accountability are strictly followed.

3.6.3. Develop and implement disaster control duties and squadron responsibilities pertaining to aircraft/SE movement and personnel evacuation IAW DAFI 10-2501.

3.6.4. Maintain and have available for immediate use copies of the following as a minimum: flying schedule, emergency action and functional checklists, base grid map with cordon overlay, IPI listings, MESL, Quick Reference List (QRL) (if developed), WUC manual, and tracking device for aircraft status. **(T-3) Note:** Base grid maps and cordon overlays may not always be available during contingency operations at austere locations. Effort should be made to obtain maps and overlays but may not be available.

3.6.4.1. Track, as a minimum, the following aircraft status information: aircraft serial number, location, priority, status and ETIC, configuration, OAP condition codes, fuel load, munitions load, and remarks. Show all limitations against the Full Systems List (FSL) and Basic System List (BSL) column as itemized on the MESL or MDS equivalent. **(T-3)** Ensure devices depicting aircraft status comply with program security requirements. **(T-3)**

3.6.5. Follow established CANN procedures and ensure all CANNs are accurately documented in the aircraft/system forms and MIS as described in **Chapter 11**.

3.6.6. Ensure aircraft OAP sampling is completed IAW **Chapter 11** and applicable technical data. **(T-3)**

3.6.7. Ensure parts are ordered with appropriate priorities and relay document numbers to the Pro Super, MOC, and appropriate technicians. **(T-3)**

3.6.7.1. Ensure timely turn in of DIFM items to DMS/supply IAW AFI 23-101.

3.6.8. Request support beyond unit capability to the MOC. **(T-3)**

3.6.9. Direct AGE drivers to position AGE as required and notify the driver of AGE on the flightline or sub-pools that require maintenance. **(T-3)**

3.6.10. Ensure timely and accurate aircraft status (for example, discrepancies, WUC/LCN, ETIC, job completion) and configuration status is reported IAW DAFI 21-103 to the Pro Super and MOC. **(T-3)**

3.6.11. Ensure completed aircraft forms are provided to the debrief function by the end of the flying day if debriefs have been suspended due to surges. **(T-3)**

3.7. Aircrew and Maintenance Debrief Section. Debrief is conducted at the termination of each sortie/mission or when a sortie/mission is aborted. Aircraft scheduled for turn-around sorties/missions need not be debriefed if returned in landing status Code 1 or 2. However, debriefing is required, regardless of landing status, after the last flight of the day for each aircrew. MAJCOMs operating RPAs will develop and publish debrief procedures for Remote Split

Operations in their supplements or addendum for both aircraft and ground control stations to adequately capture all maintenance discrepancies. The Debrief Section will:

3.7.1. Use aircraft fault reporting manuals and include fault codes when documenting discrepancies in the aircraft forms. **(T-3)** Debrief Section will use automated debrief tools such as the Computerized Fault Reporting System. **(T-3)**

3.7.1.1. Debrief Section will develop local aircrew debriefing guides when not provided and managed by the Weapon System PM. **(T-3)** QA will review and approve local aircrew debriefing guides every two years. **(T-3)**

3.7.2. Implement procedures for reporting dropped objects, aborts, code 3 flight control malfunctions and engine malfunctions. **(T-3)**

3.7.3. Use operational utilization update screens in MIS to enter flying time information. **(T-2)** Debrief Section will ensure flying times and installed engine Event History Recorder (EHR) readings, for both home station and deployed sorties/missions, are updated no later than the next duty day after occurrence. **(T-3)**

3.7.4. Check AFTO Form 781H, *Aerospace Vehicle Flight Status and Maintenance*, to ensure updates to airframe time and applicable servicing data (in-flight/hot pit refueling) are entered on the AFTO Form 781H or equivalent and/or applicable debrief system during the pilot/aircrew debrief. **(T-3)**

3.7.5. Input discrepancy verbatim and deviation information, utilization, and applicable flight data (to include landing status, system capability IAW DAFI 21-103 and other applicable cause codes) into the MIS. **(T-3)** Unless using an automated 781 process, do not send AFTO Form 781-series forms to Operations Squadron(s) or to Aviation Resource Management before MIS updates. Use local backup procedures for recording data when the MIS is unavailable.

3.7.6. Utilize MIS to identify and research discrepancies for repeat/recur trends and document them accordingly on the AFTO Form 781A. **(T-3)** Debrief Section will ensure previously documented discrepancies are reviewed and identified as repeat/recurs. **(T-3)**

3.7.6.1. Debrief Section will identify repeat/recurs on automated debriefing sortie recaps and on the AFTO Form 781A. **(T-3)**

3.7.7. Use the appropriate landing status code (**Table 3.1**) and the appropriate system capability code (**Table 3.2**) for the completion of a sortie/mission. **(T-3)**

3.7.8. Provide the MOC with aircraft identification numbers and system WUCs for each aircraft debriefed with a landing status Code-3 IAW **Table 3.1** using the approved MESL or MDS equivalent IAW DAFI 21-103.

3.7.9. Enter one of the deviation cause codes (**Table 3.3**) into the MIS. **(T-3)** Indicate the reason for the deviation and the agency that caused a deviation as referenced in applicable MIS guidance.

3.7.10. Collect and submit ASIP aircraft usage data IAW the MDS specific TOs, DAFI 63-140, and **Chapter 11** of this instruction.

3.7.11. If MIS is not available, use blank printouts as manual documentation method. **(T-3)** If deployed, send documents to home station for data transcribing by the most expeditious means

available. Debrief Section will turn in, validate, and reconcile all documents with the MIS when it becomes available. **(T-2)**

Table 3.1. Landing Status Codes.

CODE	STATUS
Code 0	Ground Abort
Code 1	Aircraft Mission Capable (MC) with no additional discrepancies
Code 2	Aircraft or system has minor discrepancies but is capable of further mission assignment.
Code 3	Aircraft or system has major discrepancies in mission essential equipment that may require extensive repair or replacement prior to further mission assignment. The discrepancy may not affect safety-of-flight and the aircraft may be Non-Mission Capable (NMC) flyable.
Code 4	Aircraft or system has suspected or known radiological, chemical, or biological contamination.
Code 5	Aircraft or system has suspected or known battle damage.
Note: Debrief will enter code “8” in MIS for aircraft debriefed as code “4” or “5”. MESL or MDS equivalent requirements determine if aircraft status is NMC or Partially Mission Capable (PMC).	

Table 3.2. System Capability Codes.

CODE	STATUS
Code 0	System flown with a known discrepancy; no additional discrepancies noted. System can be used.
Code 1	System used and performed satisfactorily. No maintenance required.
Code 2	System used and performed satisfactorily. A minor malfunction exists, but system is capable of further mission assignment.
Code 3	System performance was unsatisfactory. This system did not cause an abort.
Code 4	System performance was unsatisfactory. This system caused or contributed to an abort.
Code 5	System out-of-commission prior to takeoff.
Code 6	System installed but not used.
Code 7	System not installed.
Code 8	Aircraft or system has suspected or known radiological/biological contamination.

Table 3.3. Deviation Cause Codes.

CODE	DEVIATION REASON
ATx	Air Traffic
GAA	Ground Abort, before engine start, maintenance
GAB	Ground Abort, after engine start, before taxi, maintenance
GAC	Ground Abort, after taxi, maintenance
HQT	Higher Headquarters
HQN	Higher Headquarters, NAF
HQP	Higher Headquarters, other
MTx	Maintenance
OPx	Operations
SUx	Supply
SYx	Sympathy
WXx	Weather
OTx	Other
Xxx	MAJCOM/local use
Note: Use x for any character for MAJCOM/local use.	

3.8. Aircraft Section. The Aircraft Section is the primary work center responsible for maintaining assigned aircraft. This section performs tasks to include servicing, scheduled and unscheduled maintenance, pre-flights, thru-flights, basic post-flights, home station checks, special inspections, corrosion control, cleaning, ground handling, launch/recovery of aircraft, troubleshooting and adjustment, on-equipment repairs and component removal/replacement, documenting maintenance actions, and managing aircraft forms. AMUs with 18 or more Primary Aerospace Vehicle (Aircraft) Inventory (PAI) aircraft may have two Aircraft Sections. The Aircraft Section consists of Aircraft Technicians. Refer to **Chapter 11** for FCC responsibilities.

3.8.1. Aircraft Technician:

3.8.1.1. Perform ground handling, servicing, -6 inspections, alert duties, maintenance ground tests, corrosion control, lubrication and maintenance and modification preparations, as applicable, on the assigned aircraft/system.

3.8.1.2. Inventory on-aircraft -21 equipment when this responsibility is not assigned to another function.

3.8.1.3. Perform engine operation when qualified and certified.

3.8.2. Dedicated Crew Chief (DCC) Program. The objective of a DCC program is to directly assign a maintenance person to each aircraft to provide continuity/accuracy of aircraft forms, aircraft status, scheduled maintenance, and improve aircraft appearance. DCCs manage and supervise maintenance on their aircraft. DCCs are selected on the basis of initiative, management and leadership ability, and technical knowledge. When authorized, ensure the DCC's and Assistant Dedicated Crew Chief name and rank is stenciled or painted on their assigned aircraft. Use only authorized wing paint scheme and marking procedures in TO 1-1-8. In addition to Aircraft Technician responsibilities, DCCs, if assigned:

3.8.2.1. Accompany their aircraft through scheduled inspections and assist the Inspection Section NCOIC/Chief as needed.

3.8.2.1.1. Attend pre- and post-dock meetings.

3.8.2.1.2. Assist the Inspection Section NCOIC/Chief with completing the required document review and validation at the end of the inspection.

3.8.2.2. Coordinate with Pro Supers and expediters for downtime to accomplish scheduled and unscheduled maintenance.

3.8.2.3. Manage deferred discrepancies.

3.9. Specialist Section. The Specialist Section is responsible for aircraft systems troubleshooting, on-equipment repairs, component removal and replacement, aircraft avionics systems, classified item management, aircraft ground handling, servicing, and cleaning. The section may include avionics, propulsion, hydraulic, and electro/environmental technicians, and other specialties approved through higher headquarters. When used, the Specialist Section Expediter coordinates maintenance priorities with the Pro Supers and Flightline Expediters.

3.9.1. In addition to the common responsibilities in **Chapter 2**, the Specialist Section Chief:

3.9.1.1. Ensures accurate and timely pod and support equipment status is updated or verified daily in Reliability, Availability, Maintainability, for Pods IAW DAFI 21-103 for pods under the control of the Aircraft Maintenance Squadron.

3.9.2. Avionics Specialists:

3.9.2.1. Perform PACER WARE, SERENE BYTE message, or TCTO reprogramming of avionics systems. **(T-3)**

3.9.3. Electronic Warfare (EW) specialist functions may be combined with the avionics specialists. EW Specialists:

3.9.3.1. Maintain inventory control of all installed Electronic Counter Measure (ECM) AME and ECM pods. **(T-3)**

3.9.3.2. Perform reprogramming of avionics/electronic warfare systems (to include electronic attack pods) IAW applicable mission directives, PACER WARE/SERENE BYTE messages, or TCTO requirements. **(T-3)**

3.9.3.3. Load contingency and training configuration settings in ECM pods, infrared countermeasures systems, and Radar Warning Receiver/Radar Threat Warning systems, unless the equipment is assigned to another section. **(T-3)**

3.9.4. Propulsion Specialists:

3.9.4.1. Troubleshoot, repair, and replace aircraft propulsion systems and components. **(T-3)**

3.9.4.2. Perform engine flightline blade blending. **(T-3)**

3.9.4.3. Perform flightline engine borescope inspections. **(T-3)**

3.9.5. Electrical & Environmental (E&E) Specialists:

3.9.5.1. Troubleshoot, repair, and replace aircraft E&E system components including aircraft environmental control, bleed air, vacuum, pneumatic, installed fire extinguishing and suppressant systems, Liquid Oxygen (LOX) and Gaseous Oxygen (GOX) systems, and On-Board Oxygen Generating Systems (OBOGS), On-Board Inert Gas Generation Systems (OBIGGS) and components. **(T-3)**

3.9.5.2. Remove and install In Flight Refueling (IFR) carts and fire bottle squibs. **(T-3)** **Note:** Ensure only approved temporary storage locations are used for these components.

3.9.6. Hydraulic Specialists will maintain authorized on-equipment/off-equipment pneumatic and hydraulic systems and components. **(T-3)**

3.10. Weapons Section/Expediter/ Loading Element/ Maintenance Element/ Non-Standard Weapons Sections. See AFMAN 21-206 for duties and responsibilities.

3.10.1. - 3.10.5.8. DELETED.

3.11. Support Section. The Support Section may include the following elements/functions to support unit flightline maintenance activities; support (CTKs/special tools, eTools, test equipment, TOs, bench stock), -21 equipment, AME, mobility equipment and DMS. Personnel will be assigned to the Support Section for a minimum of 12 months. **(T-3)** Personnel may be required to maintain task qualifications/certifications to ensure units can meet readiness and Core Mission Essential Task List (METL) requirements in Defense Readiness Reporting System-Strategic (DRRS-S) IAW AFI 10-201. Support Sections must standardize procedures across the squadron for security, control, and accountability of equipment. **(T-2)** Materiel support procedures in this section do not apply to aircraft supported by Contractor Operated and Maintained Base Supply. The Support Section:

3.11.1. Maintains TOs IAW TO 00-5-1.

3.11.2. Maintains bench, shop, and operating stocks IAW AFI 23-101, and **Chapter 9** of this instruction.

3.11.3. Ensures maintenance, control, and storage of assigned AME, -21 equipment, and Maintenance, Safety, and Protective Equipment IAW DAFI 21-103.

3.11.3.1. Develops local procedures to control and store other equipment not identified as -21 equipment (such as, aircraft galley items, U-2 pod panels, aircraft pylon attachment cover panels, aircraft covers/plugs) using DAFI 21-103 guidelines.

3.11.4. Ensures proper calibration, use, care, handling, and transportation of TMDE IAW TO 00-20-14, AFMAN 21-113, and applicable Calibration Measurement Summaries.

3.11.5. Maintains and manages squadron Land Mobile Radio (LMR) IAW **Chapter 11** (as applicable).

3.11.6. Monitors the status of critical support equipment and testers for serviceability, accountability, and status of TCTO modifications. **(T-3)** Support Section will provide monthly critical support equipment status update to Maintenance Supervision. **(T-3)**

3.11.7. Maintains tools/CTKs IAW **Chapter 8**.

3.12. Unit Decentralized Materiel Support (DMS). In addition to the responsibilities in **Chapter 9** for DMS procedures, DMS personnel:

3.12.1. Requisition parts and use supply management products. Initiate follow-up action when necessary. **(T-3)**

3.12.2. Notifies Flightline Expediter of all back-ordered parts. **(T-3)**

3.12.3. Develops and maintains a QRL as needed and provide it to technicians. **(T-3)**

3.12.4. Tracks and processes DIFM assets, to include warranty parts IAW AFI 23-101. **(T-3)**

3.12.4.1. Notifies unit leadership when DIFM asset turn-in times exceed requirements outlined in AFI 23-101. **(T-3)**

3.12.5. Manages reusable containers IAW DAFI 24-602V2, *Cargo Movement*, and TO 00-20-3. **(T-3)**

3.12.6. Controls and manages aircraft TNB if stored within the Support Section. **(T-3)** When FOM assets are collocated with TNB, the items must be similarly controlled and managed. **(T- 3)**

3.12.7. Coordinates with the Pro Super and Flightline Expediter(s) for “mark for” changes. **(T- 3)**

3.12.8. Manages the unit’s CANN program supply transactions and the associated documentation. **(T-3)**

Chapter 4

MAINTENANCE SQUADRON (MXS)/GENERATION SQUADRON.

4.1. General. The MXS/Generation Squadron supports MGN operations by providing centralized back shop support to perform on and off equipment maintenance tasks that are assigned to a specific back shop function. The MXS provides both organizational and intermediate level maintenance described in the "Maintenance Concept" section in **Chapter 1** of this DAFI. Bases with permanently assigned Centralized Repair Facilities (CRF), which support enterprise RN functions, will develop, and document the division of responsibilities between the MGN and RN, as outlined in **Chapter 13** of this DAFI, to ensure both local and enterprise mission requirements are met. IAW AFI 38-101, the MXS may consist of personnel from various AFSCs organized into flights: Propulsion Flight, Avionics Flight, TMDE Flight, Accessories Flight, AGE Flight, Fabrication Flight, Armament Flight, Maintenance Flight, and Munitions Flight. The MXS maintains AGE, munitions, off-equipment aircraft, and support equipment components; performs on-equipment maintenance of aircraft and fabrication of parts; and provides repair and calibration of TMDE. **Note:** For purpose of this instruction, MXS represents MXS, Equipment Maintenance Squadron (EMS), and Component Maintenance Squadron (CMS).

4.2. Maintenance Supervision Responsibilities. Maintenance Supervision manages the resources to accomplish the workload. **Note:** In a Generation Squadron, MXSs are obsolete but responsibilities of the unit and duty positions remain. In addition to general responsibilities in **Chapter 2**, Maintenance Supervision:

4.2.1. Reviews and consolidates monthly maintenance plan inputs from flights/sections and forward to Maintenance Operations PS&D. **(T-3)**

4.2.2. Optimizes local repair capability by ensuring base level repair constraints (for example, lack of equipment, manpower, parts) are elevated to the Repair Network Manager (RNM) and applicable stakeholder(s) IAW DAFI 20-117, TO 00-20-3, and **Paragraph 1.3.2** of this DAFI, and MAJCOM supplements to keep repair at the lowest level. **(T-2)**

4.2.3. Ensures EOR procedures for transient aircraft are developed IAW TO 00-20-1 and MAJCOM supplements. **(T-3)**

4.2.4. Ensures the MXS and WS develop procedures for required weapons loading actions on transient aircraft, storage of transient aircraft impulse cartridges, and requisition and maintenance of weapons safing equipment for common transient types of aircraft. **(T-3)**

4.2.5. Ensures local manufacture capability and fabrication process is controlled IAW this instruction. **(T-3)**

4.2.6. Ensures MXS personnel utilize Engineering Technical Service (ETS) personnel and the Joint Engineering Data Management Information and Control System (JEDMICS) **https://jedmics.af.mil/webjedmics/index.jsp** to obtain information and specifications when the information in TOs does not provide enough detail. **(T-3) Note:** For drawings not available electronically, contact the appropriate JEDMICS help desk.

4.2.7. DELETED.

4.3. MXS Production Superintendent (Pro Super). Monitor backshop production and flightline operations and coordinate support and priority with other squadron Pro Supers and MOC.

(T-3) Focuses overall maintenance efforts toward MXG maintenance priorities. Identifies production requirements and shortfalls to Maintenance Supervision. **(T-3)**

4.3.1. & 4.3.2. DELETED.

4.4. Accessories Flight. The Accessories Flight normally consists of four sections; Electrical and Environmental (E&E), Egress, Fuels, and Hydraulics and is responsible for performing on/off-equipment maintenance of systems and equipment.

4.4.1. Accessories Flight CC/Chief Responsibilities. In addition to the common responsibilities in **Chapter 2**, the Accessories Flight CC/Chief:

4.4.1.1. Ensures an egress training program is established IAW this instruction. **(T-3)**

4.4.1.2. Coordinates with squadron superintendents or civilian equivalent to ensure assigned personnel rotation plans are established to comply with core task upgrade requirements. **(T-3)**

4.4.1.3. Ensures explosives are controlled and stored in approved storage areas/containers IAW DESR6055.09_AFMAN91-201.

4.4.2. Electrical and Environmental (E&E) Section. The E&E Section performs authorized local manufacture, repair, overhaul, testing, modification, and inspection of aircraft and SE electrical components, wiring harnesses, batteries, and charging units. The E&E Section:

4.4.2.1. Ensures battery disposal procedures meet applicable environmental standards and batteries are controlled for accountability purposes. **(T-0)**

4.4.2.2. Performs on/off-equipment maintenance on aircraft electrical and environmental systems and components. **(T-3)**

4.4.2.3. Repairs LOX/GOX/Liquid Nitrogen servicing units/carts. **(T-3) Note:** AGE performs chassis, enclosure, and trailer maintenance on gaseous and cryogenic servicing units and all maintenance on Self-Generating Nitrogen Servicing Carts.

4.4.2.4. Performs off-equipment maintenance for aircraft and aircrew Carbon Dioxide cylinders. **(T-3)**

4.4.2.5. Performs off-equipment maintenance on type MA-1 portable breathing oxygen cylinders (portable walk around bottles) and regulators, to include removing/replacing the regulator and purging the bottle. **(T-3) Note:** Ownership and storage of these cylinders remain with the appropriate support section.

4.4.3. Egress Section. The Egress Section maintains aircraft egress systems, components, and trainers (such as, aircraft ejection seats, extraction and escape systems, egress components of jettisonable canopies, explosive components of escape hatches/doors) and stores egress explosive components that are removed to FOM. Wings will identify the base level organization responsible for locating inadvertent beacon activations on the flightline and configuring survival kit personnel locator beacons (on-aircraft). **(T-3)**

4.4.3.1. The Egress Section:

4.4.3.1.1. Performs all off-equipment ejection seat maintenance in the egress maintenance facility compliant with Defense Explosives Safety Regulation 6055.09_DESR6055.09_AFMAN 91-201and TO requirements.

4.4.3.1.2. Ensures all personnel use the Demand Response Team during any task requiring the removal/installation of explosive components, and during egress final inspections. **(T-3)=3**

4.4.3.1.2.1. Demand Response Teams will be comprised of individuals who are certified to perform egress maintenance. **(T-3)** At least one team member must be a certified egress journeyman. **(T-3)**

4.4.3.1.3. Coordinate with PS&D and monitor the weekly maintenance schedule to identify egress items requiring removal for scheduled time changes/maintenance. **(T-3)**

4.4.3.1.4. Utilize a facility that meets the requirements of DAFMAN 32-1084, *Facility Requirements*. Locations are established IAW DESR6055.09_AFMAN 91-201 to store explosive components and ensure they are properly licensed.

4.4.3.1.4.1. Egress Section will ensure licensed explosive area will not exceed the licensed Net Explosive Weight capacity for each Hazard Division without approval from Wing Safety. IAW DESR6055.09_AFMAN 91-201.

4.4.3.2. The Egress Section NCOIC/Chief will:

4.4.3.2.1. Ensure ejection systems are “safed” IAW with 00-80G-series technical orders and DESR6055.09_AFMAN 91-201 prior to an aircraft being placed on static display. **(T-3)**

4.4.3.2.2. Ensure egress systems on training aircraft are de-armed/“safed” IAW MDS specific TOs when an aircraft is used for Fire Emergency Services and/or aircrew extraction training. **(T-3)**

4.4.3.2.3. Ensure aircraft (to include GITA) are "safed” IAW 00-80-series TOs.

4.4.3.2.4. Ensure all permanently decommissioned static display aircraft explosive devices are removed and turned in to munitions inspections IAW DAFMAN 21-201. Egress Section will sign the appropriate block on the AF Form 3580, *USAF Heritage Program Aerospace Vehicle Static Display Egress and Safety Certificate*, which is retained by the Historical Property Custodian(s). **(T-3)**

4.4.3.2.5. Request assistance from Explosive Ordnance Disposal (EOD) when egress explosive devices are damaged or suspected to be unsafe. **(T-3)**

4.4.3.2.6. Establish egress training program requirements and conduct reviews IAW AFI 36-2650. **(T-2)**

4.4.3.2.6.1. As a minimum, the program will include: a master training plan, explosive safety certification requirements, and MIS time change documentation qualification minimums. **(T-3)**

4.4.3.2.6.2. Certification requirements.

4.4.3.2.6.2.1. Trained and certified egress 5-levels and above reassigned to another base or unit are not required to complete the Organizational Maintenance (on-equipment) egress technician course unless required by the Egress Section NCOIC/Chief.

4.4.3.2.6.3. Decertification requirements:

4.4.3.2.6.3.1. Decertify egress personnel after not having performed egress maintenance for more than 18 months. **(T-3)** Instructing and inspecting egress maintenance is not considered performing maintenance.

4.4.3.2.6.3.2. Document decertification IAW DAFMAN 36-2689.

4.4.3.2.6.4. Recertification requirements:

4.4.3.2.6.4.1. Recertify egress personnel who have not performed egress maintenance for 18 months. **(T-3)**

4.4.3.2.6.4.2. Recertification must be accomplished by a 2A673 trainer and certifier. **(T-3)**

4.4.3.2.7. Review and validate all egress familiarization training documents at least every 24 months. **(T-3)**

4.4.3.2.8. Ensure the egress Time Change Item (TCI) data in the MIS is accurate. **(T-3)**

4.4.3.2.8.1. Ensure automated data products will be updated whenever an egress item is replaced to ensure the annual TCI forecast is correct. **(T-3)**

4.4.3.2.8.2. Ensure separate databases are not used to manage the egress TCI program. **(T-3)**

4.4.3.2.8.3. Ensure component background information is provided to PS&D to include a list of all components having multiple part numbers with a different service life. **(T-3)**

4.4.3.2.9. Reconcile and verify each aircraft's egress data annually with PS&D. **(T-3)**

4.4.3.2.9.1. Document the annual verification on the AF Form 2411, *Inspection Document* maintained in the aircraft jacket file. **(T-3)**

4.4.3.2.10. Establish local egress systems documentation requirements: **(T-3)**

4.4.3.2.10.1. Egress Section will maintain an egress tail number binder for each assigned aircraft. **(T-3) Note:** This binder should not be confused with the aircraft jacket file of historical records maintained by PS&D but serves to standardize the format for maintaining egress documentation requirements across AF egress shops. As a minimum the binder will include:

4.4.3.2.10.1.1. Binder Spine - Aircraft assigned Serial Number. **(T-3)**

4.4.3.2.10.1.2. Front Cover - Delayed Discrepancies. **(T-3)**

4.4.3.2.10.1.3. Tab A – PRA or 5th Gen equivalent (Cross reference sheet stating digital location of data). **(T-3)**

4.4.3.2.10.1.4. Tab B – Completed In-Shop Maintenance Flow Sheet(s). **(T-3)**

4.4.3.2.10.1.5. Tab C – Completed Major Inspection Flow sheet(s) (for example, 36 month), or equivalent (if Mission Design Series applicable). **(T-3)**

4.4.3.2.10.1.5.1. Annotate pull check/inspection results on the flow sheet. **(T-3)**

4.4.3.2.10.1.6. Tab D – Egress Configuration Screen (IMDS 257 or 5th

Generation equivalent), current manual Cartridge Actuated Device/Propellant Actuated Device (CAD/PAD) collection sheets. **(T-3)**

4.4.3.2.10.1.7. Tab E – Completed Time Change Item Replacement Sheets, for example, locally generated or equivalent. **(T-3)**

4.4.3.2.10.1.8. Tab F – Significant Historical Data (AFTO 95 or equivalent (cross reference to MIS maybe used), Depot/Program Depot Maintenance (PDM) package, -107 TAR or ETARs). **(T-3)**

4.4.3.2.10.1.9. Tab G – Misc. (example, PAIR, Extension Letters). **(T-3)**

4.4.3.2.10.1.10. Tab H AF Form 2411, *Inspection Document*. **(T-3)**

4.4.3.2.11. A certified egress inspector (for example, Red X, IPI certified and tracked on the SCR IAW **Table 11.1**) will inspect any integral part of the egress system when any maintenance other than a visual inspection is performed. **(T-3)**

4.4.3.2.11.1. The inspection must be an egress final inspection unless another inspection is prescribed by technical data. **(T-3)**

4.4.3.2.11.2. Egress personnel will conduct an egress final every 30 days on ejection seats that have integrated personnel/recovery parachutes and/or survival kits as part of the seat if prescribed by technical data. **(T-3)**

4.4.3.2.12. Egress Sections may store spare parachutes and survival kits for use in responding to Red Ball and unscheduled maintenance events.

4.4.4. Fuel Systems Section. The Fuel Systems Section repairs, functionally checks, and inspects aircraft fuel systems, fuel tanks, hydrazine systems, in-flight refueling receptacle systems, and related components. This section also performs maintenance on AME external fuel tanks, Conformal Fuel Tanks, and Weapons Bay Tanks and provides temporary storage for Conformal Fuel Tanks, and Weapons Bay Tanks.

4.4.4.1. The Fuels Systems Section will:

4.4.4.1.1. Maintain serial number inventory accountability for all removable external fuel tanks IAW DAFI 21-103. **(T-3)**

4.4.4.1.2. Purge and preserve fuel tanks for storage and shipment. **(T-3) Note:** LRS is responsible for the storage, delivery, and shipment of fuel tanks in their possession.

4.4.4.1.3. Establish a local Memorandum of Agreement (MOA) or Memorandum of Understanding (MOU) (MXS with squadron or equivalents) governing the storage, issue, receipt, and inventory control of in-use removable external fuel tanks. **(T-3)**

4.4.4.1.4. Perform all maintenance and inspections on WRM fuel tanks. **(T-3)**

4.4.4.1.4.1. Meet quarterly with installation War Reserve Materiel Officer/WRM Non-Commissioned Officer (NCO) and LRS representatives to review inspection criteria for stored WRM tanks, schedule tank inspections and maintenance, and report discrepancies identified during WRM monthly walk-through inspections. **(T-3)**

4.4.4.2. In addition to the common responsibilities outlined in **Chapter 2**, the Fuel Systems Section NCOIC/Chief will:

4.4.4.2.1. Establish controls to prevent unauthorized entry into fuel cell and hydrazine repair areas. **(T-3)**

4.4.4.2.2. Provide required qualification training to all personnel who enter aircraft fuel tanks and/or open fuel tank areas to perform maintenance or to provide assistance. **(T-3)**

4.4.4.2.3. When required, ensure Hydrazine Response Teams are formed. The HRT supervisors must possess 2A6X4 AFSC. Team members can be any qualified personnel provided they are certified IAW with TO 00-25-172, *Ground Servicing of Aircraft and Static Grounding/Bonding*, TO 00-105E-9, *Aerospace Emergency Rescue and Mishap Response Information*, TO 42B1-1-18, *General Procedures for Handling of H-70*, and review MDS-specific TOs and MAJCOM/Lead Command directives for additional information on hydrazine hazards and management. **(T-2)**

4.4.4.2.3.1. Ensure initial and refresher hydrazine safety training is completed for all hydrazine response team members IAW TO 42B1-1-18.

4.4.4.2.3.2. Integrate Hydrazine Response Team responsibilities into the CDDAR Program and local In-Flight Emergency (IFE) functional checklists (as applicable). **(T-3)**

4.4.4.2.4. Perform safety inspections on facilities to ensure open tank repair areas, and equipment used for open fuel tank or hydrazine maintenance meet MDS-specific TOs, TO 42B1-1-18 and TO 1-1-3, *Inspection and Repair of Aircraft Integral Tanks and Fuel Cells* requirements.

4.4.4.2.5. Establish a Confined Space Entry Program IAW TO 1-1-3 and AFMAN 91-203.

4.4.4.2.6. Establish a Respiratory Protection Program IAW AFI 48-137.

4.4.4.2.6.1. All respiratory training requirements are documented on AF Form 55 or equivalent IAW DAFI 91-202.

4.4.4.3. Ensure assigned personnel receive periodic physical examinations as established by the base medical service as required IAW TO 1-1-3. Track periodic physical examinations in the MIS. **(T-3)**

4.4.5. Hydraulic Section. The Hydraulic Section performs on- and off-equipment maintenance on pneumatic and hydraulic systems, components (except environmental and egress systems) and provides maintenance support for SE and test equipment. The Hydraulic Section also maintains hydraulic test stands, pumping units, and associated components.

4.4.5.1. The Hydraulic Section will:

4.4.5.1.1. Perform maintenance on munitions loading and handling equipment with discrepancies that exceed the munitions flight repair capabilities.

4.4.5.1.2. Maintain and inspect refueling drogues, booms, and refueling receptacle systems for large aircraft.

4.4.5.1.3. Repairs, overhauls, and bench checks flight control, landing gear, and hydraulic power system components (such as, brakes, struts, accumulators, reservoirs, actuators).

4.5. Aerospace Ground Equipment (AGE) Flight. The AGE Flight is normally organized as a consolidated maintenance unit (repair, inspection, and servicing sections). The AGE Flight is responsible for providing powered and Non-Powered AGE (NPA) as defined in TO 00-20-1 to support both aircraft and non-aircraft weapon systems.

4.5.1. The AGE Flight will:

4.5.1.1. Maintain and inspect AGE, IAW TO 00-20-1, and equipment specific TOs in support of sortie production and back shop maintenance activities.

4.5.1.2. Pick up, service, deliver, repair, and perform approved modifications, TCTOs, inspect AGE and perform corrosion control tasks.

4.5.1.3. Utilize AF Form 864, *Daily Requirement and Dispatch Record*, or MAJCOM-approved electronic product to record all equipment pickup and delivery.

4.5.1.4. Perform chassis, enclosure, and trailer maintenance on gaseous and cryogenic servicing units.

4.5.1.5. Manage maintenance and inspection scheduling activities for flight-maintained equipment. **Note:** Maintain oversight of additional requirements for assigned Nuclear Certified Equipment IAW AFI 63-125.

4.5.1.6. Safeguard any Item Unique Identification (IUID) marks during maintenance activities to the extent possible. **(T-3)** In the event the Unique Item Identifier (UII) is damaged during maintenance activities, the AGE Flight notifies the responsible Equipment Custodian.

4.5.2. AGE Flight Chief Responsibilities. In addition to the applicable Flight CC/Chief responsibilities in **Chapter 2**, the AGE Flight Chief will:

4.5.2.1. Review and coordinate the AGE MEL annually with applicable Maintenance Supervision. **(T-3)**

4.5.2.1.1. Provides copies of the approved MEL to the MOC. **(T-3)**

4.5.2.2. Track AGE status/scheduling daily using the MIS. **(T-3)** Once available and training is complete, DPAS M&U will be the MIS for tracking AGE Status and Scheduling. **(T-2)** Additional guidance for stand up and integration of DPAS M&U is available at: **https://usaf.dps.mil/teams/afdpassemis**.

4.5.2.2.1. Provide status and ETIC information to the MOC when it falls below MEL. **(T-3)**

4.5.2.3. Ensure newly assigned AGE receives acceptance inspections IAW TO 00-20-1. **(T-3)**

4.5.2.4. Control fuel dispensed from issue tanks IAW DAFI 23-201, *Fuels Management*.

4.5.2.5. Ensure the Uniform Repair and Replacement Criteria Program is implemented IAW TO 00-25-240 and TO 35-1-24.

4.5.2.6. Coordinate welding requirements with the Fabrication Flight Chief. **(T-3)**

4.5.2.7. Manage AGE CANN actions IAW **Chapter 9** and **Chapter 11**. **(T-3)**

4.5.2.8. Establish and monitor the AGE Operator Training Program and assist in the development of course control documents in conjunction with Maintenance Training (MT). **(T-3)**

4.5.2.9. Ensure an AGE Corrosion Control and Prevention Program is maintained and a field number system is established IAW TO 35-1-3, TO 1-1-8, TO 1-1-691, MAJCOM instructions, and equipment specific TOs.

4.5.2.10. Develop and implement a tracking system to prioritize complete repainting for AGE equipment based on a "worst is first" principle.

4.5.2.10.1. Coordinate with Fabrication Flight Chief for work beyond the AGE work center capability.

4.5.2.11. Ensure equipment is prepared for storage or shipment IAW TO 35-1-4, *Processing and Inspection of Support Equipment for Storage and Shipment*, and applicable end item TOs.

4.5.2.12. Submits annual transient aircraft landing data to the respective MAJCOM AGE functional manager by 1 February. Data will reflect previous year's TA aircraft landings by aircraft MDS and is obtained from local Transient Alert managing office.

4.5.2.13. Establish AGE sub-pools, as needed, in coordination with OSS's Airfield Operations Flight.

4.5.2.14. Ensure AGE tow vehicles are two-way radio equipped, permanent or hand-held, to expedite AGE deliveries. **(T-3)** Ensure any permanent installation of radios are accomplished IAW AFI 24-302. **(T-3)**

4.5.3. AGE Pro Super Responsibilities (if not assigned, the AGE Flight Chief will fulfill these responsibilities). The AGE Pro Super will:

4.5.3.1. Monitor the production of AGE Flight and recommend equipment/personnel adjustments to the AGE Flight Chief as required. **(T-3)**

4.5.3.2. Monitor adherence to AGE Flight's safety, training, and CTK programs. **(T-3)**

4.5.3.3. Monitor serviceability status of equipment parked in sub-pools. **(T-3)**

4.5.3.4. Monitor distribution, control, and condition of AGE Flight's assigned vehicles.

4.5.3.5. Monitor shop equipment for condition and documentation. **(T-3)**

4.5.4. AGE Production Support Section. The AGE Production Support Section provides administration and ancillary services for TO file maintenance, supply support, and fuels management. A full-time Materiel Management Journeyman/craftsman (AFSC 2S0X1) should be assigned to the AGE Production Support Section when the workload warrants. In addition to the applicable Section NCOIC/Chief responsibilities outlined in **Chapter 2**, the AGE Production Support Section NCOIC/Chief will:

4.5.4.1. Manage the AGE Flight's TO libraries IAW TO 00-5-1.

4.5.4.2. Manage the AGE Flight's tool storage and issue areas IAW **Chapter 8**. **(T-3)**

4.5.4.3. Manage the AGE Flight's TMDE program IAW TO 00-20-14 and AFMAN 21-113. **(T-3)**

4.5.4.4. Manage the AGE Flight's materiel management function IAW **Chapter 9** and AFI 23-101.

4.5.4.4.1. Pre-assembled part kits are authorized; if required, assemble from bench stock in minimum quantities necessary to support workload requirements.

4.5.4.5. Coordinate the AGE Flight's scheduling function with PS&D. **(T-3)** The AGE Production Support Section NCOIC/Chief will:

4.5.4.5.1. Maintain AGE historical records. **(T-3)**

4.5.4.5.2. Prepare an AGE scheduled maintenance plan and maintain a current equipment scheduling report for all assigned equipment. **(T-3)**

4.5.4.6. Manage the AGE Flight's organizational fuel tank(s) IAW DAFI 23-201.

4.5.4.7. Manage the AGE Flight's HAZMAT/ESOH programs IAW AFI 90-8XX series ESOH instructions and the AFI 32-70XX series environmental instructions.

4.6. Armament Flight. See AFMAN 21-206 for duties and responsibilities.

4.6.1. - 4.6.4.2. DELETED.

4.7. Avionics Flight. The Avionics Flight normally consists of some combination of; a Communication-Navigation Section, an Radio Frequency (RF) Multiplexing Section, an Instrument and Flight Control Systems (IFCS) section, a Weapons Control System Section, a Sensors Section, an Electronic Warfare System (EWS) Section, an Avionics Intermediate Section, a Computer Section, a Surveillance Radar Section, a Combat Systems Section, a Cryptographic Section, an Offensive Avionics Section, and a Cyber/Information Security Section. **Note:** Do not authorize additional manpower positions to form sections resulting from local management decisions.

4.7.1. Sections within the Flight are responsible for maintaining avionics systems and components and the associated test/support equipment. They perform authorized equipment repairs, TCTOs, component programming/reprogramming, troubleshooting, CND/BCS screening of line replaceable units (LRUs), sub-component removal and replacement, management, programming, and status reporting for assigned pods and SE, and in-work classified avionics systems component management. Repairs above and beyond those listed require approval from the appropriate approval authority (Lead Command, Depot).

4.7.2. Avionics Flight CC/Chief Responsibilities. In addition to the applicable Flight CC/Chief responsibilities listed in **Chapter 2**, the Avionics Flight CC/Chief will:

4.7.2.1. Support Wing EW system programming. **(T-3)**

4.7.2.2. Ensure control and storage of assigned AME IAW DAFI 21-103. Develop local procedures for control and storage of items not specified in -21 TOs. **(T-3)**

4.7.2.3. Ensure avionics POD status is updated in RAMPOD or approved MIS IAW DAFI 21-103. **(T-3)**

4.7.2.4. Ensure personnel do not make unauthorized or false transmissions on international distress frequencies IAW TO 31R2-1-251, *General Instructions-Transmission of False Distress Signals on Emergency Frequencies*. **(T-3)**

4.7.2.5. Ensure cryptography components are controlled and maintained IAW National Security Agency publications and directives for the functions performed. **(T-3)**

4.7.2.6. When applicable, determine maintenance responsibility for aircraft adapter group equipment. **(T-3)**

4.7.3. Section NCOICs will maintain AFTO Form 95, or equivalent, on selected, repairable, serialized components for which historical failure data will enhance repair. **(T-3)** Historical records are mandatory for SPRAM LRUs, and items asterisked in weapons system -6 TOs. Historical records will be maintained IAW TO 00-20-1.

4.7.3.1. The record will remain with the component anytime it is undergoing maintenance. **(T-3) Note:** Data is provided from these records, upon request, to the analysis function to aid in defining avionics maintenance problems and recommended solutions.

4.7.4. Avionics Flight's within established Repair Networks will collaborate with the Repair Network Manager (RNM) for maintenance constraint resolution. If the SMR code in the 4th position is "F" (I-Level Repair) will require RNM and all applicable stakeholders to determine next step or appropriate Action Taken Code to use when resolving the maintenance constraint.

4.7.5. Implement the “Bad Actor” program IAW TO 00-35D-54. The purpose of the Air Force Bad Actor Program is to identify serial-numbered items that enter the repair cycle at an abnormally high rate when compared to the total population of like assets and to repair them or remove them from the exhibit holding activity.

4.7.6. Repair Monitor Responsibilities. Monitors the status of items processed into the section for repair. Each shift may have a repair monitor assigned. Maintain records used by the repair monitor according to AFI 33-322. Each Repair Monitor will:

4.7.6.1. Process items into and out of the section, ensuring all documentation is accurate and complete. **(T-3)**

4.7.6.2. Advise the section NCOICs and Pro Supers of item status. **(T-3)**

4.7.6.3. Assist the section NCOICs in managing the DIFM program by complying with MAJCOM instructions to ensure ordered and received parts are documented; and uses, maintains, and files, management and computer records. **(T-3)** Repair Monitors will maintain and update a working copy of the D-23, *Repair Cycle Asset Management Listing*, sorted by location and detail number. **(T-3)**

4.7.6.4. Designate and maintain an AWP area, ensure accurate documentation, and submit supply assistance requests, as required. **(T-3)**

4.7.6.5. Track and monitor MICAP status for all assigned DIFM and parts affecting section repair capabilities using automated Integrated Logistics System -Supply (ILS-S) reports. **(T-3)**

4.7.6.6. Ensure the MIS is updated with current supply data, location changes and DIFM status changes. **(T-3)**

4.8. Fabrication Flight. The Fabrication Flight may consist of four sections; Aircraft Structural Maintenance (ASM), Metals Technology, Nondestructive Inspection (NDI), and Low Observable Aircraft Structural Maintenance (LOASM) and is responsible for performing on/off-equipment maintenance of systems and equipment.

4.8.1. Fabrication Flight CC/Chief Responsibilities. In addition to the applicable Flight CC/Chief responsibilities outlined in **Chapter 2**, the Fabrication Flight CC/Chief will:

4.8.1.1. Provide local manufacture capability to meet mission requirements and monitor all local manufacture work order requests. **(T-3)**

4.8.1.2. Coordinate AGE welding requirements with the AGE Flight Chief. **(T-3)**

4.8.1.3. *Assist WG Corrosion Manager in efforts to ensure effective corrosion prevention and control requirements, wash rack procedures, and established paint schemes are accomplished IAW TO 1-1-691, TO 1-1-8, TO 35-1-3, MAJCOM/Lead Command instructions, and MDS-specific TOs.*

4.8.1.4. Coordinate with squadron SUPTs or civilian equivalent to ensure assigned personnel rotation plans are established to comply with core task upgrade requirements. **(T-3)**

4.8.2. Aircraft Structural Maintenance (ASM) Section. Manages structural repair, corrosion control, Low Observable, inspection, damage evaluation, repair, manufacture, and/or modification of metallic, composite, fiberglass, plastic components, and related hardware associated with aircraft and SE. In addition to applicable Section NCOIC/Chief responsibilities in **Chapter 2**, the ASM Section NCOIC/Chief will:

4.8.2.1. Ensure appropriate resources are available to all personnel to chemically or mechanically inspect, remove, and treat corrosion on aircraft, engines, AGE, and components. **(T-3)**

4.8.2.2. Monitor the aircraft wash and corrosion inspection schedule in the weekly and monthly maintenance plans. **(T-3)**

4.8.2.3. Provide training and assistance to sections managing their own corrosion programs to include cleaning operations, corrosion prevention, inspection, removal, and treatment techniques. **(T-3)**

4.8.2.4. Develop maintenance procedures IAW **Chapter 11** of this instruction, DAFMAN 91-203, and ensure assigned ASM personnel are trained and qualified on aircraft intake maintenance. **(T-3)**

4.8.2.5. Review the Qualified Product List/Qualified Product Database for changes to cleaners that must conform to a MIL-Spec as specified in applicable TOs for aircraft wash rack. **(T-3)**

4.8.2.6. Stock supplies and equipment necessary to support aircraft and equipment washing, inspection, and treatment. **(T-3)**

4.8.3. Metals Technology Section. Inspects, repairs, services, manufactures, fabricates, performs heat treating, cleans, welds, and tests aircraft and equipment, components, and tools. In addition to responsibilities outlined in **Chapter 2**, the metals technology section NCOIC will:

4.8.3.1. Ensure assigned welders are certified in all base metal groups prescribed by the MAJCOM Fabrication functional manager (or equivalent) IAW TO 00-25-252, *Aeronautical Equipment Welding*. **(T-3)**

4.8.3.1.1. Ensure assigned welders conducting Gas Tungsten Arc Welding, Gas Metal Arc Welding, or Shielded Metal Arc Welding repairs on support equipment are certified IAW TO 00-25-252.

4.8.3.1.2. Ensure welding proficiency is documented IAW TO 00-25-252.

4.8.3.2. Provide safety briefings stressing Arc radiation hazards. **(T-3)**

4.8.3.3. Ensure special tools, jigs, and fixtures are designed, fabricated, protected, and properly stored. **(T-3)**

4.8.4. Nondestructive Inspection (NDI) Section. Performs NDI of aircraft, engines, AGE, other equipment and manages the Oil Analysis Program (OAP). Inspection findings are limited to a description of the size, location, and type of any defect discovered. NDI personnel do not make serviceability determinations except for "inspect only" TCTOs and if NDI actions constitute a completed maintenance action. In addition to the applicable Section NCOIC/Chief responsibilities in **Chapter 2**, the NDI Section NCOIC/Chief will:

4.8.4.1. Ensure OAP requirements are accomplished (if applicable to assigned MDS) IAW AFI 21-131, Joint Oil Analysis Program and **Chapter 11**. **(T-3)**

4.8.4.1.1. If the NDI laboratory providing OAP support is not located on the same base as the supported unit, or the supported unit does not have NDI/OAP personnel assigned, assign the OAP responsibilities to the owning organization IAW TO 33-1-37-1, *Joint Oil Analysis Program Volume II* and TO 33-1-37-3, *Joint Oil Analysis Program Laboratory Manual, Volume III*, TO 33-1-37-4, *Joint Analysis Program Manual, Volume IV*. The owning organization provides samples in an expeditious manner to the supporting OAP laboratory.

4.8.4.1.1.1. The owning organization will establish collection points and procedures to receive and forward OAP samples to the supporting laboratory, monitor sample collection, assign control numbers, and provide blocks of sample control numbers for use in other squadrons. **(T-3)**

4.8.4.2. Advise Maintenance Supervision, MOC and the owning work center of abnormal OAP trends. **(T-3)**

4.8.4.3. Ensure capability exists to perform optical, dye-penetrant, magnetic particle, ultrasonic, eddy current, radiographic, and special inspections as required. **(T-3)**

4.8.4.4. Ensure process control procedures IAW TO 33B-1-2, *Nondestructive Inspection General Procedures and Process Controls* are completed at the required or established frequency. **(T-3)**

4.8.4.5. Establish technique files using AFTO Form 242, *Nondestructive Inspection Data*, and TO 33B-1-1, *Nondestructive Inspection Methods Basic Theory*. **(T-3) Note:** Locally developed inspection techniques for use on aircraft and their components will be approved by the responsible ALC NDI manager prior to use. All other non-aircraft related AFTO Form 242 established techniques may be approved by the lab Chief.

4.8.4.6. Maintain coordination with the base medical service that provides occupational physicals, emergency treatments, film badge services, and acts as radiographic advisors IAW DAFMAN 48-125, *Personnel Ionizing Radiation Dosimetry*, and TO 33B-1-1.

4.8.4.7. Ensure a Radiation Safety Program is established IAW TO 33B-1-1.

4.8.4.8. Control and dispose of radiographic silver-bearing materiel IAW AFI 23-101.

4.8.4.9. Ensure radiographic film files and computed radiography files contain, as a minimum:

4.8.4.9.1. The last complete set of radiographs taken by owning organization, for each assigned aircraft and engine by serial number or identification number. **(T-3)**

4.8.4.9.2. The name of the person who interpreted the radiography. **(T-3) Note:** Radiography identification procedures will be followed IAW TO 33B-1-1.

4.8.4.9.2.1. Ensure the person interpreting the film also initials the set of radiographs or a locally developed interpretation worksheet, as applicable. **(T-3)**

4.8.4.9.3. All NDI radiographic film exposures, to include paper, will be filed and maintained for all One Time Inspection (OTI), TCTO, -6 TO, -9 TO, and -36 TO inspection requirements. **(T-3)** The NDI Section NCOIC/Chief will ensure disposition of radiographic film IAW Air Force Records Disposition Schedule located at **https://afrims.cce.af.mil. (T-3)**

4.8.4.10. Ensure all NDI technicians are certified IAW TO 33B-1-1.

4.8.5. Low Observable (LO) Aircraft Structural Maintenance Section. LO ASM Section manages structural repair, corrosion control, composite repair, LO coatings. **Note:** The Fabrication Flight CC/Chief will determine which tasks listed in **Paragraph 4.8.2** in this instruction (ASM Section) will be applicable to this section based on flight configuration. In addition to applicable Section NCOIC/Chief responsibilities in **Chapter 2**, the LO ASM Section NCOIC/Chief will:

4.8.5.1. Provide inspection, damage evaluation, repair, manufacture, and/or modification of LO components, and related hardware associated with aircraft. **(T-3)**

4.8.5.2. Ensure appropriate resources are available to perform all LO related tasks. **(T-3)**

4.8.5.3. Stock supplies and equipment necessary to support aircraft inspection, and treatment. **(T-3)**

4.8.5.4. Monitor the inspection schedule in the weekly and monthly maintenance plans. **(T-3)**

4.8.5.5. Ensure protective/LO coatings are applied to aircraft, AGE, applicable munitions, and components IAW applicable TOs. Ensure protective/LO coatings are applied IAW local, state, and federal environmental directives. **(T-0)**

4.8.5.6. Provide training and assistance to sections managing their own LO programs. **(T-3)**

4.9. Maintenance Flight. May consist of Repair and Reclamation, Wheel and Tire, Inspection, and TA Sections.

4.9.1. The Maintenance Flight CC/Chief will comply with the common Flight CC/Chief responsibilities in **Chapter 2** and locally established management requirements. **(T-3)**

4.9.2. Repair and Reclamation Section. When established, removes, replaces, and rigs flight control surfaces/systems on assigned aircraft. Troubleshoots, rigs, and replaces landing gears, actuated doors, canopies, and associated equipment requiring component maintenance beyond the capability of other activities. MAJCOM or MXG/CC may identify delineation of complex tasks to optimize maintenance capability in supplements or addendums to this DAFI as required.

4.9.2.1. Repair and Reclamation Section, when established, will remove, install, and repair towed targets and airborne reel pods. **(T-3)**

4.9.3. Wheel and Tire Section. Manages the build-up, repair, test, and storage of wheel and tire assemblies and components. Wheel and Tire Section will:

4.9.3.1. Degrease and disassemble wheel components for NDI inspection IAW TO 4W-1-61, *Maintenance and Overhaul Instruction - All Types Aircraft Wheels*, prior to processing through the ASM and NDI Sections.

4.9.3.2. Clean, inspect, and properly store (do not co-mingle) wheel bearings. **(T-3)**

4.9.4. Aircraft Inspection Section. Performs aircraft PH, PE, ISO, or letter check inspections. **Note:** Section may be divided into separate elements for each type aircraft maintained. In addition to the applicable Section NCOIC/Chief responsibilities in **Chapter 2**, the Inspection Section NCOIC/Chief will:

4.9.4.1. Ensure assigned non-powered SE (such as, dock stands) is maintained. **(T-3)**

4.9.4.2. Review inspection schedules and ensure dock teams are available to meet inspection needs. **(T-3)**

4.9.4.3. Develop standardized inspection flow plan to aid in managing the inspection progress and to control dock personnel and support specialists. **(T-3)**

4.9.4.3.1. DELETED.

4.9.4.3.2. Inspection Section NCOIC/Chief will ensure flow plan data remains current with -6 TO requirements. **(T-3)**

4.9.4.4. Inform the MOC and owning agency of all MICAP parts. **(T-3)**

4.9.4.5. Provide PS&D with an inspection document record upon completion of the inspection. **(T-3)**

4.9.4.6. Ensure components are tagged with an AFTO Form 350, *Reparable Item Processing Tag*, IAW TO 00-20-2.

4.9.4.6.1. Ensure serially controlled components are reinstalled on the same aircraft and position from which they were removed. **(T-3) Exception:** If it is absolutely necessary to install serially controlled components in a different position, the Inspection Section NCOIC/Chief will notify PS&D to update the records.

4.9.5. Transient Aircraft (TA) Section. Recovers, services, inspects, maintains, and launches transient aircraft. Transient aircraft are those aircraft not assigned to a base that are enroute

from one location to another that may require routine servicing. Aircraft are not considered transient aircraft when deploying to, staging from, or departing from any location for the purpose of flying sorties or conducting training, either with or without the necessary maintenance support from the aircraft's home base. MOC coordinates specialist support for transient aircraft through appropriate squadrons. For off-station recovery procedures refer to owning MAJCOM instructions and command-to-command agreements. In addition to the applicable Section NCOIC/Chief responsibilities outlined in **Chapter 2**, the TA Section NCOIC/Chief will:

4.9.5.1. Recover and deliver all deceleration chutes for assigned, transient, and tenant aircraft to the AFE. **(T-3)**

4.9.5.2. Complete reimbursement documentation. **(T-3)**

4.9.5.2.1. AFTO Form 726, T*ransient Aircraft Service Record*, may be used for documenting maintenance servicing requirements and necessary billing information and is prescribe in TO 00-20-1.

4.9.5.3. Record arrivals and departures of transient aircraft on AF Form 861, *Base/Transient Job Control Number* Register or locally approved form if it captures all AF Form 861 fields. **(T-3)** TA Section NCOIC/Chief (or equivalent) will:

4.9.5.3.1. Assign each aircraft a single Event Identification Description (EID) for all support general work performed by TA. **(T-3)**

4.9.5.3.2. Enter, as a minimum, "P" for park, "I" for inspect, "S" for service, "L" for launch, and "E" for EOR in the job description/remarks block. **(T-3)**

4.9.5.3.3. Forward completed AF Form 861 for contracted TA activities to the COR monthly. **(T-2)** The COR forwards completed forms to the applicable contracting officer managing the TA contract for inclusion in the contract file.

4.9.5.3.4. Route the AF Form 861 for non-contracted TA activities to the Maintenance Flight CC/Chief for review. **(T-3)**

4.9.5.3.4.1. After review, the TA Section NCOIC/Chief will file AF Form 861 for a minimum of 1 year. **(T-3)**

4.9.5.3.4.2. AF Form 861 may be used as a reference to quantify tasked performed to validate manpower and equipment requirements against current AF standards.

4.9.5.4. Close out support general EIDs daily. **(T-3)**

4.9.5.4.1. Use the same last four digits on subsequent days for the same aircraft.

4.9.5.4.2. Use a separate EID for each discrepancy that is not support general.

4.9.5.5. Ensure that when a FCF is required on transient aircraft, QA at the transient base serves as the focal point and ensures all FCF requirements are completed. **(T-3)**

4.9.5.5.1. DELETED.

4.9.5.5.2. If no off-station agencies exist, owning MXG/CC and owning OG/CC will issue guidance directly to the aircraft commander and off-station maintenance personnel. **(T-3)**

4.9.5.6. Supervise maintenance performed by assigned personnel on transient aircraft. **(T-3)**

4.9.5.7. Maintain the appropriate TOs for aircraft that can be expected to transit the function on a regular basis. **(T-3)**

4.9.5.8. Ensure personnel are trained and strictly adhere to oil sample requirements specified in the respective -6 TO. **(T-3)**

4.9.5.9. Ensure personnel authorized to run engines are qualified IAW **Chapter 11**.

4.9.5.9.1. Request the aircrew to run engines if TA or maintenance personnel are not authorized.

4.9.5.9.2. If qualified aircrew members are not available, contact MOC to request assistance from the home station.

4.9.5.10. Ensure transient aircraft status changes are reported to MOC. **(T-3)** If support is required, the MOC notifies the home station for support.

4.9.5.11. Ensure EOR procedures for transient aircraft are developed IAW TO 00-20-1.

4.9.5.12. Ensure procedures exist for required weapons loading actions on transient aircraft, transient aircraft impulse cartridge tracking and storage, and weapons "safing" equipment requisition and maintenance for frequently transiting aircraft. **(T-3)**

4.9.5.12.1. Arming, de-arming and munitions unloading/loading operations on transient aircraft will be performed by a weapons load crew certified/qualified on the munitions and aircraft. **(T-3)**

4.9.5.12.2. DELETED.

4.9.5.12.2.1. In such cases, the aircrew will be available for consultation on aircraft peculiarities. **(T-3)**

4.9.5.12.2.2. If these criteria cannot be met, request assistance from higher headquarters.

4.9.5.13. Ensure checklists exist to ask pilots about explosive egress systems pertaining to unfamiliar aircraft that do not normally transit their base. **(T-3)**

4.9.5.13.1. Aircrew members remove and install flight status safety pins on aircraft when transient maintenance personnel are not qualified.

4.9.5.13.1.1. DELETED.

4.9.5.13.1.2. If TA cannot accomplish the required inspections, servicing, or repairs because of a lack of qualified personnel, facilities, or materiel (or there is no TA support available), and the transient aircraft commander does not wish to continue the flight without accomplishment of these items, the transient aircraft commander is responsible for requesting assistance through the appropriate external organizations.

4.10. Munitions Flight. Controls, accounts for, stores, ships, receives, inspects, maintains, assembles, and delivers conventional, precision guided and nuclear munitions. Manages and maintains all assigned tools, test and munitions handling equipment. Refer to AFI 21-2XX series

instructions for specific guidance. **Note:** Munitions may be part of the MXS or established in a Munitions Squadron IAW AFMAN 21-200.

4.11. Propulsion Flight. Maintains aircraft engine propulsion units, propulsion components, and propellers. Performs engine/module/accessory disassembly, inspection, assembly, test, and repair. Responsible for Jet Engine Intermediate Maintenance (JEIM); Engine Test Stands (ETS) and Noise Suppression Systems (NSS); accessory and Quick Engine Change (QEC) repair; small gas turbine; module/accessory repair section; support equipment; and turboprop/turbo-shaft repair, engine PH/ISO inspections, as required. Sections may be combined or grouped at the discretion of the squadron commander. When an engine CRF is co-located with an operational wing, a MOA or MOU may be developed to clarify mutual support responsibilities. In addition, the flight will be the focal point for common propulsion support equipment, for example, flexible borescopes, engine trailers and download equipment.

4.11.1. In addition to the applicable Flight CC/Chief responsibilities in **Chapter 2**, the Propulsion Flight CC/Chief will:

4.11.1.1. Perform as the wing focal point for propulsion maintenance programs, focusing on continuity, compliance, and standardization, provide advice to wing leadership on propulsion issues and monitor all aspects of wing propulsion maintenance program. **(T-3)**

4.11.1.2. Act as the wing 2A6X1 AFSC functional manager and provide technical guidance to maintain propulsion systems to support the wing mission. **(T-3)**

4.11.1.3. Coordinate with Engine Manager (EM) and organization leadership to support War Readiness Engine (WRE) requirements. **(T-3)**

4.11.1.3.1. Track the status of ready spare engines using a visual display or automated product showing serial number, configuration (type and position, if applicable), time remaining until next scheduled engine removal, overhaul or reconditioning, preservation date, type accomplished, re-preservation due date, OAP code (if applicable), and remarks. **(T-3)**

4.11.1.4. Review production data to ensure propulsion units and components processed through the flight are repaired and functionally checked IAW TO 2-1-18, *Aircraft Engine Operating Limits and Factors*, including QEC configuration when applicable. **(T-3)**

4.11.1.5. Coordinate with the EM to ensure accurate engine and equipment status reporting IAW **Chapter 14**, DAFI 21-103, AFMAN 20-116, AFPAM 63-129, and TO 00-25-254-1.

4.11.1.6. Develop guidelines to comply with AF and wing OAP requirements IAW 33-series TOs and **Chapter 11**. **(T-3)**

4.11.1.7. Review/analyze all unscheduled engine or module removals and ETS rejects. **(T-3)**

4.11.1.7.1. Review/analyze major component failure trends. **(T-3)**

4.11.1.8. Ensure in-shop CANN actions are accomplished IAW local procedures, **Chapter 9**, **Chapter 11**, and TO 00-20-2.

4.11.1.8.1. Ensure local procedures are coordinated with Engine Management (EM) to ensure sufficient time remains on TCIs prior to CANN action approval. **(T-3)**

4.11.1.9. Coordinate with base civil engineering to provide maintenance on NSS and ETS supporting structures that are categorized as real property. **(T-3)** If the wing or squadron is a tenant, incorporate this maintenance requirement into the host-tenant support agreement. **(T-3)**

4.11.1.9.1. Ensure NSS and/or ETS repair discrepancies that exceed the base repair capability are reported in Web Applications Software Product (WASP). **(T-3) Note:** Entering repair requirements into WASP establishes official repair request and ensures visibility to MAJCOM and SE Product Group Manager at Robins AFB (AFLCMC/WN).

4.11.1.10. Ensure an uninstalled engine run qualification and certification program is established IAW **Chapter 11**.

4.11.1.11. Ensure specialized and long-life shipping devices and containers are accounted for and maintained in a serviceable condition IAW AFI 23-101 and TO 00-85-20, *Engine Shipping Instructions*.

4.11.1.12. Ensure engines and engine components removed from crash damaged aircraft are correctly dispositioned for termination IAW DAFI 21-103 and disposed of IAW AFI 23-101.

4.11.1.13. Ensure an engine flexible borescope certification and blade-blending certification program, for each Type, Model, Series (TMS) possessed, is established IAW **Chapter 11**.

4.11.1.14. Monitor scheduled and unscheduled engine removals to balance Propulsion Flight workload with production capability and coordinate with EM section to program engine removals for the weekly and monthly maintenance plans. **(T-3)**

4.11.1.14.1. Coordinate with EM to develop a 6-month plan to smooth surges in the engine maintenance workload. **(T-3)**

4.11.1.14.1.1. Use automated methods to develop the 6-month plan and include scheduled engine removals for TCIs, PE, TCTOs and a projected unscheduled removals factor.

4.11.1.14.1.2. Ensure Reliability-Centered Maintenance principles IAW AFMAN 20-116 are followed. **(T-3)**

4.11.1.15. Ensure Engine Automated Work Package (EAWP) user permissions mirror current training and certification authorizations. **(T-3)**

4.11.1.15.1. Ensure EAWP users use the EAWP program in lieu of a work folder to meet minimum requirements of this DAFI.

4.11.1.16. Coordinate with the OAP laboratory to obtain maximum benefits from OAP data when abnormal wear-metal trends are indicated. **(T-3)**

4.11.1.16.1. Ensure all OAP responsibilities are performed IAW **Chapter 11**.

4.11.1.16.2. Establish procedures to monitor OAP trends. **(T-3)**

4.11.1.16.3. Ensure personnel are trained to identify and respond to wear metal limits for assigned and maintained engines and are trained to perform sampling procedures IAW TO 33-1-37-2.

4.11.1.16.4. Ensure oil samples taken at the ETS are promptly delivered to the OAP laboratory. **(T-3)**

4.11.1.16.5. Act as a central point-of-contact for all abnormal OAP laboratory results. **(T-3)**

4.11.1.16.6. Forward information to the OAP laboratory concerning actions taken as a result of OAP recommendations. **(T-3)**

4.11.1.16.7. Review OAP response time (from sampling to receipt at the laboratory and return to the unit) to ensure processing time meets mission needs. **(T-3)**

4.11.2. Support Section. The Support Section manages the flight's HAZMAT program and operates tool storage areas. DMS or designated personnel process supply requests to facilitate the issue request, tracks MICAP due-outs, monitors bench stock, conducts bench stock/adjusted stock level reviews IAW DAFMAN 23-122. **(T-3)** In addition to the applicable Section NCOIC/Chief responsibilities outlined in **Chapter 2**, the Support Section NCOIC/Chief will:

4.11.2.1. Ensure a flight due-out release point and holding bins are established, and Urgency of Need Designator "A" and Urgency Justification Code BQ requirements are verified. **(T-3)**

4.11.3. Jet, Turboprop, Turbo-shaft Engine Intermediate Maintenance (JEIM) section. Stores, builds up, tears down, inspects, modifies, and repairs engines, QEC kits, and tests components. In addition to the applicable Section NCOIC/Chief responsibilities in **Chapter 2**, the JEIM Section NCOIC/Chief will:

4.11.3.1. Plan and monitor the progress of propulsion system maintenance production, ensuring maintenance schedules are met by anticipating materiel required and managing delays to prevent schedule disruptions to support operational requirements and maintain required WRE levels. **(T-3)**

4.11.3.1.1. Report production to Propulsion Flight CC/Chief and immediately inform EM of engine status changes.

4.11.3.2. Ensure personnel prepare propulsion units and components for shipment and properly identify units to be returned to depot. **(T-3)**

4.11.3.2.1. Attach CEMS and/or MIS paper products to life-limited components IAW 00-20-series TOs if required by the source of repair.

4.11.3.3. Ensure documentation of TCTO compliance IAW 00-20-series TOs.

4.11.3.4. Ensure CEMS and/or MIS products obtained from EM are used for all assigned engines. **(T-3)**

4.11.3.4.1. CEMS and/or MIS products will list all parts and serial numbers installed on the engine. **(T-3)**

4.11.3.5. Establish procedures to ensure all parts and serial numbers are inventoried when an engine is received or released by the section. **(T-3)**

4.11.3.5.1. The JEIM Section NCOIC will notify EM when a different serial numbered part is installed or changed so the automated record is updated. **(T-3)**

4.11.3.5.2. EAE is the change correction authority on Part Number/Serial Number Record updates in EAWP. **(T-3)**

4.11.3.6. Ensure an engine work folder is established for each engine during PE, reconditioning, or other maintenance. **(T-3)**

4.11.3.6.1. One work order is initiated in MIS for an entire job.

4.11.3.6.1.1. MIS work orders are completed during inspection, reconditioning or maintenance.

4.11.3.6.1.2. Separate JCN/Work Center Event (WCE)/Work Event Separator are initiated for discrepancies found during the look phase of an inspection, subsequent to repair, or when maintenance is required beyond the scope of the JEIM induction JCN.

4.11.3.6.2. Establish engine work folders on all possessed engines and EM or JEIM will maintain the folders until the engine is transferred. **(T-3)** As a minimum, engine work folders will contain the following:

4.11.3.6.2.1. List of all parts, TCTOs and TCI requirements for the engine. **(T-3)**

4.11.3.6.2.2. Engine/Module/Accessories Information Worksheet. **(T-3)** This document is used to provide a quick synopsis of maintenance accomplished. Minimum requirements will include engine serial number, type, position (if applicable), engine operating time, date started work, date turned serviceable, job control number, maintenance required, reason for removal, list of time change and TCTO requirements. **(T-3)**

4.11.3.6.2.2.1. A supervisory review of signature blocks (Crew Chief, Support Section, EM Section) to verify all repair requirements have been accomplished and are correctly documented in the work folder. **(T-3)**

4.11.3.6.2.2.2. Validation that a JCN was created by the JEIM/Module/Accessories Section or EM section and used to account for maintenance events completed in the process of repairing the engine and modules. **(T-3)** This procedure ensures all maintenance data is documented against one JCN and engine failure information is connected to the in-shop action.

4.11.3.6.2.3. Receiving Inspection Worksheet. **(T-3)** The worksheet is used for documenting items to be accomplished by JEIM prior to engine repair. Minimum requirements will include: FOD check of engine inlet and exhaust, inspection of engine for general condition and fluid leakage, EHR/Turbine Engine Monitoring System data (if applicable), ET&D (if applicable), borescope inspection (if applicable), a check with OAP lab for possible problems, and a list of unique or problem areas to be checked prior to engine disassembly or maintenance. **(T-3)**

4.11.3.6.2.4. Serially Controlled/Time-Tracked Item Replacement Record. **(T-3)** This document shows a list of components replaced by nomenclature, old and new part number (if applicable), and serial number.

4.11.3.6.2.5. Daily Summary Record. **(T-3)** This document provides a synopsis of maintenance performed during each shift.

4.11.3.6.2.5.1. Each entry in the Daily Summary Record includes the Employee Number of the person who accomplished the maintenance action. For EAWP users, this process may be automated.

4.11.3.6.2.5.2. Include a sufficient reference in the summary block (such as, work package, TO) used to perform the task or determine the work performed (subordinate work packages are not required to be listed if the work package for the primary task identifies all required work packages for the task).

4.11.3.6.2.5.3. At the end of each shift, the crew chief who verified the entries listed in the Daily Summary Record will annotate their shift, rank, last name, and employee number. **(T-3)** Units may use a general purpose or MAJCOM/locally approved form.

4.11.3.6.2.6. IPI Worksheet. **(T-3)** This form includes the WUC, nomenclature, specific step required for the IPI, and space for employee numbers and signatures of technicians and inspectors performing maintenance. **Note:** Organizations using digital systems may file a printed report in lieu of signatures (such as, Interactive Electronic Technical Manual (IETM)).

4.11.3.6.2.7. Parts Requisition Record. **(T-3)** This document is used to list all parts (including TCIs) on order. As a minimum, this document will include the following headings: Engine/ Module/Accessory, TMS, Engine/Module/Accessory Serial Number, Nomenclature, Part Number, National Stock Number (NSN), Requisition Number, Priority, Status, and DIFM Clear with “Yes” and “No” sections. **(T-3)**

4.11.3.6.2.8. JEIM ETS Preparation Worksheet. **(T-3)** This worksheet contains a list of items/tasks to be accomplished by JEIM prior to sending an engine to the ETS. As a minimum, document the following:

4.11.3.6.2.8.1. Inlet and exhaust FOD inspection; any pre-run servicing required (such as, cap open lines, cannon plugs, engine intake and exhaust inspection). **(T-3)**

4.11.3.6.2.8.2. A thorough tool inventory and an inspection for loose hardware. **(T-3)**

4.11.3.6.2.8.3. The section supervisor will document a review of the work folder to ensure maintenance performed or required actions are documented. **(T-3)**

4.11.3.6.2.9. ETS Pre-run Worksheet. **(T-3)** ETS personnel will complete this document prior to an engine run. **(T-3)**

4.11.3.6.2.9.1. As a minimum, this document will include the following headings: Engine TMS; Engine Serial Number; Engine Operating Time

(EOT)/Cycles; JCN; Remarks; Pre-run Emergency Briefing Accomplished with run Supervisor's Name, Signature and Date sections; and Inspection with Area, Employee Number, and Date sections. **(T-3)**

4.11.3.6.2.9.2. As a minimum, area inspections will include Inlet FOD/Foreign Object (FO); Exhaust FOD/FO; Engine Exterior and FO; General Engine Serviceability; Test Stand/Thrust Bed/Test Equipment for FO; CTK Inventory Complied With (C/W); Engine Servicing Check; all preliminary engine installation and run requirements C/W; and serviceable fire extinguisher on hand. **(T-3)**

4.11.3.6.2.9.2.1. Each area inspection will have the performing technician's employee number and date accomplished annotated. **(T-3)**

4.11.3.6.2.10. ETS Post Run Worksheet. **(T-3)** This document is used to document items/tasks accomplished by ETS personnel after engine run.

4.11.3.6.2.10.1. As a minimum, this document will include the following headings: Engine TMS; Engine Serial Number; EOT/Cycles; JCN; Maintenance Actions Performed; Engine Monitoring System (EMS) operational/performance data collected and provide to EM; ETS Supervisors Post-run Review with Name, Signature and Date; and Area Inspections, Employee Number and Date. **(T-3)**

4.11.3.6.2.10.2. As a minimum, area inspection will include: Inlet FOD/FO; Exhaust FOD/ FO; CTK Inventory C/W; Post-Run OAP Samples C/W (if applicable); AFTO Form 350 or AFTO Form 20, *Caution and Inspection Record*, annotate: Engine Preservation Type and Date; Throttle Secured to Off Position (if applicable) and Tagged; Cap Open Lines/Cannon Plugs; Install Intake/Exhaust Covers; Servicing Amount; ETS Discrepancies Cleared; 7-Level Inspection of Components Replaced or Disconnected; and Final Leak Check. **(T-3)**

4.11.3.6.2.10.3. ETS personnel will leak-check items not accessible with the engine installed in or on the aircraft prior to leaving ETS. **(T-3)**

4.11.3.6.2.10.4. Each area inspection will have the performing technician's employee number and date accomplished annotated. **(T-3)**

4.11.3.6.2.11. Final Inspection Worksheet. **(T-3)** This document is used to document JEIM requirements after repair or testing has been completed.

4.11.3.6.2.11.1. As a minimum, this worksheet will include: FOD inspection of intake, exhaust, and external engine; borescope engine (if applicable); ensuring throttle is secured and tagged to "off" position (if applicable); capping, plugging and covering fittings and lines; attaching AFTO Form 350 to lines, fittings or plugs that require "leak check" when installed in aircraft (items not accessible in aircraft must be leak checked on ETS); attaching AFTO Form 350 and/or serviceable tag to engine, ensure supply accounts and MIS entries have been cleared. **(T-3)**

4.11.3.6.2.12. Borescope Worksheets. **(T-3)** Borescope inspection worksheets will

be used for engines requiring borescope documentation. **(T-3)**

4.11.3.6.2.13. Uninstalled Engine/Module Blade Blending/FOD Damage Worksheet. **(T-3)** This worksheet is used to document blade blending/FOD damage for uninstalled engines/modules. As a minimum, this worksheet will include Engine/Module Serial Number, Date, Discrepancy, Stage and Corrective Action including number of blades blended, depth of damage before and after blend, area of damage and Employee Number. **(T-3)**

4.11.3.6.2.14. Reliability Centered Maintenance Worksheets (if applicable). **(T-3)**

4.11.3.6.2.14.1. For JEIM engine builds, a copy of the "Reliability Centered Maintenance Build Options" and "Reliability Centered Maintenance Calculator Summary" worksheets are maintained in the engine work folder or EAWP for documenting life-limited component engine build recommendations.

4.11.3.6.2.14.1.1. Utilize Reliability Centered Maintenance calculator software accessed through CEMS prior to engine build.

4.11.3.6.2.14.1.2. The sheets are required only if life-limited components (excluding LRU) are removed and replaced during the JEIM engine build and the TMS engine is available in the Reliability Centered Maintenance Calculator. The calculator is not used for engines which do not have the calculator developed.

4.11.3.6.2.15. Worksheets that document engine historical information, critical maintenance management stages, and employee numbers of technicians and supervisors completing maintenance and inspections.

4.11.3.6.2.15.1. Supplement work folders and worksheets to fit unit needs.

4.11.3.6.2.15.2. Flights may use computer-generated products, provided they include all required information. If TMS has an established EAWP, it will be utilized. **(T-3)**

4.11.3.6.2.15.2.1. EAWP users will ensure all maintenance discrepancies are documented in the system's appropriate discrepancy block. **(T-3)**

4.11.3.7. Ensure MICAPs are processed in Enterprise Solution-Supply; ensure all pertinent data is included. **(T-3)**

4.11.3.8. Upgrade, downgrade and cancel MICAP requirements. **(T-3)**

4.11.4. Noise Suppression Systems (NSS) and Engine Test Stands (ETS) Section. Tests engines to evaluate the quality of maintenance, engine performance, and accomplish engine preservation including engines installed on aircraft in coordination with owning squadron. In addition to the applicable Section NCOIC/Chief responsibilities outlined in **Chapter 2**, the NSS and ETS Section NCOIC/Chief will:

4.11.4.1. Assign primary and alternate AutoTAR or Air Force Lifecycle Management (AF-PLM) custodians to perform -107 ETAR and status updates in AutoTAR/AF-PLM for AFLCMC/WN-managed NSSs and ETSs. **(T-2)**

4.11.4.2. Monitor repair activity and ensure reporting and status updates are timely, accurate, and kept current in AutoTAR/AF-PLM. **(T-3)**

4.11.4.3. Ensure NSS and ETS personnel accomplish minor maintenance, make adjustments to engines, document engine condition, and collect EMS operational/performance data and deliver to EM. **(T-3)**

4.11.4.3.1. Ensures ETS components are calibrated on site, if practical. **(T-3)**

4.11.4.4. Brief maintenance personnel on NSS/ETS operating/emergency procedures. **(T-3)**

4.11.4.5. Handle and report halon releases IAW AFMAN 32-7002.

4.11.5. Module/Accessory Repair Section. Repairs, stores, and maintains fuel nozzles, fuel manifolds, oil pumps, accessory housings, afterburners, thrust reversers, augmentors, engine components, time change modules, and shop replaceable units. Operates and maintains the bearing room IAW TO 44B-1-15, *General Instructions - Jet Engine Anti-friction Bearing Handling, Removal, Cleaning, Inspecting, and Installation at Jet Engine Base Maintenance Facilities* (if applicable).

4.11.6. Small Gas Turbine Engine Section. Repairs and maintains small gas turbines used in aircraft. In addition to applicable Section NCOIC/Chief responsibilities outlined in **Chapter 2**, the Small Gas Turbine Engine Section NCOIC/Chief will ensure personnel are qualified to operate small gas turbine engines and test stands. **(T-3)**

4.11.7. Engine Equipment Maintenance Section. Maintains, manages, and stores engine support and removal/installation/transportation equipment and trailers. The Engine Equipment Maintenance Section NCOIC/Chief will:

4.11.7.1. Ensure engine removal/installation/transportation trailers and adapters status is properly reported IAW DAFI 21-103 and MAJCOM supplements. **(T-3)**

4.11.7.2. Track and schedule all inspections and maintenance, removal, installation, transportation trailers and adapters in the MIS. **(T-3)**

4.11.7.3. Ensure equipment forms and MIS documentation are complete, accurate, and accomplished for all maintenance and scheduled inspections. **(T-3)**

4.11.7.4. Ensure status is accurately reflected in both the maintenance forms and the MIS. **(T-3)**

4.11.8. Propeller Section. Repairs, builds up, tears down, inspects, tests, and modifies propellers, valve housings, pump housings, and associated components.

4.11.9. Quick Engine Change (QEC) Kit Management. QEC kit removals and installations are coordinated with the SRAN EM and loaded in MIS as a part number-serial number item, reflecting where the kit is installed or spared.

4.11.9.1. In addition to repair cycle procedures outlined in **Chapter 9** in this instruction, the technician removing a QEC kit item from an engine will complete an AFTO Form 350, enters the reason for removal in Block 14, and annotates the QEC kit inventory for each repairable item. **(T-3)**

4.11.9.2. Technicians will complete the AF Form 596, *Quick Engine Change Kit Inventory* for on repair cycle items and QEC kit unique items, when an engine enters the section for tear down. **(T-3)**

4.11.9.2.1. If TO requirements restrict reuse of items, the technician will mark the AF Form 596 with an asterisk to show a demand has been placed on supply. **(T-3)**

4.12. Test, Measurement, and Diagnostic Equipment (TMDE) Flight. Maintains, calibrates, and certifies TMDE, traceable through the AF Primary Standards Laboratory (AFPSL) to the National Institute of Standards and Technology (NIST), or other AF Metrology and Calibration (AFMETCAL)-approved source. Provides base-level support of aircraft, precision-guided munitions, ground systems, and other equipment assigned to the base or GSU. TMDE Flight ensures Calibration, certification, and maintenance of TMDE is accomplished IAW AFMAN 21-113, TO 00-20-14, TO 33K-1-100-1, *Calibration Procedure for Maintenance Data Collection Codes and Calibration Measurement Summaries*. A Rapid Assistance Support for Calibration may also be assigned.

4.12.1. In addition to applicable Flight CC/Chief responsibilities in **Chapter 2**, the TMDE Flight Chief will:

4.12.1.1. Establish a PMEL Quality Assurance Section IAW AFMAN 21-113 and TO 00-20-14. **(T-3)**

4.12.1.2. Publish a monthly PMEL Activity Summary and route it through the Maintenance Supervision to the SQ/CC (or organizational equivalent). **(T-3)**

4.12.1.2.1. The report format will comply with TO 00-20-14 and meet local requirements. **(T-3)**

4.12.1.3. Ensure all Groups with TMDE Flights assigned include the TMDE Quality Program Activity Summary in the QA monthly summary IAW **Chapter 6**. **(T-3)**

4.12.2. The NCOIC, PMEL Logistics will:

4.12.2.1. Ensure TMDE monitors are properly trained and maintain a database or log to track training events (dates, names, organizations). **(T-3)**

4.12.2.2. TMDE will be scheduled with input priorities IAW TO 00-20-14, Air Force Metrology and Calibration Program.

4.12.2.2.1. - 4.12.2.2.3. DELETED.

Chapter 5

MAINTENANCE OPERATIONS (MXO).

5.1. General. MXO is directly responsible to the MXG/CC for the administration, analysis, training management of assigned personnel, and programs and resources necessary to support the group's production effort. MXO is comprised of the following sections: EM, PS&D, MMA, MOC, MT, and Programs and Resources (P&R). In missile organizations, MXO will be organized as a Maintenance Operations Squadron, as applicable. For the purposes of this instruction, the term MXO is equivalent with Maintenance Operations Flight for ANG units.

5.2. Maintenance Operations. MXO is the central agency for monitoring and developing long-range strategies of fleet management to sustain the health of the fleet. Fleet management is defined as the effective utilization of available resources to accomplish the aircraft support cycle from planned maintenance events to operations schedule execution. It is a disciplined and prioritized scheduling effort that optimizes support to aircraft requirements such as flying/operational events, ground training events, scheduled maintenance inspections, aircraft/system configuration control, aircraft/system modification schedules and aircraft/system recovery maintenance. Effective fleet management results in consistent availability of quality aircraft/systems to meet operational requirements. The Maintenance Operations Superintendent position will be filled by SNCO 2RXXX personnel and act as the 2R Base Functional Manager for their component. **(T-2)**

5.2.1. Base 2R Functional Manager will be the senior ranking enlisted member, possessing a 7-skill level or higher, assigned to the host MAJCOM of the installation. **(T-2)** They are responsible for both AFSC 2R0X1 and 2R1X1 personnel development, training, and assignment for their component. HQ MAJCOM personnel may not fill this position.

5.2.2. Develop a 2R0X1 and 2R1X1 training plan for all assigned personnel, to include tenant units. Determine utilization and assignment of installation AFSC 2R0X1 and 2R1X1 personnel and a rotation plan for their respective 2R0X1 and 2R1X1 wing resources based on mission requirements. **(T-3)**

5.2.3. Ensure 2R0X1 and 2R1X1 are trained and qualified by establishing a structured training program. **(T-3)** Ensure training sessions for 2R0X1 and 2R1X1 are conducted and documented monthly. Maintain training session documentation to include attendance logs for at least one year.

5.2.4. Maintenance Operations, Director of Operations /Superintendent (DO/SUPT). In addition to the applicable Maintenance Supervision responsibilities in **Chapter 2**, the MXO OIC/SUPT will:

5.2.4.1. Develop and publish the wing operations/maintenance schedule in coordination with other squadrons and submit to both the OG/CC and MXG/CC for approval. **(T-3)**

5.2.4.2. Determine long-range fleet health maintenance priorities. **(T-3)**

5.2.4.3. Manage the data collection process, review data, and verify analysis for maintenance data collection requirements. **(T-3)**

5.2.4.4. Evaluate and provide trend analysis information to the MXG/CC and SQ/CCs. **(T-3)**

5.2.4.5. Ensure aircraft status is properly reported and maintained IAW DAFI 21-103.

5.2.4.5.1. Coordinate with the PS&D Aerospace Vehicle Distribution Officer (AVDO) to ensure all assignment and possession changes are accurately reported to the MAJCOM AVDO IAW DAFI 21-103 and AFI 16-402, *Aerospace Vehicle Programming, Assignment, Distribution, Accounting, and Termination*.

5.2.4.6. Initiate, review, and validate special analysis studies. **(T-3)**

5.2.4.6.1. Determine planning factors for the next year's flying hour program. **(T-3)**

5.2.4.6.2. Utilize a sortie production model or equivalent for the assigned MDS, if available. **(T-3)**

5.2.4.7. Develop procedures to update Geographical Location (GEOLOC) codes for all on and off-station possessed aircraft and ensure GEOLOC codes are updated/correct in the MIS "Location Subsystem" (FMxC2 units are exempt as long as a HHQ agency accomplishes this requirement). **(T-3)**

5.2.4.8. IMDS units will use code "XXXX," and FMxC2 units will use "CCCC" for classified locations. **(T-3)**

5.2.1.8.1. DELETED.

5.2.4.9. Host DFTs/CFTs, provide in-briefs on unit-specific maintenance and tool-control requirements, review plans, coordinate/monitor status of aircraft and progress of repair work. **(T-3)**

5.2.4.10. Participate in the review of base level repair capability IAW TO 00-20-3, AFREP in **Chapter 11** of this DAFI, and supplements.

5.2.4.11. Publish wing notification requirements for munitions-loaded or unloaded aircraft. **(T-3)**

5.2.4.12. Establish/sustain local radio call signs for maintenance LMR networks IAW AFI 17-210, Radio Management. **(T-3)**

5.2.4.13. Develop a training plan for individuals assigned to QA that will inspect MXO functions. Minimum training requirements will include MIS (FMxC2/IMDS/or equivalent) online and background products for inspections, time changes, TCTOs, and aircraft configuration management. **(T-3)** For units with IMDS, the QA inspector will be trained on the use of DS Maintenance Scheduling Module (MSM) to provide the capability for a qualified QA inspectors to evaluate and report PS&D compliance with functional requirements. **(T-3)** The senior 2R in the MXO will provide assistance to the inspector as required. **(T-3)**

5.2.4.14. Ensure MAJCOM Master Course Listing includes 2R weapon system familiarization courses requirements. **(T-3)**

5.2.4.14.1. As a minimum, the course will include weapon system/communications electronics familiarization, flightline and shop operations, organizational structure and roles of each group, squadron, and flight. **(T-3)**

5.2.4.14.2. Analysts will attend the course within 6 months of assignment to the unit. **(T-3)**

5.2.4.14.3. For remote assignments, analysts will attend within 1 month of assignment. **(T-3)**

5.2.4.14.4. DELETED.

5.2.5. Maintenance Operations Center (MOC). The MOC monitors and coordinates sortie generation, maintenance production, and execution of the operations and maintenance schedules while maintaining visibility of fleet health indicators. Through coordination with maintenance units, the MOC communicates priorities for competing limited resources (such as, fuel or calibration docks, wash racks, and dispatched specialists from the maintenance squadron(s) (for example, egress) based on daily operations schedule and maintenance priorities. The exchange of information between squadrons and the MOC must be in sufficient detail to allow the MOC to comply with reporting requirements and to identify potential problems.

5.2.5.1. The MOC will:

5.2.5.1.1. Monitor the status of aircraft/systems, as directed, (through the use of electronic or manual visual aids) including ETIC, progress of FCFs, and location of each aircraft on station. **(T-3)**

5.2.5.1.2. Track contingency and exercise aircraft generation activities. **(T-3)**

5.2.5.1.2.1. Maintain and update aircraft generation line up and display aircraft status using AF Form 2408, *Generation Maintenance Plan* and AF Form 2409, *Generation Sequence Action Schedule* or locally computer-generated equivalents. **(T-3) Note:** If the tail number, mission number or specifically tasked no-later-than times are linked, this form becomes classified. See DODM 5200.01V1_AFMAN 16-1404, *Information Security Program: Overview, Classification and Declassification*.

5.2.5.1.2.2. Monitor and report aircraft generation progress with a minimum of the following information: ETIC, location of each aircraft, status of generation actions, progress against timeline necessary to meet mission requirements. **(T-3) Note:** The display format should be compatible with OPLANS and command post displays.

5.2.5.1.3. Utilize the Enhanced Maintenance Operations Center. **(T-3) Note:** BLADE will be used to track classified aircraft status.

5.2.5.1.4. Track aircraft maintained or supported by the unit but not on station. (Aircraft cross-country). **(T-3)**

5.2.5.1.5. Coordinate maintenance on the alert force, if applicable. **(T-3)**

5.2.5.1.6. Ensure status boards depict aircraft status and location comply with Security Program guidelines. **(T-3)**

5.2.5.1.7. Monitor the status and ETIC of MEL-designated AGE if it falls below critical levels. **(T-3)**

5.2.5.1.8. Monitor the status of ECM and sensor pods IAW AFI 10-201, *Force Readiness Reporting*. **(T-3)**

5.2.5.1.8.1. When MC pod availability falls below requirements per the DOC or

OPLAN, the MOC will track/monitor the following information: pod serial number, status (AWP/Awaiting Maintenance (AWM)), MICAP NSN, off-base requisition numbers, and ETIC. **(T-3)**

5.2.5.1.9. Classify information IAW AFI17-130, *Cybersecurity Program Management.*

5.2.5.1.10. Verify aircraft status and ETICs with the Pro Super(s) and ensure they are properly documented in the MIS IAW DAFI 21-103**.** Reference AFCSM, 21-564, V2, *Status and Inventory Reporting Software User Manual* or equivalent for MIS guidance.

5.2.5.1.10.1. When the Production Superintendent (Pro-Super) or equivalent notifies the Maintenance Operations Center (MOC) that an aircraft is "Crew Ready" the MOC will review the Maintenance Information Systems (MIS) for each Crew Ready aircraft to ensure there are no open Red Xs. **(T-3)** If open Red X(s) are present in the MIS, the MOC will notify the Pro-super or equivalent for action. **(T-3)**

5.2.5.1.11. The MOC will verify aircraft status using the MIS and ETIC before reporting it. **(T-3)**

5.2.5.1.12. Inform affected activities of changes in priorities, plans, and schedules. **(T-3)**

5.2.5.1.13. Coordinate on changes to the operations schedule with applicable agencies by use of AF Form 2407. **(T-3)**

5.2.5.1.14. Ensure all deviations to the daily operations schedule are reviewed and accurately reported. **(T-3)**

5.2.5.1.14.1. Forward a copy of each AF Form 2407 and the daily flying schedule, with all annotated deviations, to MMA. **(T-3)**

5.2.5.1.15. Request support services outside the scope of the MXG (such as, standby firefighting capability, aircraft water, snow removal, fueling and defueling service, civil engineer support, or control tower clearances for ground movement of aircraft and equipment). **(T-3)**

5.2.5.1.15.1. Coordinate on all aircraft engine runs and all aircraft ground movements conducted by maintenance personnel prior to execution. **(T-3)**

5.2.5.1.16. Develop, coordinate, implement, and maintain functional and emergency action checklists. **(T-3)** Checklists contain those actions required to be taken by functional area(s).

5.2.5.1.16.1. Functional checklists are required for use during actions such as nuclear mass loads, Broken Arrow, Dull Swords, Bent Spear, aircraft crash/mishap/incident, aircraft FOD, aircraft damage, flightline fire, severe weather warning or evacuation, runway closure, hazardous chemical release (example, Hydrazine, Broken Pod Glass release of Thorium Fluoride or Americium), Quick Reaction Checklists, injuries resulting from aircraft maintenance and any other unusual circumstances deemed necessary.

5.2.5.1.16.2. For OPLAN 8010 notification, use the plan implementation

checklists.

5.2.5.1.16.3. Use unit OPLANs as a guide in developing these checklists.

5.2.5.1.16.4. DELETED.

5.2.5.1.16.5. The MOC will maintain checklists that implement all approved MAJCOM and local requirements. **(T-3)**

5.2.5.1.16.6. Establish a command/contingency focal point to coordinate ABDR and or Joint Combat Assessment Team (JCAT) response requests with AFMC. **(T-3) Note:** If data collection forms are required forms will be forwarded to the Aircraft Battle Damage Repair (ABDR) Technical Support Office (TSO) and JCAT. **(T-3)** For ABDR TSO, CLASSIFIED messages must be sent to: **usaf.wright-patt.afsc-lg.mbx.afsc-lgpm-abdr-tso@mail.smil.mil**_____and UNCLASSIFIED messages must be sent to NIPR: **afsc.lgpm.abdrtso@us.af.mil** for filing in the historical archives. For JCAT, CLASSIFIED data must be submitted via the Intellipedia Secret Internet Protocol Router Network (SIPRNET) link **https://www.intellipedia.intelink.sgov.gov/wiki/Portal:Joint_Combat_Assessment_Team**. UNCLASSIFIED data can be sent to: JCAT (**JCAT@us.af.mil**).

5.2.5.1.17. Coordinate munitions delivery priorities with flying units and munitions maintenance activities, and control when tasked. **(T-3)**

5.2.5.1.17.1. Maintain a contact list and notify the base Fire Emergency Services and all applicable agencies that require notification of munitions-loaded or unloaded aircraft. **(T-3)**

5.2.5.1.17.1.1. The MOC will provide agencies with the aircraft type, tail number, location, type of explosives, and arming status. **(T-3)**

5.2.5.1.18. Upon notification of deployments, ensure all deploying equipment is identified and loaded into the IMDS-CDB, Aerospace Expeditionary Force subsystem or designated MIS equivalent for the duration of the deployment. **(T-3)**

5.2.5.1.19. Monitor and manage reporting of Hangar Queen aircraft/systems IAW **Chapter 11**.

5.2.5.1.20. Notify Flightline Expediters of all OAP code conditions. **(T-3)**

5.2.5.1.21. Ensure facilities and visual aids meet the following minimum standards:

5.2.5.1.21.1. A completely enclosed room with air conditioning and heating. **(T-3)** An observation room is permitted.

5.2.5.1.21.1.1. Doors to the MOC and the observation room will be either mechanically or electrically locked to control access. **(T-3)**

5.2.5.1.21.2. Isolate MOC electrical power circuits and provide a standby power source and emergency lighting. **(T-3)**

5.2.5.1.21.2.1. The MOC will establish procedures to operate standby power sources. **(T-3)**

5.2.5.1.22. Maintain the status and location of all transient aircraft. **(T-3)**

5.2.5.1.22.1. Post the priority of each transient aircraft on the status board, based on the maintenance priorities listed in **Table 1.2** **(T-3)**

5.2.5.1.22.2. Coordinate with the appropriate agency for aircraft maintenance support. **(T-3)**

5.2.5.1.22.3. Contact WS for arming or de-arming of transient aircraft IAW **Chapter 11**. **(T-3)**

5.2.5.2. MOC Maintenance Communications. Reliable, redundant, and effective communications systems are essential for efficient operation. Communications equipment will be operated and managed IAW AFI 17-210, DAFI 17-220, *Spectrum Management*, and AFI 17-130. The MOC NCOIC/SUPT will:

5.2.5.2.1. Establish a procedure to process requests for specific radio equipment to support MXG maintenance activities IAW DAFMAN 23-122.

5.2.5.2.1.1. Specific radio allowances are stated in Allowance Standard 660 at **https://usaf.dps.mil/teams/12599/AFKN_Docs/ASC%20Prefaces/ASC%20660%20Ground%20Communications%20-%20Operations%20Support.pdf**.

5.2.5.2.2. Ensure a Very High Frequency (VHF) and/or Ultra High Frequency (UHF) and/or High Frequency (HF) radio is authorized and available to provide communications between aircraft and maintenance.

5.2.5.2.3. Ensure the MOC has a hotline on the secondary crash phone net. **(T-3)**

5.2.5.2.3.1. When required, direct communications lines will be provided to QA, Munitions Control, EOD, airfield operations, base fire department, NDI, control tower and the central security control. **(T-3)**

5.2.5.2.4. Develop and exercise comm-out procedures to include loss of radios, Local Area Network (LAN) and phone. **(T-3)**

5.2.5.2.5. Ensure MOC personnel receive initial radio operating training before assuming duties involving radio operations IAW AFI 17-210 and **Chapter 11**. **(T-3)**

5.2.6. Engine Management. EM manages unit efforts to maintain adequate engine support for mission requirements by monitoring engine removals and replacements, component tracking, engine TCTOs and TCIs, engine records in the MIS and CEMS; and perform Engine Manager duties. Functions supporting EM will be combined within the wing and physically co-locate with the Propulsion Flight. **(T-3)** The SRAN Engine Manager works and is co-located with the EM section. **(T-3)**

5.2.6.1. Specific EM responsibilities are detailed AFMAN 20-116, AFPAM 63-129, TO 00-25-254-1, -2 and **Chapter 14**.

5.2.7. Plans, Scheduling, and Documentation (PS&D). PS&D is responsible for coordinating aircraft maintenance requirements and utilization scheduling between maintenance, operations, and external agencies. PS&D oversees the entire maintenance scheduling effort throughout the wing and notifies applicable senior managers of scheduling process discrepancies and recommended courses of action.

5.2.7.1. Specific PS&D responsibilities are detailed in **Chapter 14**.

5.2.8. Maintenance Management Analysis (MMA). MMA tracks, analyzes, and presents information to help senior leadership assess the health of the units' weapon systems and equipment. MMA acts as the group POC for MIS issues and performs analyses to assess and improve unit performance (such as, effectiveness and efficiency of unit resources and logistical support processes). The MIS provides the main source of information used by analysts to assess unit performance and capability.

5.2.8.1. MMA will:

5.2.8.1.1. Be centrally organized but may locate analysts in the squadron to enable maximum responsiveness and effectiveness. **(T-3)**

5.2.8.1.1.1. When analysts are located in the squadron, they will still work directly for the MMA Section NCOIC/Chief who will provide their training and monitor the quality/relevancy of their workload. **(T-3)**

5.2.8.1.2. Provide information on analysis services, capabilities and training to units and maintenance supervision. **(T-3)** At a minimum, the following will be covered; MIS changes, on-going special studies, trend analysis, performance indicators/metrics TTP. **(T-3)** For units where MMA is centralized, perform monthly visits to maintenance work centers directly associated with aircraft generation. **(T-3)**

5.2.8.1.2.1. Work with MTS and/or FTD for opportunities to provide training on analysis services and capabilities (example, Mx Orientation, DCC Course). **(T-3)**

5.2.8.1.2.2. DELETED.

5.2.8.1.3. Calculate maintenance metrics and compare unit performance against MAJCOM and locally developed goals (if applicable). **(T-3)**

5.2.8.1.4. Develop products to track, monitor and identify seasonal and cyclical trends at the group, squadron, and unit level for MAJCOM reportable leading and lagging indicators. **(T-3)**

5.2.5.1.4.1. & 5.2.5.1.4.2. DELETED**.**

5.2.8.1.5. Review data for anomalies, variations, and trends to identify areas requiring further study. **(T-3)**

5.2.8.1.5.1. When significant seasonal or cyclical trends are identified in leading or lagging indicators, accomplish and document further analysis. **(T-3)**

5.2.8.1.5.1.1. Provide presentations, reports, studies/analyses, and briefings as requested or deemed appropriate. **(T-3)**

5.2.8.1.5.2. Units with like MDSs will compare and contrast metrics to identify significant variation. **(T-3)**

5.2.8.1.5.2.1. When significant variation is identified, accomplish and document further analysis. **(T-3)**

5.2.8.1.5.2.2. Provide presentations, reports, studies, analyses, and briefings as requested or deemed appropriate. **(T-3)**

5.2.8.1.6. Monitor wing, group, and squadron utilization rates. **(T-3)**

5.2.8.1.6.1. When operational requirements are not achieved, determine if assignable causes are present. Recommend corrective actions or measures when necessary. **(T-3)**

5.2.8.1.7. Assist unit leaders with the application and interpretation of maintenance data. **(T-3)**

5.2.8.1.8. Coordinate with PS&D and unit's Maintenance Supervision to provide monthly airframe, facility, and personnel capabilities (as required), attrition, and spare factors for use in planning the annual FHP. **(T-3)**

5.2.8.1.8.1. MAJCOMs will publish attrition and spare factors computations in a supplement to this instruction reference TO 00-20-2.

5.2.8.1.8.1.1. MMA will use MAJCOM supplement guidance to calculate attrition and spare factor computations. **(T-3)**

5.2.5.1.8.1.2. DELETED.

5.2.8.1.9. Analyze equipment performance trends to identify problems affecting the unit mission and, whenever possible, provide predictive analytical information with recommendations to unit's Maintenance Supervision. **(T-3)**

5.2.8.1.10. Verify accuracy of Job Data Documentation (JDD), flying schedule deviations, aircraft status and utilization within the MIS. **(T-3)**

5.2.8.1.10.1. Validate data entered into the MIS as part of daily analysis duties and inform affected agencies of discrepancies. **(T-3)**

5.2.8.1.10.2. Identify erroneous or missing data to the responsible agency for correction or completion. **(T-3)**

5.2.8.1.11. Control the assignment of unit work center and mnemonic codes. **(T-3)**

5.2.8.1.11.1. Coordinate with P&R, MTS, or responsible agency on the assignment of alphanumeric and work center codes. **(T-3)**

5.2.8.1.11.2. Publish written guidance to control these codes when not provided by higher headquarters. Multiple mnemonic codes may be used within a work center code to accommodate different AFSCs assigned. **(T-3)**

5.2.8.1.11.3. Coordinate new or revised mnemonic codes with affected activities for planning purposes. **(T-3)**

5.2.8.1.12. Be responsible for MIS database management. **(T-3)**

5.2.8.1.13. Assists MIS users in developing procedures for collecting information from deployments and exercises where the MIS is not available. **(T-3)**

5.2.8.2. In addition to the applicable Section NCOIC/Chief responsibilities outlined in **Chapter 2**, the MMA Section NCOIC/Supervisor will:

5.2.8.2.1. Ensure growth of analysis personnel by developing and maintaining a plan to rotate personnel through various duty positions within MMA.

5.2.8.2.1.1. Establish and coordinate plans for rotating 2R0XX personnel to increase field knowledge and experience every 24 months, not to exceed 36 months. **(T-3)**

5.2.8.2.1.2. This rotation plan applies to TSgts and below as well as 3- or 5-skill level personnel of any rank. **(T-3)**

5.2.8.2.2. Define the daily, weekly, monthly, and annual roles and responsibilities for each duty position within MMA. **(T-3)**

5.2.8.2.3. Ensure the CFM approved AFSC duty titles are utilized for all MMA personnel. **(T-3)**

5.2.8.3. Maintenance Information Systems (MIS). For management of IMDS-CDB, FMxC2, and Reliability and Maintainability Information System (REMIS), follow AFCSM 21-556, Vol 2, *Intro to IMDS CDB*, MAJCOM/Lead Command guidance, unit procedures, and REMIS user manuals. Personal computers and software used as "stand-alone" systems are not considered MIS.

5.2.8.3.1. Request to modify/create new functionality within IMDS-CDB IAW AFCSM 21-556V2. FMxC2 units will submit a System Change Request for any new requirements or corrections to existing features. **(T-3)**

5.2.8.3.2. Database Manager (DBM) will identify functions that require subsystem monitors and provide applicable training to those responsible for ensuring the accuracy/sustainment of their subsystem. **(T-3)**

5.2.8.3.2.1. Subsystem monitors will be appointed by the Section Chief of subsystem functions (such as, PS&D Section Chief appoints and signs appointment letter for configuration management). **(T-3)**

5.2.8.3.2.2. MMA is responsible for the overall management of the JDD subsystem. **(T-3)**

5.2.8.3.3. MAJCOMs will provide guidance describing the management of the MIS listed in **paragraph 5.2.8.3** within their command.

5.2.8.3.4. At a minimum, the MMA MIS/Host DBM will ensure:

5.2.8.3.4.1. MAJCOM coordination occurs when problems exist that are beyond the scope of responsibilities of Host DBMs. **(T-3)**

5.2.8.3.4.2. IMDS-CDB/FMxC2 security is maintained IAW AFI 17-130, *Cybersecurity Program Management*.

5.2.8.3.4.2.1. MMA personnel coordinate MIS access permission requirements to enable MDD on non-possessed aircraft. **(T-3)**

5.2.8.3.4.3. MMA personnel provide expertise on IMDS-CDB/FMxC2 for resolution of problems beyond the work center and sub-system monitors' control. **(T-3)**

5.2.8.3.4.4. Support is provided to tenant organizations and users. **(T-3)**

5.2.8.3.4.5. Coordination with the Defense Enterprise Computing Center or AF

Network Control Center on all matters concerning IMDS-CDB. **(T-3)**

5.2.8.3.4.6. The Defense Enterprise Computing Center supports all requirements concerning the operation and maintenance of IMDS-CDB. **(T-3)**

5.2.8.3.4.7. Scheduled MIS downtime is published for users. **(T-3)**

5.2.8.3.4.8. MMA personnel control and monitor submissions of IMDS-CDB Difficulty Report(s). **(T-3)**

5.2.8.3.4.9. Coordination occurs on matters pertaining to the interface of other automated systems with IMDS-CDB. **(T-3)**

5.2.8.3.4.10. A functional checklist is developed to establish timelines and MIS data capture requirements for use in the event of a weapon system mishap. **(T-3)**

5.2.8.3.4.10.1. The checklist must require immediate capture and isolation of the historical data for the mishap weapon system regardless of the time or day of week. **(T-3)** Contact the Host DBM to immediately put the IMDS-CDB in File Update Mode (when required) until the functional checklist can be completed. FMxC2 equipment records will be locked using screen 9012 (Lock/Unlock Aircraft/Data Records). **(T-3)**

5.2.8.3.4.11. Support of the Communications-Electronics maintenance community referring to DAFI 21-103 and TO 00-33A-1001, *Methods and Procedures, General Cyber Defense Operations Activities Management Procedures and Practice Requirements,* for maintenance analysis and host DBM responsibilities.

5.2.8.3.4.12. Control of access to specific IMDS-CDB programs and subsystems by utilizing Transaction Identification Codes (TRICs) security profiles or screen 9057 (program access) for FMxC2. **(T-3)**

5.2.8.3.4.12.1. Audit permissions to IMDS security profiles and FMxC2 access keys annually. Take appropriate measures when a compromise is suspected or reported. **(T-3)**

5.2.8.3.4.12.2. Semi-annually audit IMDS ELC access. **(T-3)**

5.2.8.3.4.13. IMDS-CDB subsystem managers are informed of the status of applicable TRICs prior to turning the TRIC on or off. **(T-3)**

5.2.8.3.5. MMA is the focal point for codes used on the maintenance data documentation process. This includes maintenance deferred codes, delayed status codes, flying scheduling deviation and cause codes listing. **(T-3)**

5.2.8.3.5.1. Use the MAJCOMs approved codes and narrative for official use. Code listings will be adjudicated yearly by all commands. **(T-2)**

5.2.8.3.5.2. Recommended changes, additions, and deletions to these codes and/or data elements will be adjudicated and approved by all MAJCOMs. MMA will submit request to their respective MAJCOM to initiate and coordinate any updates to the code listings. **(T-2)**

5.2.8.3.6. Data Integrity. MMA is the OPR for the Data Integrity Team (DIT). All maintenance units will participate in the DIT program. **(T-3)**

5.2.8.3.6.1. The purposes of the DIT include: (1) ensuring the unit has complete and accurate data in the MIS and aircraft forms, (2) identifying and quantifying problems within the unit preventing complete and accurate documentation, and (3) identifying and correcting the root causes for poor data integrity. The DIT is established to evaluate/isolate/eliminate documentation problems in IMDS-CDB/FMxC2/DPAS M&U Module. MMA will ensure that all assigned DIT members are trained in the use of MIS applicable programs for the data integrity review/correction process. **(T-3)** Errors identified by the DIT team will be reconciled IAW **Paragraph 5.2.5.3.6.5**. **(T-3) Note:** DIT should be aware of Logistics Interference (LI) and data errors that may be the result of purposeful efforts. DIT will note possible LI and monitor for trends and report unusual behavior IAW AFI 17-130.

5.2.8.3.6.2. The DIT will include, at a minimum, one representative from each squadron under the MXG. It will include participation from PS&D, MOC, DMS, EM, Debrief Section, and QA as determined by MMA. **(T-3)**

5.2.8.3.6.3. MAJCOMs will determine the frequency of DIT meetings.

5.2.8.3.6.4. Representatives will be at least a SrA that possesses a 5-skill level and is familiar with the unit's assigned weapon system(s). **(T-3)**

5.2.8.3.6.5. As a minimum, the following functions will be performed by the DIT:

5.2.8.3.6.5.1. Educate group, squadron, and AMU leadership on the importance of data integrity including the impacts of erroneous data.

5.2.8.3.6.5.2. Ensure MIS accurately reflects AFTO Form 781-series forms entries.

5.2.8.3.6.5.3. Run maintenance action review background reports for all work accomplished by squadrons and work centers.

5.2.8.3.6.5.3.1. Audit the report by JCN/WCE (Work Event Separator for FMxC2) to identify suspected errors.

5.2.8.3.6.5.3.2. Responsibility for correcting errors belongs to the performing work center.

5.2.8.3.6.5.3.2.1. The use of general WUCs/LCNs when a component level WUC/LCN exists will be counted as an error. **(T-3)**

5.2.8.3.6.5.3.3. Audit for Weapons System status, flying schedule deviation and utilization errors. **(T-3)**

5.2.8.3.6.5.3.4. Use of automated processes is authorized.

5.2.5.3.6.5.4.1. DELETED.

5.2.8.3.6.5.3.5. Develop a system to track, measure and report data integrity errors by work center, AMU, and squadron. **(T-3)**

5.2.8.3.6.5.3.6. Implement training programs that are geared toward correcting data integrity trends. **(T-3)**

5.3. Maintenance Training (MT). MT consists of the Training Management Element and the Development and Instructor Element. Maintenance Training assists SQ/CCs by providing Unit Training Managers (UTM) to manage the enlisted specialty training program. MT will:

5.3.1. Provide initial, recurring, and advanced proficiency, qualification, or certification training needed by a technician to perform duties in their primary AFSC and manage course codes to track training IAW AFI 36-2650 and DAFMAN 36-2689.

5.3.2. Serve as the single point of contact for all training matters affecting maintenance. **(T-3)**

5.3.3. The MT Superintendent/NCOIC will maintain administrative responsibility for UTMs whether UTMs are centralized or decentralized. **(T-3)**

5.3.4. Develop and administer appropriate Maintenance Cyber Discipline training. Training will be tailored to DoD Information Technology used locally and will emphasize authorized, and unauthorized uses, prevention, detection, remediation, and provide an overview of recent negative trends and effective mitigation techniques. **(T-3)**

5.3.4.1. Coordinate with Quality Assurance, MXG/CC designated responders, and facilitators for action when discovery that DoD Information Technology lacks the capability to perform a mission function. **(T-3)** Example: Enhanced Technical Information Management System containing software for a TO task that does not have a hardware TO approving its installation or use.

5.4. Programs and Resources (P&R). P&R serves as the MXG focal point for interaction with external functional support activities to ensure critical mission generations support, infrastructure personnel management and resources are configured to maximize mission capability/AA. P&R program configurations may vary based on mission but generally P&R coordinates with functional base OPRs to interact on Facility Management (FM), Vehicle Control (VCO), Support Agreements, Unit Safety, Security, Resources, Manpower, Environment, Deployment and Maintenance Information System programs as applicable. Units will maximize consolidation of personnel assigned in P&R as described in **Paragraph 2.4.14**. P&R will:

5.4.1. Develop, maintain, and coordinate all applicable AFI-directed programs and plans affecting maintenance. **(T-3)**

5.4.2. Act as the resource advisor to the MXG/CC. **(T-3)**

5.4.3. Coordinate with the MXG/Squadron SUPTs to manage manpower authorizations for the MXG. **(T-3)**

5.4.4. Serve as the focal point within the MXG for management of facilities. **(T-3)**

5.4.4.1. Ensure fire detection and foam suppression training is included in unit facility manager/ occupant training briefings. **(T-3)**

5.4.5. Serve as the Environmental Coordinator focal point within the MXG. **(T-3)**

5.4.6. Serve as the focal point for MXG deployment planning and execution actions. **(T-3)** If designated as a UTC pilot unit IAW DAFI 10-401, *Operations Planning and Execution*, P&R will:

5.4.6.1. Coordinate with other UTC tasked units on cargo and equipment authorizations/requirements to develop and maintain a standardized package to meet specific mission capability requirements. **(T-3)**

5.4.6.2. Coordinate with the unit equipment custodian(s) to review equipment changes and new equipment requirements driven by changes to UTCs and/or Allowance Standards (AS). **(T-3)**

5.4.6.3. Assist with coordination of site surveys for deployment locations and maintain copies of the Expeditionary Site Plan (ESP) **Part I** for deployment locations IAW AFI 10-404, *Base Support and Expeditionary (BAS&E) Site Planning*.

5.4.6.4. Coordinate with QA biennially to verify aircraft MDS Hot Pit refueling capabilities are current and accurate in Base Support and Expeditionary and ensure applicable ESP/BSP **Parts I** and **II** accurately reflect unit capabilities IAW AFI 10-404, if applicable. **(T-3)**

5.4.7. Oversee local, functional or host country unique support agreements applicable to the MXG IAW AFI 25-201, *Intra-Service, Intra-Agency, and Inter-Agency Support Agreements Procedures*.

5.4.8. Develop and coordinate MXG commercial contracts as directed by the MXG/CC. **(T-3)**

5.4.9. Manage readiness reporting for the MXG IAW AFI 10-201.

5.4.10. Coordinate with LRS Deployment & Distribution Flight to obtain unit assistance in interpreting guidance for marking, packing, and marshaling of tasked equipment IAW DAFMAN 24-604, *Preparing Hazardous Materials for Military Air Shipments*, DAFI 10-401 and DESR6055.09_AFMAN 91-201.

Chapter 6

QUALITY ASSURANCE (QA)

6.1. General. Maintenance quality and equipment reliability is the responsibility of all maintenance personnel. The combined efforts of QA personnel, maintenance leaders, and technicians are necessary to ensure high quality maintenance production and equipment reliability. The QA staff evaluates the quality of maintenance accomplished and performs necessary functions to manage the MSEP. Personnel assigned to QA are not an extension of the work force and will not be tasked to perform sortie production inspections unless authorized by the MXG/CC or MGFE/CC on a case-by-case basis. **(T-2)** QA serves as the primary technical advisory agency in the maintenance organization, assisting maintenance supervision at all levels to identify, validate and/or resolve quality, proficiency and/or compliance issues impacting mission generation. The evaluation and analysis of deficiencies and problem areas identified are key functions of QA that highlight and reveal underlying causes of poor quality in the maintenance production effort. Aircraft and equipment condition and personnel proficiency are validated through the MSEP and recorded in the Logistics Evaluation Assurance Program (LEAP) QA database. Civil service and contracted personnel are to follow requirements established in their respective civilian position description/contract and accepted quality assessment system.

6.2. Responsibilities. QA is responsible to the MXG/CC or equivalent to perform as the primary technical advisory agency for maintenance actions and to assist work center supervisors in reviewing tasks involved in supporting the maintenance effort. MXG QA Inspectors have the authority to observe, correct and document applicable maintenance activities performed within the MXG. QA will:

6.2.1. Implement and administer the MSEP and other programs as applicable to include:

6.2.1.1. Product Improvement Program (PIP). **(T-2)**

6.2.1.1.1. DR. **(T-2)**

6.2.1.1.2. Product improvement inputs. **(T-2)**

6.2.1.2. Aircraft and equipment impoundment procedures IAW **Chapter 7**.

6.2.1.3. Functional Check Flight (FCF) program IAW this **Chapter**. **(T-2)**

6.2.1.4. W&B Program IAW this **Chapter**.

6.2.1.5. Hot Refuel/Defuel and Aircraft-to-Aircraft Refuel Programs if applicable. **(T-2)**

6.2.2. Review and analyze aircraft aborts, IFEs, and incidents involving damage to equipment or injury of personnel to determine if trend analysis, cross-tell or MSEP focus is warranted. **(T-2)**

6.2.3. Comply with the configuration management program requirements IAW **Chapter 14**. **(T-2)**

6.2.4. In coordination with PS&D, comply with TCTO Program requirements IAW **Chapter 14**, TO 00-5-1 and TO 00-5-15.

6.2.5. In conjunction with PS&D, develop a local Job Standard (JST) for both gaining and losing aircraft and equipment transfer inspection IAW **Chapter 14**. **Note:** For the purpose of

this instruction JST is an alpha code identifying the type of job represented in a job standard (defined in IMDS User's Manual AFSM 21-566, Volume 2).

6.2.6. Coordinate with PS&D on all AFTO Form 103s. **(T-2)**

6.2.7. Manage OTIs. **(T-2)**

6.2.8. Augment evaluations at the request of the WS. **(T-2)** Flightline weapons loading inspections/evaluations are the responsibility of WS evaluators.

6.2.9. Evaluate unit maintenance management procedures, including locally developed forms, publications, OIs, checklists, for accuracy, intent, and necessity as referenced in this DAFI.

6.2.10. Evaluate cyber hygiene, discipline practices, and cyber incident reporting per applicable TO, Wing directive, and this instruction for compliance. **(T-2)**

6.2.10.1. Report weapons system and support equipment cyber related deficiencies to the applicable Program Manager IAW T.O. 00-35D-54.

6.2.10.1.1. Elevate resolution of deficient cyber-requirements or issue via an AF Form 1067, Modification Proposal IAW AFI 63-101/20-101, and/or maintenance assistance request (such as, Technical Assistance Request) IAW TO 00-25-107 *Maintenance Assistance*.

6.3. QA Superintendent (QA SUPT) Responsibilities. In addition to the applicable Flight CC/SUPT duties in **Chapter 2** the QA SUPT will:

6.3.1. Develop and maintain a master training plan to train all QA Inspectors, and include augmentees, if applicable. **(T-2) Note:** See **Paragraph 5.2.1.13** for minimum MAJCOM training requirements for inspectors inspecting MXO function.

6.3.2. Develop and monitor the MSEP using the LEAP QA database and provide supervisors access to MSEP data. **(T-2)**

6.3.3. Notify the appropriate agencies when deficiencies are found in (AF, MAJCOM/Lead Command, WG, Group (GP)) instructions. **(T-2)**

6.3.4. Review maintenance-related instructions, supplements, operating instructions, forms, and local/functional and emergency action checklists every two years or when source data changes for accuracy, intent, and necessity. **(T-2)**

6.3.4.1. The QA SUPT will document the review once complete. **(T-2)**

6.3.5. Review JSTs annually or when source data changes for accuracy, intent, and necessity. **(T-2)**

6.3.5.1. The QA SUPT will document the review once complete. **(T-2)**

6.3.6. Ensure management and special inspections are performed (when required). **(T-2)**

6.3.7. Ensure the GP portion of the FOD Prevention Program is conducted IAW **Chapter 11**. **(T-2)**

6.3.8. Oversee and implement the GP Impoundment Procedures IAW **Chapter 7**. **(T-2)**

6.3.9. Coordinate on all requests for locally manufactured, developed, and modified tools and equipment, and maintain records for approved requests. **(T-2)**

6.3.9.1. This includes pictures or drawings and a description of the use for each item.

6.3.9.1.1. If applicable technical data contains the option for use of these tools and equipment, QA does not need to coordinate or maintain the records on these items.

6.3.9.1.2. Locally manufactured, developed, or modified equipment for weapons loading, maintenance and the armament systems flight must be coordinated through the WWM before routing to QA. **(T-2)**

6.3.10. Verify IPI requirements from MAJCOM and sources outlined in TO 00-20-1 and publish combined MXG IPI listing every 2 years as a minimum or when source data changes. **(T-2)**

6.3.11. Develop KTL/RIL to supplement MAJCOM listings (if required). **(T-2)**

6.3.11.1. Provide copies of approved KTL/RIL to all affected organizations. **(T-2)**

6.3.12. Ensure Acceptable Quality Level (AQL) Standards are developed for all tasks including key tasks and routine inspections not included on the MAJCOM AQL. **(T-2)**

6.3.13. Ensure agendas and presentations are compiled for the MSEP summary. **(T-2)**

6.3.14. Review wing requests for assistance IAW **Chapter 1** and **Chapter 14**.

6.3.15. Designate a Chief Inspector. **(T-2)**

6.3.16. Designate individuals to be the Technical Order Distribution Office (TODO) and Product Improvement Manager (PIM). **(T-2)**

6.3.17. Designate individuals to be the W&B and FCF Program managers. **(T-2)**

6.3.18. Monitor the ASIP IAW **Chapter 11**.

6.3.19. Maintain DOP program oversight IAW **Chapter 11**.

6.3.20. When hot refueling is performed by maintenance personnel, ensure Hot Refueling Program is accomplished IAW TO 00-25-172 and this DAFI.

6.3.21. Ensure non-resident organizations hot refueling aircraft at an AF certified hot pit coordinate site/personnel certification, utilization and documentation requirements with the supporting QA and Airfield Management/Operations. **(T-2)**

6.3.21.1. Using units are responsible for maintaining currency/reporting requirements. **(T-2)**

6.3.22. Ensure designated Responders/facilitators respond to DoD IT incidents that lack the capability to perform a mission function. **(T-2)**

6.3.22.1. Consolidate and report incidents in conjunction with appropriate POC (e.g., WAM, TODO, or designated official). **(T-2)** Example: ETIMS containing software for a TO task that does not have a hardware TO approving its installation or use.

6.4. Chief Inspector Responsibilities. The Chief Inspector is responsible to the QA SUPT for ensuring functions listed below are performed and is responsible for applicable Section NCOIC/Chief duties in **Chapter 2**. The Chief Inspector will:

6.4.1. Use assigned inspectors/augmentees to provide on-the-spot assistance to correct problems. **(T-2)**

6.4.2. Spot-check TOs, inspection work cards, checklists, job guides and WUC manuals during evaluations and inspections for currency and serviceability. **(T-2)**

6.4.3. Assist MMA with investigations and studies. **(T-2)**

6.4.4. Review QA LEAP MSEP inspection summary inputs for accuracy and content. **(T-2)**

6.4.5. Initiate actions when additional attention is required to resolve adverse maintenance trends or training problems. **(T-2)**

6.4.5.1. Actions include preparing cross-tell information bulletins and messages for MXG/CC release to other similarly equipped units and higher headquarters.

6.4.6. Review and compile inputs for updating the IPI listing. **(T-2)**

6.4.6.1. Maintain a copy of the MXG/CC or equivalent approved IPI listing with the signature and date of review and certification. **(T-2)**

6.4.7. Review Category II major discrepancies for trends quarterly. **(T-2)**

6.4.7.1. If frequency or severity of identified discrepancies warrant inclusion of that item into a specific TO governing an action or inspection, the QA Chief Inspector must submit an RC or develop a local work card, local page supplement or checklist IAW TO 00-5-1.

6.4.8. Establish procedures for QA Inspectors to document completed inspections. **(T-2)**

6.4.9. Perform inspections on GITA IAW **Chapter 11**. **(T-2)**

6.4.10. Construct and maintain a master standardized AFTO Form 781-series forms binder IAW TO 00-20-1.

6.4.11. Develop an aircrew briefing checklist specifically for high-speed taxi checks (see **Paragraph 6.14**). **(T-2)**

6.4.12. Review MSEP data monthly to identify high-missed carded items from Personnel Evaluations and Quality Verification Inspections (QVI). **(T-2)** A high-missed carded item is defined as any work card item missed at least three times during a one-month period.

6.4.12.1. Coordinate with MMA to identify any relationships with repeat, recur and CND trends. **(T-2)**

6.4.12.2. Include this data in the monthly MSEP summary. **(T-2)**

6.4.13. Conduct Evaluator Proficiency Evaluations on each inspector. **(T-2)**

6.4.13.1. Evaluators Proficiency Evaluation (EPEs) will be conducted while the Chief Inspector assesses one Personnel Evaluation (PE) and one technical inspection (QVI/Special Inspection (SI)). **(T-2)**

6.4.13.2. Each QA Inspector, permanent or augmentee, must pass both EPEs prior to performing unsupervised evaluations and inspections. **(T-2)**

6.4.14. Document QA Inspector training in the MyTraining. **(T-2)**

6.4.15. Ensure each discrepancy/finding within rated inspections, evaluation, and observation reports have been assigned both a Category (CAT I or CAT II) and a Finding Severity (Maj or Min).

6.5. Quality Assurance Inspector Responsibilities. QA Inspectors will:

6.5.1. Evaluate flightline and back shop maintenance tasks/inspections and MXO functions to include items identified by the KTL/RIL. **(T-2)**

6.5.2. Enter inspection and evaluation reports into the LEAP QA database. **(T-2)**

6.5.3. Perform QA review of Dull Swords, TCTOs, OTIs, modification proposals, DRs, RCs, instructions, and supplements. **(T-2)**

6.5.4. Provide training/instruction as applicable to address deficiencies identified during evaluations/inspections. **(T-2)**

6.5.5. Evaluate forms and MIS documentation to evaluate compliance IAW MXG written procedures described in **Chapter 2**. **(T-2)**

6.5.6. Evaluate maintenance TO files that are kept on the aircraft (G files). **(T-2)**

6.6. Quality Assurance Inspector Training. As a minimum, the local QA Inspector Training Plan will include the applicable items listed below to ensure QA program standardization. **(T-2)**

6.6.1. Training must cover inspection and evaluation techniques, documenting inspection worksheets and actions to prevent injury to personnel or property/equipment damage. **(T-2)**

6.6.2. All EPEs must be tracked in the MIS and/or the LEAP QA database. **(T-2) Note:** Additional requirements for Nuclear Weapons Certifying Officials are located in AFI 21-204.

6.6.3. QA Inspectors inspecting outside of their AFSC will be task qualified on a Work Center Job Qualification Standard (WJQS) in MyTraining for the KTL requirements they evaluate. **(T-2)**

6.6.3.1. Chief Inspectors will identify other critical tasks requiring DAF Form 797, *Job Qualification Standard Continuation/Command JQS*, qualification (QA WJQS) within MyTraining as required. **(T-2)**

6.6.3.2. For all other tasks, QA Inspectors must be familiar with the requirements/procedures of tasks they evaluate. **(T-2)**

6.6.3.2.1. Cross-utilization for QA Inspectors is not allowed for 2W1, 2W0, 2A7X2, or 2P0X1 career field specific tasks. Inspectors will hold the respective AFSC, have accomplished any required ancillary/safety training, and evaluate IAW their respective AFIs/TOs. **(T-2)**

6.6.3.2.1.1. QA inspectors evaluating Scheduling and Analysis functions must be trained and qualified. **(T-2) Note:** See **Paragraph 5.2.1.13** for additional requirements.

6.6.4. & 6.6.5. DELETED.

6.6.6. MAJCOMs will determine if QA personnel who conduct engine run evaluations are required to maintain the engine run proficiency requirements outlined in **Chapter 11** and document requirements in their supplement to this DAFI. **(T-2)**

6.6.7. - 6.6.10.2. DELETED.

6.7. Maintenance Standardization and Evaluation Program (MSEP). The purpose of the MSEP is to provide units with a method of evaluating technical compliance and measure how well they comply with established standards.

6.7.1. Units will develop a MSEP and conduct local inspections to ensure their programs, processes, maintenance technician proficiency, equipment condition and other focus areas are in compliance with AF, MAJCOM, and local directives. **(T-2)** The unit level MSEP is not applicable to contract maintenance activities unless required by the contract SOW or PWS.

6.7.1.1. The MSEP will be developed in conjunction with inputs from assigned squadron Maintenance Supervision and Group Leadership and will be executed by QA. **(T-2)**

6.7.1.2. DELETED.

6.7.1.3. The following types of evaluations, inspections and observations support the MSEP: PEs, QVIs, SIs, Management Inspection (MI)s, Detected Safety Violation (DSV)s, Technical Data Violation (TDV)s, Unsatisfactory Condition Report (UCR)s, and when directed, other inspections.

6.7.1.3.1. These inspection terms may differ in the LEAP QA database however, MAJCOMs must provide non-standard terms and definitions in their supplement to this DAFI when used.

6.7.1.3.2. Develop the monthly MSEP on the minimum personnel evaluations, inspections or observation requirements as depicted in Air Force Manpower Standard 21QX Quality Assurance Application Tool, located on the Air Force Manpower Analysis Agency SharePoint site: **https://cs2.eis.af.mil/sites/11190/AFMDandAFMS/AFMS/Forms/FAC1stFAC2nd.aspx**.

6.7.2. Unit MSEP Focus Areas. QA will assess how units are meeting compliance goals and will identify areas of opportunity for improvement. **(T-2)** A unit's MSEP will focus on:

6.7.2.1. Compliance with and currency of TOs and directives. **(T-2)**

6.7.2.1.1. Ensure personnel at all levels are responsible and accountable for enforcing mandatory standards and ensuring all applicable TOs and directives are complete, current, and used.

6.7.2.2. Aircraft, systems, and equipment forms documentation. **(T-2)**

6.7.2.2.1. Ensure forms used to document any maintenance related action for aircraft, systems or equipment are documented IAW 00-20 series TOs, specific equipment TO requirements, and other applicable directives and supplements. **(T-2)**

6.7.2.2.2. MSEP will validate compliance with the MXG's or equivalents' written procedures to ensure aircraft/system forms, equipment forms and MIS documentation are complete, accurate, and accomplished for each shift as referenced in **Paragraph 2.4.53**. **(T-2)**

6.7.2.3. Aircraft, Systems and Equipment Inspections. **(T-2)**

6.7.2.3.1. Ensure aircraft and equipment, including munitions, are inspected IAW TOs and directives. **(T-2)**

6.7.2.4. Compliance and Management of Occupational Safety and Health, Environmental, Bioenvironmental, Housekeeping, and FOD Programs. **(T-2)**

6.7.2.4.1. Personnel at all levels are responsible for minimizing risk to equipment, personnel, and the environment. **(T-2)**

6.7.2.5. Training. **(T-2)**

6.7.2.5.1. Verify training is correctly documented and ensure individuals are qualified/certified to perform evaluated tasks. **(T-2)**

6.7.2.6. Unit-Directed Programs. **(T-2)**

6.7.2.6.1. Verify units' programs are in compliance with local directives. **(T-2)**

6.7.2.7. Key Task List (KTL). The KTL is an AF, MAJCOM or unit developed list of required inspections that cover tasks that are complex and tasks affecting safety of flight.

6.7.2.7.1. MAJCOMs will identify minimum KTLs for each MDS. **(T-2)**

6.7.2.7.2. All maintenance actions/functions listed on the KTL require mandatory call-in to QA each time the maintenance action/function is accomplished. **(T-2)**

6.7.2.7.2.1. QA evaluators will respond and perform an evaluation. **(T-2)**

6.7.2.7.2.1.1. The MXG/CC may waive the inspection or designate authorized a representative(s) to waive the inspection.

6.7.2.7.2.1.2. QA will track all KTLs called in, waived, or completed and maintain a list of MXG-designated KTL waiver authorities. **(T-2)**

6.7.2.7.3. QA will review and update the KTL list at least every 2 years to ensure it encompasses those maintenance actions/functions directly affecting quality of maintenance. **(T-2)**

6.7.2.8. Routine Inspection List (RIL). The RIL is an AF, MAJCOM, or unit developed list of routine inspections that must be performed.

6.7.2.8.1. QA will consolidate Maintenance Supervision inputs and suggested changes for the RIL. **(T-2)**

6.7.2.8.2. Additional RIL requirements for nuclear capable units are located in AFMAN 21-200.

6.7.2.8.3. Tasks will not be removed from the RIL without issuing authorities' approval (such as, AF, MAJCOM, MXG/CC). **(T-2)**

6.7.2.8.4. The RIL must contain the following if applicable to the unit:

6.7.2.8.4.1. Pre-flight. **(T-2)**

6.7.2.8.4.2. Thru-flight. **(T-2)**

6.7.2.8.4.3. Basic post-flight. **(T-2)**

6.7.2.8.4.4. HSC/HPO inspections. **(T-2)**

6.7.2.8.4.5. Aircraft forms/MIS documentation. **(T-2)**

6.7.2.8.4.6. Equipment forms/MIS documentation. **(T-2)**

6.7.2.8.4.7. Aircraft and munitions flightline accountability/accountable property system of record (APSR). **(T-2)**

6.7.2.8.4.8. Aircraft ground handling. **(T-2)**

6.7.2.8.4.9. Launch and recovery. **(T-2)**

6.7.2.8.4.10. Servicing tasks. **(T-2)**

6.7.2.8.4.11. Technical data. **(T-2)**

6.7.2.8.4.12. CTK Program. **(T-2)**

6.7.2.8.4.13. TMDE calibrations when the performing work center is not a PMEL IAW TO 00-20-14. **(T-2)**

6.7.2.8.4.14. AGE maintenance. **(T-2)**

6.7.2.8.4.15. AGE flightline use. **(T-2)**

6.7.2.8.4.16. Housekeeping. **(T-2)**

6.7.2.8.4.17. Vehicles. **(T-2)**

6.7.2.8.4.18. Aircraft washes/aircraft corrosion inspections. **(T-2)**

6.7.2.8.4.19. Supply discipline (example, TNB, DIFM management & coding). **(T-2)**

6.7.2.8.4.20. Equipment washes/ equipment corrosion inspections. **(T-2)**

6.7.2.8.4.21. Environmental compliance. **(T-2)**

6.7.2.8.4.22. NWRM accountability and forms documentation. **(T-2)**

6.7.2.8.4.23. TCTO Program. **(T-2)**

6.7.2.8.4.24. Time-Change Program. **(T-2)**

6.7.2.8.4.25. FHP management. **(T-2)**

6.7.2.8.4.26. Maintenance Cyber Discipline. **(T-2)**

6.7.2.8.4.26.1. Upload and download of software and data. **(T-2)**

6.7.2.8.4.26.2. Malicious code detection and reporting. **(T-2)**

6.7.2.8.4.26.3. Verify personnel upload required CPINS updates prior to use. **(T-2)**

6.7.2.8.4.26.4. Verify personnel validate antivirus scans of external media are complete prior to use. **(T-2)**

6.7.2.8.4.26.5. Account for ATS/ATE in the appropriate APSR. **(T-2)**

6.7.2.8.4.26.6. Cyber hygiene. **(T-2)**

6.7.2.8.4.27. Repair Network Node Management. **(T-2)**

6.7.2.9. QA will coordinate with the Munitions Activity (Munitions Supervision with in the MUNS) and will develop quarterly standards (such as, number of inspections and frequency) for the following areas:

6.7.2.9.1. Munitions accountability. **(T-2)**

6.7.2.9.2. Munitions storage practices, security, and safety. **(T-2)**

6.7.2.9.3. Munitions inspections. **(T-2)**

6.7.2.9.4. Munitions materiel handling and test equipment. **(T-2)**

6.7.2.9.5. Munitions stockpile management. **(T-2)**

6.7.2.9.6. Tactical missile reporting system. **(T-2)**

6.7.2.9.7. Munitions infrastructure (such as, adequacy of lightning protection and grounding systems, bonding of facility doors, adequate power conversion equipment). **(T-2)**

6.7.2.9.8. Munitions training programs. **(T-2)**

6.7.2.9.9. Maintenance Cyber Discipline. **(T-2)**

6.7.3. Unit MSEP Evaluation and Inspection (E&I) Plan. QA will develop an E&I Plan specifying numbers of approved areas and types (PE, QVI, SI, MI) of inspections and evaluations to complete during the month. Types of inspections must be separated and will not be combined (such as, PE/QVI). **(T-2)**

6.7.3.1. The E&I Plan, and changes to it, will be coordinated through each squadron Maintenance Supervision. **(T-2)**

6.7.3.2. The E&I Plan will be reviewed and updated monthly based on trends in the maintenance complex and will be adjusted to meet the MXG/CC's focus areas. **(T-2)**

6.7.3.3. When developing the E&I Plan, the QA SUPT will:

6.7.3.3.1. Address areas of concern identified by maintenance managers and the WWM. **(T-2)**

6.7.3.3.2. Tailor the plan for each squadron, flight, and section. **(T-2)**

6.7.3.3.3. Coordinate and distribute the E&I Plan. **(T-2)**

6.7.4. Evaluation Criteria.

6.7.4.1. Acceptable Quality Levels (AQL). AQLs denotes the maximum allowable number of minor findings that a process or product may be charged for the task to be rated "Pass" and are used to minimize subjectivity in assessing tasks identified by the MSEP.

6.7.4.1.1. MAJCOMs may develop standardized AQLs by weapon system and establish procedures to review at least annually.

6.7.4.1.2. MXG/CCs establish AQLs for local tasks/inspections.

6.7.4.1.2.1. AQLs need to be derived/revised from QA performance-based data.

6.7.4.1.3. AQLs/baselines for nuclear maintenance, cruise missile maintenance and nuclear weapons handling tasks are defined in AFMAN 21-200.

6.7.4.1.4. All findings will be rated Cat I or Cat II with a severity of Major or Minor. **(T-2)**

6.7.4.2. Discrepancy Categories.

6.7.4.2.1. Category I (CAT I). A required inspection/TO/AFI procedural item missed or improperly completed. This category is a specific AFI requirement, work card item or TO step, warning, caution, or note for a specific condition or action. Use findings of major or minor to indicate the discrepancy's relative severity.

6.7.4.2.2. Category II (CAT II). An obvious defect, which could have been readily detected by a technician or supervisor, but is not a specific AFI requirement, work card item or TO step, warning, caution, or note for that specific evaluated task. Use findings of major or minor to indicate the discrepancy's relative severity.

6.7.4.3. Findings.

6.7.4.3.1. A major finding is defined as a condition that may endanger personnel, jeopardize equipment or system reliability, impact safety of flight or warrant discontinuing the process or equipment operation.

6.7.4.3.2. Any major discrepancy will result in an automatic inspection failure. **(T-2)**

6.7.4.3.3. The QA Inspector will intercede and declare a major finding when one additional action will result in one of the following: endanger personnel, jeopardize equipment or system reliability, impact safety of flight or warrant discontinuing the process or equipment operation. **(T-2)**

6.7.4.3.3.1. The QA Inspector will write up the major finding even though the jeopardizing action was never taken due to their intercession. **(T-2)**

6.7.4.4. A minor finding is defined as an unsatisfactory condition that requires repair or correction, but does not endanger personnel, impact safety of flight, jeopardize equipment reliability or warrant discontinuing a process or equipment operation.

6.7.4.4.1. CAT II minors will be documented for trends but must not be counted against the AQL. **(T-2)**

6.7.4.4.2. Soft FO contained in tool kits or found in cargo areas of aircraft which pose no FOD threat are classified as a minor finding since it will require more than one additional action to meet the definition of a major finding.

6.7.5. Observations. This category represents observed events or conditions with safety implications or technical violations not related to an evaluation or inspection, are considered unsafe, in violation of established procedures, or in the case of equipment, unfit for operations. Observations include: DSVs, TDVs and UCRs. The LEAP QA database is used to document any of the following conditions:

6.7.5.1. DSV. An observed unsafe act by an individual.

6.7.5.1.1. The QA Inspector must stop the unsafe act immediately. **(T-2)**

6.7.5.1.2. The QA Inspector will not document a separate DSV on an individual undergoing a PE since the unsafe act automatically results in a "Fail" rating on the PE. **(T-2)**

6.7.5.1.2.1. The QA Inspector will use DSV verbiage in the PE summary when a safety violation is committed during a PE. **(T-2)**

6.7.5.2. TDV. An observation of any person performing maintenance without the proper technical data available, available but not in use or not following the correct sequence of steps (if directed).

6.7.5.2.1. The technician must have knowledge of all general directives associated with the job prior to performing the task. **(T-2)** However, those general directives need not be present at the job site.

6.7.5.2.2. Do not document a separate TDV on an individual undergoing a PE but use TDV verbiage in the PE summary since failure to use technical data automatically results in a "Fail" rating.

6.7.5.3. UCR. An unsafe or unsatisfactory condition, other than a DSV, chargeable to the work center supervisor.

6.7.5.3.1. UCRs will be documented even when it is not possible to determine who created the condition. **(T-2)**

6.7.6. Evaluations. An evaluation represents the direct evaluation of a logistics action, inspection, or training conducted/performed by an individual or team. Evaluations are used to evaluate job proficiency, degree of training, and compliance with technical data or instructions.

6.7.6.1. PE. A PE is an over-the-shoulder (direct) evaluation of a maintenance action, inspection, or internal MXG support process (such as, PS&D, Analysis, MOC). Individuals performing, supervising, or evaluating tasks are subject to a PE. PEs may be performed on individuals working alone or as part of a team.

6.7.6.1.1. Rate PEs “Pass or Fail” based on established AQLs/standards. **(T-2)**

6.7.6.1.2. Document the PE in the LEAP QA database. **(T-2)**

6.7.6.1.3. PEs will be accomplished on all technicians who perform maintenance. **(T-2)** MAJCOMs will “establish” the frequency. **(T-2)**

6.7.6.1.4. Personnel in any AFSC certified to perform nuclear maintenance or logistics operations (example, limited general maintenance, transfer, transport) will also comply with applicable PE requirements in AFMAN 21-200.

6.7.6.1.5. Types of PEs.

6.7.6.1.5.1. Individual Evaluations. This is a QA over-the-shoulder (direct) evaluation of a technician or supervisor performing a job.

6.7.6.1.5.2. Team Evaluations. This is a QA over-the-shoulder (direct) evaluation of technicians and supervisors performing a team task.

6.7.6.1.5.2.1. A team task is one requiring more than one person to complete the task (for example, refueling, ECM pod up/downloading, bomb build-up, towing, weapons maintenance, pylon installation).

6.7.6.1.5.2.2. Team evaluations must accurately assess the proficiency of each individual under evaluation.

6.7.6.1.5.2.3. Refer to AFMAN 21-200 for nuclear weapons maintenance and handling evaluations.

6.7.6.1.6. QA Inspectors will conduct on each NDI technician, for each NDI method annually (every 2 years for the ARC) to ensure effective trending on NDI methods. **(T-2)**

6.7.6.2. Performing a PE. When performing a PE, the QA Inspector will brief the individual or team on the evaluation and how it will be rated. **(T-2)**

6.7.6.2.1. The QA inspector will determine what task will be evaluated. **(T-3)**

6.7.6.2.2. The PE will include an evaluation of the individual's training records, SCR (if task requires), tools, equipment, TMDE (use/impact of certification label limitation on maintenance being performed), and TOs used to perform the task. **(T-2)**

6.7.6.2.3. The evaluation starts when the individual or team begins the task, or portion of the task to be evaluated, and is completed when the task or previously determined portion of the task is finished. **(T-2)**

6.7.6.2.4. Provide feedback to the individual or team and supervision upon completion. **(T-2)**

6.7.6.3. Rating PEs. QA Inspectors rate each evaluation based on AQLs/standards. The rating applies only to the specific task evaluated and not to other tasks that a technician or supervisor is qualified to perform. Upon completion of a failed evaluation, the QA Inspector must provide on-the-spot feedback. **(T-2)** Determine ratings as follows:

6.7.6.3.1. Pass: Number of discrepancies does not exceed AQL/standards.

6.7.6.3.2. Fail: An evaluation that results in any of the following:

6.7.6.3.2.1. Number of discrepancies exceeds the established AQL/standards.

6.7.6.3.2.2. A technician fails to detect a major discrepancy while complying with an inspection or TO requirement.

6.7.6.3.2.3. A technician fails to comply with a technical data step.

6.7.6.3.2.3.1. QA Inspectors will notify individuals immediately during the PE that a TDV was committed. **(T-2)**

6.7.6.3.2.3.2. Do not document a separate TDV on an individual undergoing a PE, since failure to use technical data automatically results in a "Fail" rating.

6.7.6.3.2.4. A technician demonstrates a lack of technical proficiency, system knowledge or demonstrated knowledge commensurate with skill grade.

6.7.6.3.2.5. Training and certification not documented.

6.7.6.3.2.6. A technician commits a safety violation.

6.7.6.3.2.6.1. Use the word "Safety" when a safety violation is committed during a PE.

6.7.6.3.2.6.2. Do not document a separate DSV on an individual undergoing a PE since the unsafe act automatically results in a "Fail" rating on the PE.

6.7.6.3.2.7. A technician fails to document maintenance actions in appropriate equipment records.

6.7.6.3.2.8. For nuclear weapons maintenance, an unsatisfactory rating must be given when any deficiencies or applicable unsatisfactory conditions exist IAW AFMAN 21-200. **(T-2)**

6.7.7. Inspections: An inspection represents inspections of equipment, programs, and processes to ensure compliance with established standards. Inspections are rated as "Pass" or "Fail". Inspections include:

6.7.7.1. QVIs. A QVI is an inspection of equipment condition, or a maintenance process, an assessment following a maintenance inspection, servicing or repair action, or verification that a technician or supervisor properly completed an inspection or repair action.

6.7.7.1.1. QVIs will not be conducted after equipment operation when such operation could invalidate indications of proper job accomplishment.

6.7.7.1.2. Limit QVIs to the same inspection card deck or technical data required for the job. This inspection does not require disassembling parts, removing stress panels or like actions.

6.7.7.1.3. A QVI required for -6 TO inspections may be accomplished by checking a portion of the required card or area.

6.7.7.1.4. The QVI report should reflect deficiencies by the individual who accomplished the task and identify specific discrepancies.

6.7.7.1.5. Document these discrepancies in active equipment records and forms, for example AFTO Form 781A, AFTO Form 244, *Industrial/Support Equipment Record*.

6.7.7.1.6. Rate QVIs "Pass" or "Fail" by comparing the number of discrepancies with the established AQLs/standards.

6.7.7.1.6.1. Pass: Number of discrepancies does not exceed established AQL/standard.

6.7.7.1.6.2. Fail: An inspection that results in any of the following:

6.7.7.1.6.2.1. A technician fails to detect a major discrepancy while complying with an inspection or TO requirement.

6.7.7.1.6.2.2. Number of CAT I minor discrepancies exceeds the established AQL/standard.

6.7.7.1.6.2.3. A technician is not signed off in training records as task qualified.

6.7.7.1.6.3. Document the QVI in the LEAP QA database.

6.7.7.1.6.3.1. Each QVI is chargeable to the technician or supervisor who signed off/cleared the "corrected by" block or "inspected by" block of the applicable maintenance form or equipment record.

6.7.7.1.6.3.2. When evaluating the technician who signed off the "inspected by" block, evaluate only the items normally verified by signing off the "Red-

X".

6.7.7.1.6.3.3. Only one evaluation is scored for each inspection.

6.7.7.2. Management Inspection (MI). Perform these inspections to follow-up on trends, conduct investigations or conduct research to get to the root cause of problems. MXG/CCs, SQ/CCs or work center supervisors may request MIs. MIs may encompass PE/QVI trends and other inspection data, NMC causes, aborts and trends, IFE trends, high component or system failure rates, suspected training deficiencies, and tasks outlined in aircraft -6 TOs. MI results are reported to the requester. MIs can be non-rated and may be counted in QA trends. The LEAP QA database will be used to document MIs. **(T-2)**

6.7.7.3. Special Inspections (SIs) are inspections not covered by QVIs, PEs or MIs. SIs may include, but are not limited to, aircraft and equipment forms inspections, document file inspections, CTKs, TO files, vehicle inspections, housekeeping, safety practices, FOD Program, SIs may be condition, procedural, or compliance oriented.

6.7.7.3.1. The LEAP QA database will be used to document special inspections. **(T-2)**

6.7.7.3.2. SIs will be rated as "Pass" or "Fail" based on established AQLs/standards.

6.7.8. Discrepancy Reporting. Report all discrepancies to the applicable work centers. **(T-2)**

6.7.8.1. QA will provide an authoritative, validated source reference for all reported discrepancies (such as, work cards, job guides, WUC manuals, checklists, occupational safety requirements, TOs, and other applicable references). **(T-2)**

6.7.9. Units will grade their MSEP evaluations monthly using objective ratings based on the following five-tier rating system:

6.7.9.1. Outstanding: 95-100% **(T-2)**

6.7.9.2. Excellent: 90-94.99% **(T-2)**

6.7.9.3. Satisfactory: 80-89.99% **(T-2)**

6.7.9.4. Marginal: 70-79.99% **(T-2)**

6.7.9.5. Unsatisfactory: 0-69.99% **(T-2)**

6.7.9.6. Inspections and evaluations performed (such as, PE, SI, QVI) are rated "Pass/Fail". Exception: Unless otherwise directed by AFMAN 21-200 and AFI 21-204 for Nuclear Weapons PEs and Certification Program.

6.7.9.7. Ratings are calculated by dividing the total number of inspections passed by total completed. For example, QA inspects 10 aircraft preflights with the following results: 9 "passes" and 1 "failure". Divide the total "passes" by the total inspections (9/10=0.90) 90 percent for an "Excellent" rating.

6.7.9.7.1. Deduct 0.5 percentage points from overall percentage grade for each TDV, DSV, and UCR monthly. For example, a squadron earns an overall rating of 90 percent, "Excellent", however, QA observed 4 TDVs and 3 DSVs. Multiply the sum (7) by 0.5 and subtract the product (3.5) from the original 90 percent. The adjusted total is 86.5 percent; therefore, the squadron is rated "Satisfactory".

6.7.10. A cumulative MXG score will be determined by dividing the Group's total number of inspections and evaluations passed by the total inspections and evaluations completed. **(T-2)**

6.7.10.1. Deduct 0.5 percentage points for each TDV, DSV, and UCR from the overall percentage grade, using same formula in **Paragraph 6.7.9.7.1**.

6.7.11. Monthly Summary. QA will publish and distribute the monthly summary to the MXG/CC or equivalent and inspected organizations. **(T-2)**

6.7.11.1. For security purposes, classified portions of the MSEP will be published separately from the main summary. **(T-2)**

6.7.11.2. QA will compile the summary from inspection data and attach the load crew evaluation statistics provided by WS. **(T-2)**

6.7.11.3. The MSEP summary should include visual information, graphs, narratives, quality trends identified through inspections and evaluations, discussion of common problem areas and descriptions of successful programs or initiatives.

6.7.11.4. The following areas must be addressed in the summary:

6.7.11.4.1. Compliance with and currency of TOs and directives to include unit. **(T-2)**

6.7.11.4.2. Aircraft and equipment forms documentation. **(T-2)**

6.7.11.4.3. Compliance and management of Safety, Environmental, Housekeeping, cyber discipline/Hygiene and FOD Programs. **(T-2)**

6.7.11.4.4. Training Program. **(T-2)**

6.7.11.4.5. Key Task List (KTL). **(T-2)**

6.7.11.4.6. Routine Inspection List (RIL). **(T-2)**

6.7.11.4.7. TDVs, DSVs, and UCRs. **(T-2)**

6.7.11.4.8. Munitions Program. **(T-2)**

6.7.11.4.9. TMDE PMEL Activity Summary (if TMDE lab assigned). **(T-2)**

6.7.11.4.10. High-missed carded items. **(T-2)**

6.7.11.4.10.1. A high-missed carded item is defined as any work card item missed at least three times during a one-month period.

6.7.11.4.10.2. Units should use the high-missed carded items to enhance maintenance training programs, detect trends and improve the quality of maintenance.

6.7.11.4.10.3. MMA will review items to identify any relationships with repeat, recur and CND trends. **(T-2)**

6.7.11.4.11. Narrative Report: The monthly narrative report must contain an analysis of the MSEP results, a summary of significant CAT I and II discrepancies, technical inspections, and recommendations for improvement.

6.7.11.4.11.1. Prior to preparing the narrative report, QA will conduct a study of trends. **(T-2)**

6.7.11.4.12. Trend Analysis. QA will review previous reports to determine if inspected areas have improved or declined. **(T-2)**

6.7.11.4.12.1. Consistent high scores in any category may indicate the programs emphasis is not focused on the unit's actual problem areas. Low scoring areas may require a reassessment of the corrective actions taken by management. Continuous communication between MMA, unit leadership, maintenance supervision, and QA personnel is essential.

6.7.11.4.12.2. Highlight trends and root causes in the summary.

6.7.12. - 6.7.12.2. DELETED.

6.8. LEAP QA Database. Units will use the LEAP QA database to capture MSEP data. **(T-1)** The LEAP User's Manual provides information on registration, site management, and evaluation/inspection input and can be found at: **https://leap.disa.mil/mi/LEAPQA/Account/Login.aspx?ReturnUrl=%2fmi%2fLEAPQA%2fDefault.aspx**.

6.8.1. LEAP QA Database Roles and Responsibilities. Roles in LEAP are assigned based on each user's authorized level of control needed. The roles themselves operate in a hierarchical manner with each successively higher role possessing all of the rights of the subordinate roles. Only one role will be assigned to a LEAP user at any given time.

6.8.1.1. Application Administrator. This role is limited to Defense Information System Administration (DISA) programming staff and Program Management Office (PMO) personnel only. They perform Department of the AF-wide database management and modification. LEAP Application Administrator will:

6.8.1.1.1. Host a quarterly (virtual) Functional Review Board (FRB) and an annual (Physical or Virtual) Functional Review Board. **(T-2)**

6.8.1.1.1.1. Attendees will include: DISA Programming staff, PMO, AF/A4LM LEAP representative, Functional Administrators, and when possible, Site Managers. **(T-2)**

6.8.1.2. Provide initial training to Functional Administrators and Site Managers as necessary. **(T-2)**

6.8.1.3. Update the LEAP User's Manual as necessary. **(T-2)**

6.8.1.4. Provide a monthly status of all System Change Requests (SCRs). **(T-2)**

6.8.2. Functional Administrator. LEAP Functional Administrators provide overall database management and typically operate at the MAJCOM level. Usually assigned to a MAJCOM's policy section, they ensure proper use and alignment of the database with current policy guidelines. They also operate as the primary focal point for all LEAP-related issues within their MAJCOM and coordinate directly with the LEAP PMO. LEAP Functional Administrators will:

6.8.2.1. Manage access to LEAP either directly or through local site offices that have the capability for delegation for Site Managers only, for example, FMxC2 Manager on site. **(T-2)**

6.8.2.2. Develop and assign LEAP Finding Codes IAW MAJCOM directives. **(T-2)**

6.8.2.3. Create, modify, and manage sites within the LEAP Database for their MAJCOM. **(T-2)**

6.8.2.4. Transcribe and manage Command Task Lists (CTL) in LEAP IAW MAJCOM directives (example, RILs).

6.8.2.5. Assist local Site Managers with day-to-day operations in LEAP to include troubleshooting and reporting SCRs to the PMO. **(T-2)**

6.8.3. Site Manager. LEAP Site Managers provide local oversight for their respective Group (or equivalent). Possessing "base level" control, they are able to approve and modify LEAP Users and assign roles up to and including other Site Managers. While there is no limitation to how many Site Managers can be assigned per site, the level of control available should warrant assignment based on appropriate rank/position (typically, QA Superintendent and Chief Inspector). LEAP Site Managers will:

6.8.3.1. Manage access to LEAP by coordinating new user documentation with their assigned FMxC2 Manager and approving accounts in LEAP after user registration. **(T-2)**

6.8.3.2. Modify user accounts according to need. **(T-2)**

6.8.3.3. Ensure LEAP users are deactivated or downgraded in LEAP when out-processing the QA office. **(T-2)**

6.8.3.4. Create Flights and Sections in LEAP to which evaluations will be assigned. **(T-2)**

6.8.3.5. Assign RILs (Command Task Lists/Site Task Lists) within the LEAP application to Organizational Sites in order to facilitate entry of the MXG's Evaluation and Inspection Plan. **(T-2)**

6.8.3.6. Build and manage the E&I Plan (if used) in LEAP and ensure it incorporates all MAJCOM specific requirements. **(T-2)**

6.8.4. Read-Only Guest. LEAP Read-Only Guests are intended to be supervisory personnel and unit leadership who require regular access to LEAP Reports and Evaluation documentation.

6.9. QA Product Improvement Programs (PIP). QA runs PIP for the maintenance complex. Combined with daily maintenance data reporting, the PIP monitors, and reviews maintenance data to identify opportunities to improve aircraft and equipment. PIP includes the following programs:

6.9.1. DR Reporting.

6.9.2. TO RC requests.

6.9.3. SMR code change request(s).

6.9.4. Configuration Management (CM) and Modification Management Program; AF Form 1067, Modification Proposal; and TCTOs.

6.9.4.1. QA is responsible for CM and Modification Management. This includes reviewing, submitting, and tracking unit modification proposals being worked by MAJCOMs/Lead Commands and ensuring proper implementation of approved modification instructions or TCTOs.

6.9.4.2. QA will manage/document modifications IAW **Chapter 14**, AFI 63-101/20-101, TO 00-20-2, and TO 00-5-15.

6.9.4.3. QA will establish a process for updating the weapon systems MIS that require manual updates for TCTO configuration. **(T-2)**

6.9.5. Product Improvement Manager (PIM). The PIM promotes deficiency reporting and provides a sound PIP based on inputs from maintenance activities. The PIM interacts with assigned AFETS personnel, FSR and MAJCOM/Lead Command as applicable to remain cognizant of ongoing and new improvement initiatives. The PIM emphasizes and promotes product improvement initiatives and ensures maintenance personnel are familiar with them by circulating flyers/newsletters, visiting commander's calls, presenting the program at maintenance orientation briefings, and making routine visits to maintenance areas.

6.9.5.1. Deficiency Reporting. DR is the process of reporting prescribed by TO 00-35D-54. Maintenance processing of warranty items is located in TO 00-20-3. The PIM's will:

6.9.5.1.1. Monitor the DR process to ensure items are properly loaded in the MIS database. **(T-2)**

6.9.5.1.2. Ensure compliance with acceptance inspection reporting requirements on DRs for aircraft returning from depot or contractor maintenance. **(T-2)**

6.9.5.1.3. Ensure DRs are submitted using Joint Deficiency Reporting System (JDRS) at **https://jdrs.mil**. **(T-2)**

6.9.5.1.4. Review the DR prior to releasing to the ALC or AFMC Maintenance Wings IAW TO 00-35D-54. **(T-2)**

6.9.5.1.5. Verify each report against pertinent publications and assign the appropriate precedence and category. **(T-2)**

6.9.5.1.6. Screen reported deficiencies for possible unit-unique contributing factors and initiate management action on unsatisfactory conditions resulting from local procedures or a lack of technical capability. **(T-2)**

6.9.5.1.7. Perform/coordinate a technical review of DRs returned to the unit without an adequate response to determine whether resubmitting with additional information is warranted. **(T-2)**

6.9.5.1.8. Perform exhibit-processing oversight by coordinating with the ALC and the LRS to ensure proper exhibit control and handling. **(T-2)**

6.9.5.2. RC Process. The PIM will review and route RCs IAW TO 00-5-1.

6.9.5.3. SMR code change request. Submit an SMR code change request IAW TO. 00-25-195, *AF Technical Order System Source, Maintenance, and Recoverability Coding of Air Force Weapons, Systems, and Equipment*. The PIM will:

6.9.5.3.1. Track the status of SMR change requests. **(T-2)**

6.9.5.3.2. Conduct a technical review of SMR change requests returned from depots and item managers with an unsatisfactory answer to determine whether to resubmit with additional information. **(T-2)**

6.9.5.3.3. Coordinate repair evaluation meetings when approved SMR change requests affect several agencies. **(T-2)** Ensure units with active AFREP coordinate SMR code changes through the PIM prior to submission to the MAJCOM AFREP Manager. **(T- 2)**

6.9.5.3.4. Serve as focal point for base-level repair and manufacturing capability. **(T-2)**

6.10. Technical Order Distribution Office (TODO). The TODO ensures TOs and CPINS are managed IAW AFI 63-101/20-101, TO 00-5-1, TO 00-5-15 and TO 00-5-16. TO 00-5-1 provides criteria for establishing levels of TO distribution activities. Additionally, TODOs will control electronic technical data configuration IAW **Chapter 8**. Establish the PMEL TODO under the control of the TMDE Flight. **(T-2)** The TODO will:

6.10.1. Coordinate with QA SME for each incoming TCTO to determine applicability. **(T-2)**

6.10.1.1. All TCTOs received from outside agencies need to be routed through QA for the review process.

6.10.1.2. TCTO applicability is determined by aircraft serial number for aircraft, engine serial number for engines, and by part number or other specific criteria for commodities.

6.10.1.3. TCTOs need to be manually or electronically date stamped to reflect the date the electronic or hard copy is received.

6.10.1.3.1. Date stamping all TCTOs with the date received indicates QA has reviewed the TCTO and that applicability has been determined.

6.10.1.3.2. TCTO electronic date stamping can be accomplished by either (1) utilizing a locally developed spreadsheet containing the minimum following information: TCTO number, MDS, receiving TODO name, applicability determination and the date received, all of which must be associated with the corresponding TCTO or (2) inserting the receipt date on the TCTO utilizing the Adobe Tools feature. For either option, the date received will be entered by the QA TODO responsible for tracking TCTOs. **(T-2)**

6.10.1.3.2.1. If used, the TCTO tracking spreadsheet or Adobe-inserted date stamped TCTOs will be electronically secured and controlled by the receiving QA office. **(T-2)**

6.10.1.3.3. Only date stamped TCTOs are authorized for use. **(T-2)**

6.10.1.4. Post TCTO file copies IAW TO 00-5-1.

6.10.1.4.1. TCTO file copies may be posted and distributed in electronic format provide all requirements of TO 00-5-1 and AFI 33-322 are sustained. Electronic TCTO distribution is automated for ETIMS/IETM.

6.10.1.5. For hard copy TCTOs, provide a file copy of the TCTO to PS&D. **(T-2)**

6.10.1.6. Ensure personnel assigned as TODO/Technical Order Distribution Account (TODA) managers meet requirements set forth in TO 00-5-1 and AFI 63-101/20-101. **(T-2)**

6.10.2. Manage the QA Central TO File. **(T-2)**

6.10.2.1. As a minimum, the QA Central TO File must contain copies of general and procedural TOs and copies of all TCTOs pertaining to the assigned aircraft and equipment

owned, operated, or maintained. (Paper copies for paper TOs or local access for digital TOs) **(T-2)**

6.10.2.2. The file is kept to meet QA requirements, not to duplicate TOs held by maintenance work centers.

6.10.3. Manage TO accounts using ETIMS IAW TO 00-5-1. **(T-2)**

6.10.4. Limit use of Local Work Cards, Local Job Guides, Local Page Supplements or Local Checklists to accomplish maintenance on AF equipment. **(T-2)** Locally prepared technical instructions will not be used to circumvent approved technical data (see TO 00-5-1). **(T-2)**

6.10.4.1. The TODO will review and manage all locally developed products IAW TO 00-5-1 and MAJCOM supplements for safety and adequacy of procedures. **(T-2)**

6.10.4.2. Local Work Cards, Local Job Guides, Local Page Supplements and Local Checklists need to be reviewed for currency when source reference data changes.

6.10.4.3. TODO will develop local publications IAW DAFMAN 90-161 to ensure compliance with these policies. **(T-2)**

6.10.5. Prepare a list of all changes and revisions to indexes, TOs, inspection work cards and checklists. **(T-2)**

6.10.5.1. This list will include TO number and date received. **(T-2)**

6.10.5.2. The TODO will date stamp the cover page of all paper TOs, changes, supplements, Local Work Cards, Local Job Guides, Local Checklists and CPINS to reflect the date the hard copy is received. **(T-2)**

6.10.5.2.1. This list will be sent out electronically weekly to all affected agencies. **(T-2)**

6.10.5.2.2. Supervisors should review the list of changes and ensure all personnel are aware a change or revision has been received.

6.10.5.3. "Immediate" action TCTOs must be implemented upon receipt, and "Urgent Action" TCTOs, safety supplements and interim supplements must be brought to the attention of local maintenance supervision within 24 hours of receipt. **(T-2) Note:** Communication of a grounding, or potential grounding event (TCTO, OTI, PM event) to weapon systems operating in a deployed environment and/or under the authority of an operational command must follow the grounding procedures outlined in DAFMAN 11-401, *Aviation Management*, and AFI 63-101/20-101. Units will not directly communicate home station requirements to its deployed forces but provide communication through their respective MAJCOM. **(T-2)**

6.10.6. Ensure all authorized technical data variances are kept with aircraft and equipment historical records IAW **Chapter 14**. **(T-2)**

6.10.7. If designated as Lead TODO (primary as designated in block 5 of the AFTO Form 43 per TO 00-5-1), will conduct a management inspection on other maintenance TODOs/TODAs in the maintenance complex at least annually along with performing spot checks of TO files. **(T-2)**

6.10.7.1. As part of this inspection, the TODO will confirm TODO/TODA personnel and Library Custodian have completed the mandatory minimum requirements of TO System training. **(T-2)**

6.10.7.2. The Lead TODO(s) will coordinate with other TODOs and TODAs, and local Client Support Administrators, Functional Systems Administrators, and applicable functional OPRs to ensure eTools are configured with current and only authorized software to support TO and maintenance documentation. **(T-2) Note:** Coordination with the local Communications Squadron to verify network configuration requirements for eTools are available and sustained to meet the requirements listed in TO 31S5-4-ETOOL-1-WA-1. Additional user support available through the Air Force Technical Order Functional Support Team, **af.etimstofst@us.af.mil** or DSN 872-9300.

6.10.8. Control the electronic data configuration on applicable eTools IAW **Chapter 8**. **(T-2)**

6.10.8.1. TODO/ Functional Systems Administrators will develop local procedures to quarantine eTools and eTool update history in the event of a mishap. **(T-2)**

6.10.9. Maintain records of ETIMS IAW TO 00-5-1.

6.10.9.1. TODOs will set up software sub-accounts with each appropriate shop/section and ensure each shop/section has the most current software on hand. **(T-2)**

6.10.9.2. TODOs will include ETIMS or equivalent system in the routine and annual checks required by TO 00-5-1. **(T-2)**

6.11. One-Time Inspections (OTI) program. The OTI program is managed by the MXG IAW TO 00-20-1. OTIs are normally look-only actions to verify the existence of suspected equipment conditions or malfunctions.

6.12. Functional Check Flights (FCFs) to include Operational Check Flights (OCFs).

6.12.1. Check Flights are performed to ensure an aircraft is airworthy and/or capable of accomplishing its mission. Additional guidance may be found in DAFMAN 11-401, AFMAN 11-202 V3, *Flight Operations*, DAFMAN 13-201, *AF Airspace Management*; TO 1-1-300, *Maintenance Operational Checks and Check Flights*; TO 00-20-1; and applicable -6 TOs and -1 Flight Manuals.

6.12.1.1. OCF will be kept to a minimum and are not used to replace TO 1-1-300, *Maintenance Operational Checks and Check Flights* or MDS specific -6 TO Functional Check Flight (FCF) requirements. OCFs must be flown by experienced aircrews (not required to be an FCF qualified aircrew), must be briefed by QA for aircraft condition, and accomplished following the same maintenance criteria as FCFs. **(T-2)**

6.12.2. The QA FCF Program Manager will:

6.12.2.1. Establish local FCF procedures IAW TO 1-1-300 and checklists for any specific local aircraft requirements to include configuration, administration, control, and documentation of the FCF Program. **(T-2)**

6.12.2.1.1. Coordinate these procedures with OG Standardization/Evaluation and publish them in a wing publication/supplement IAW DAFMAN 90-161. **(T-2)**

6.12.2.2. Support the appropriate squadron to facilitate FCF.

6.12.2.3. Maintain an information file containing unit directives concerning FCF procedures and an FCF checklist for each MDS assigned for briefing aircrews. **(T-2)**

6.12.2.3.1. DELETED.

6.12.2.4. Ensure a FCF checklist is used for each FCF. **(T-2)**

6.12.2.5. Ensure all FCFs are debriefed with the appropriate debrief function. **(T-2)**

6.12.2.5.1. During debriefing, the FCF checklist and aircraft forms will be reviewed to determine if all requirements have been accomplished. **(T-2)**

6.12.2.5.2. After completing the review, the FCF checklist will be sent to PS&D for inclusion in the aircraft jacket file. **(T-2)**

6.12.2.6. Maintain a copy of the AF Form 2400, *Functional Check Flight Log*, or equivalent automated product for deficiency and trend analysis. **(T-2)**

6.12.3. FCF-qualified QA Inspectors will:

6.12.3.1. Ensure the FCF aircrew is briefed on the purpose and extent of the flight, previous maintenance problems and discrepancies recorded on the aircraft or engines related to the FCF. **(T-2)**

6.12.3.2. Review aircraft W&B documents. **(T-2)**

6.12.3.3. Ensure AF Form 2400 or an equivalent automated product is maintained to provide information for evaluation and analysis. **(T-2)**

6.12.3.3.1. Include the date and time of the FCF, aircraft serial number, reason for FCF, name of debriefer and name of aircraft commander. **(T-2)**

6.12.3.3.2. The AF Form 2400 or equivalent automated product will also indicate if the aircraft was released for flight, reasons for any non-release, action taken, and date completed, and the date maintenance documents were forwarded to PS&D or records section. **(T-2)**

6.12.3.4. Ensure all maintenance actions are completed and all AFTO Form 781-series forms are documented IAW MDS specific -6 TO and TO 00-20-1 or electronic equivalent. **(T-2)**

6.12.3.5. All maintenance actions on transient aircraft requiring FCF must be reviewed by QA prior to FCF. **(T-2)**

6.12.3.5.1. If the aircraft MDS/type is not assigned at the transient base, then the owning unit must provide a qualified FCF pilot/crew and maintenance as required. **(T-2)**

6.12.4. Flight Requirements. The mandatory requirements for FCF are outlined in TO 1-1-300 and the applicable -6 TO. FCF profiles are determined by the maintenance requirement causing the FCF. The FCF profile will be tailored for the discrepancy causing the FCF by applying the following guidance:

6.12.4.1. Require a clean configuration whenever FCFs are flown for flight controls, fuel controls or engine changes. **(T-2)**

6.12.4.2. Do not remove fixed wing pylons, fixed wing tip tanks and fixed external stores unless they interfere with fuel scheduling, aerodynamic reaction, air loading, signal propagation. **(T-2)**

6.12.4.3. DELETED.

6.12.5. FCF Release. An FCF release occurs upon the successful completion of all requirements as determined by the FCF aircrew. The final decision to release rests solely with the aircraft commander. An aircraft may be released for flight if a malfunction occurs during an FCF, which is not related to the condition generating the FCF and the original condition checks good.

6.12.5.1. An FCF conditional release may occur when the aircraft does not successfully complete FCF requirements due to a specific system malfunction. The FCF aircrew, in coordination with maintenance, determines a FCF conditional release if the malfunction may be corrected without generating another FCF. If upon review of the corrective action, the FCF aircrew accepts the maintenance action as a satisfactory repair of the malfunction, they may release the aircraft from FCF.

6.12.6. MAJCOMs will determine the process and level of command that will issue instructions for FCF procedures away from home station in their supplements to this DAFI.

6.13. Inflight Operational Checks. Inflight operational checks (as applicable) will be accomplished IAW TO 1-1-300, TO 00-20-1 and applicable -6 and -1 TOs.

6.13.1. Document inflight operational checks IAW TO 00-20-1.

6.14. High Speed Taxi Checks. The MXG/CC and OG/CC may authorize high speed taxi checks when a maintenance ground operational check requires aircraft movement at higher-than-normal taxi speeds (with qualified FCF aircrews) to operationally check completed maintenance.

6.14.1. High speed taxi checks (as applicable) will be accomplished IAW TO 1-1-300 instead of FCFs. **(T-2)**

6.14.1.1. Process aircraft forms through QA using FCF procedures. **(T-2)**

6.14.1.2. QA will develop an aircrew briefing checklist specifically for high-speed taxi checks, to include the required FCF briefing items and pertinent warnings, cautions. **(T-2)**

6.14.2. Configure aircraft with the minimum -1 operational fuel requirements. **(T-2)**

6.14.3. Ensure aircraft is prepared for flight and the Exceptional/Conditional Release is signed off prior to conducting high speed taxi checks. **(T-2)**

6.15. Weight and Balance (W&B) Program. QA will maintain the W&B Program IAW TO 1-1B-50, *Basic Technical Order for USAF Aircraft Weight and Balance*.

6.15.1. W&B manuals for Class I and II aircraft are maintained in a central file. **(T-2)**

6.15.1.1. The Lead Command will standardize the method of supplemental handbook storage and physical location for like-MDS aircraft. **(T-2)**

6.15.2. QA will manage W&B on commercial derivative aircraft IAW **Chapter 6**. **(T-2) Note:** The contractor is responsible for managing W&B programs on contract logistics supported aircraft.

6.15.3. The W&B Program Manager will ensure:

6.15.3.1. Sufficient personnel are qualified on assigned aircraft IAW TO 1-1B-50. **(T-2)**

6.15.3.2. All assigned aircraft are weighed IAW prescribe MDS specific publications and directives. **(T-2)** The W&B Program Manager will:

6.15.3.2.1. Keep W&B documents required by TO 1-1B-50 for each assigned aircraft. **(T-2)**

6.15.3.2.2. Use the Automated Weight and Balance System and maintain a back-up copy of all W&B documents. **(T-2)**

6.15.3.3. Procedures are established for routing completed TCTO and modification information for W&B changes. **(T-2)**

6.15.3.4. Essential W&B data and changes to the basic weight and moment are available for appropriate mission planning (such as, Standard Configuration Loads, updates to supplemental handbook). **(T-2)**

6.15.3.5. Periodic serviceability inspections are accomplished on unit-stored and maintained W&B equipment (as applicable). **(T-2)**

6.15.3.6. Coordination with Maintenance Supervision in developing a W&B Preparation Checklist if the aircraft -5 TO is not comprehensive enough for the task. **(T- 2)**

6.15.3.7. The SCR reflects W&B certification. **(T-2)**

6.15.4. W&B Qualified QA Inspector Responsibilities. The W&B Qualified QA Inspector will:

6.15.4.1. Verify scale readings and accomplish/oversee the actual computations. **(T-2)**

6.15.4.2. Supervise the preparation, leveling and weighing of the aircraft IAW MDS specific –2 and –5 series TOs and TO 1-1B-50.

6.15.4.3. Inspect W&B documents before flight when locally accomplished modifications affect the basic aircraft weight and moment. **(T-2)**

6.15.4.4. Review computations for accuracy. (T-2)

Chapter 7

IMPOUNDMENT PROCEDURES

7.1. Aircraft and Equipment Impoundment. Aircraft or equipment is impounded when intensified management is warranted due to system or component malfunction or failure of a serious or chronic nature. Refer to DAFI 91-204 for aircraft and equipment involved in accidents, mishaps, or incidents. Impounding aircraft and equipment enable investigative efforts to systematically proceed with minimal risk relative to intentional/unintentional actions and subsequent loss of evidence.

7.2. Specific Guidance. MXGs will develop and implement a standardized Impound Official training course. The course will include review of applicable AFIs, TOs, impoundment clearing procedures, and leverage FSR and AFETS expertise to ensure Impound Official is prepared to assume all duties and responsibilities of an impoundment official.

7.2.1. Local program procedures, requirements and responsibilities will be captured in a local supplement to this instruction. **(T-3)**

7.2.1.1. QA is the OPR for the Impoundment Program and will develop local impoundment checklists. **(T-3)**

7.2.1.2. QA in coordination with MT, will serve as the OPR and focal point for the management of the Impound Official training course. The course completion is mandatory prior to being assigned as an Impound Official. **(T-3)**

7.2.2. - 7.2.2.1. DELETED.

7.2.3. The Impoundment Release Authority determines the need for a one-time flight and will coordinate appropriate authorization IAW TO 00-20-1. **(T-3) Note:** If the aircraft/equipment were impounded for a mishap, coordinate with the safety office prior to releasing the aircraft/equipment from impound. **(T-3)**

7.2.4. MAJCOMs will determine the amount of time unit QAs will maintain copies of finalized Impoundment reports in their supplement to this DAFI. **Note:** See Air Force Records Information Management System (AFRIMS) Reference.

7.3. Impoundment Authorities.

7.3.1. Impoundment Authorities will:

7.3.1.1. Make impoundment determination when extraordinary measures are required to address any degradation of aircraft airworthiness or serious aircraft/equipment anomaly, not listed in section 7.5. **(T-2)**

7.3.1.2. Select the Impoundment Official. **(T-2)**

7.3.1.2.1. - 7.3.1.2.3. DELETED.

7.4. Impoundment Official Responsibilities. The Impoundment Official is designated as the single POC for impounded aircraft or equipment and will hold the minimum rank of MSgt and will be tracked on the SCR. **(T-2)** The Impoundment Official will:

7.4.1. Be responsible for controlling and monitoring the investigation of impounded aircraft or equipment. **(T-2)**

7.4.2. Use established checklists to guide the sequence of actions. **(T-2)**

7.4.3. Control and track access of personnel to impounded aircraft or equipment. **(T-2)**

7.5. Mandatory Impoundments. Aircraft and/or equipment will be impounded:

7.5.1. DELETED.

7.5.2. Following an aircraft mishap as defined in DAFI 91-204 and DAFMAN 91-223, *Aviation Safety Investigations and Reports*. **(T-2)**

7.5.3. When support equipment is known or suspected to have been a factor in a mishap or may have contributed to injuries. **(T-2)**

7.5.4. Following an un-commanded flight control movement. **(T-2)**

7.5.5. Following an inadvertent ordnance release or explosive mishap. **(T-2)**

7.5.6. When authorized procedures are not adequate or the unit is unable to identify/repair loaded nuclear weapons system malfunctions IAW DAFI 91-101. **(T-2)**

7.5.7. Following aircraft engine anomalies to include but not limited to:

7.5.7.1. Unselected propeller reversal. **(T-2)**

7.5.7.2. Flameout/stagnation (for single engine aircraft). **(T-2)**

7.5.7.3. Unselected power reversal. **(T-2)**

7.5.7.4. Engine case penetrations, ruptures, or burn-through from an internal engine component. **(T-2)**

7.5.7.5. When an aircraft experiences a loss of thrust sufficient to prevent maintaining level flight at a safe altitude. **(T-2)** This includes all cases of multiple engine power loss or roll back.

7.5.7.6. Engine damage due to a foreign object and source of FO is determined to be internal to the engine. **(T-2)** For Propeller driven aircraft, both the propeller and engine will be impounded as a single unit when the engine has confirmed internal damage due to a foreign object. **(T-2)**

7.5.7.7. Engine damage which occurs during transport. **(T-2)**

7.5.8. Following an in-flight fire. **(T-2)**

7.5.9. When an aircraft experiences an in-flight loss of all pitot-static system instruments or all gyro stabilized attitude or direction indicators. **(T-2)**

7.5.10. When there is evidence of intentional damage, tampering, or sabotage. **(T-2)** **Exception:** Intentional damage due to combat is not mandatory.

7.5.11. When physiological incidents attributable to aircraft systems or cargo occurs. **(T-2)**

7.6. Impoundment Procedures.

7.6.1. When the Impoundment Authority directs impoundment, a Red X symbol will be placed in the applicable AFTO Form 781A for aircraft, applicable engine work packages for uninstalled engines or AFTO Form 244 for equipment (or electronic form equivalents) with a

statement indicating the reason for impoundment and the name of the assigned Impoundment Official. **(T-2)**

7.6.2. The MOC will be notified when an impoundment decision has been made. **(T-2)**

7.6.3. Aircraft or equipment records will be controlled at the discretion of the Impoundment Official. **(T-2)** When required, the Impoundment Official will:

7.6.3.1. Obtain and secure the current aircraft forms and the aircraft jacket file for aircraft, applicable engine work packages for uninstalled engines, or the AFTO Form 244 for equipment (or electronic form equivalents). **(T-2)**

7.6.3.2. Notify the MIS DBM administrator to isolate the aircraft or equipment serial number in order to prevent any changes and maintain the integrity of the historical data until the aircraft or equipment is released. **(T-2)**

7.6.3.3. Request and collect any training records, required to complete the impoundment investigation. **(T-2)**

7.6.3.4. On aircraft impounded for potential safety related incidents, ensure the Cockpit Voice Recorder/Flight Data Recorder circuit breakers are pulled immediately after engine shutdown or before applying external power to safeguard Cockpit Voice Recorder/Flight Data Recorder data, if equipped. **(T-2)**

7.6.3.5. Ensure impounded aircraft/equipment is identified by cordon with cones, ropes or placards indicating impound condition and aircraft location. **(T-2)**

7.6.4. Impoundment Official will limit maintenance actions on impounded aircraft or equipment until the cause is determined. **(T-2)**

7.6.4.1. The Impoundment Official will determine what maintenance can be performed in conjunction with the maintenance required to release the aircraft or equipment from impoundment. **(T-2)**

7.6.4.1.1. Impoundment Official will coordinate with Wing Safety or equivalent for aircraft, equipment, and parts disposition to support any ongoing safety or mishap investigation. **(T-2)**

7.6.4.2. Parts removed from impounded aircraft or equipment will be carefully controlled until impound has been cleared and/or a safety investigation determination has been made. **(T-2)** This is to ensure that parts, once confirmed as the cause for impoundment, are available to be processed as DR exhibits.

7.6.5. The Impoundment Official will select a team of qualified technicians dedicated to determining the cause of the problem that led to the impoundment. **(T-2)**

7.6.5.1. Impoundment team members will be relieved of all other duties until released by the Impoundment Official. **(T-2)**

7.6.6. Once the cause of the malfunction or failure has been positively determined, the Impoundment Official will brief the Impoundment Release Authority on findings, corrective actions, and requests release of the aircraft or equipment from impoundment. **(T-2)**

7.6.7. If the cause of the discrepancy could potentially affect other aircraft or equipment in the fleet, QA will provide cross-tell information for up-channeling to the MAJCOM and the designated Lead Command IAW AFPD 10-9. **(T-2)**

7.6.8. Clear impoundments from forms/MIS IAW TO 00-20-1. **(T-2)**

7.6.9. If the cause of a reported malfunction cannot be determined or a positive corrective action cannot be confirmed, the Impoundment Release Authority will determine if further actions are required (such as, requesting depot assistance, further troubleshooting, FCF/OCF). **(T-2)**

7.6.10. MAJCOMs will publish guidance outlining impoundment and release procedures for transient aircraft.

7.6.10.1. At locations where no MXG/CC or designated representative is available, the aircraft assigned MXG/CC may temporarily delegate Impoundment and Release Authority.

7.7. Rules of Impoundment Specifically for Explosive-Related Events/Mishaps. When an inadvertent release or an explosive mishap is reported, the following procedures will apply:

7.7.1. In-flight:

7.7.1.1. When the involved aircraft returns to the de-arm or parking area, the aircraft will be impounded. **(T-2)** Limit maintenance actions to those required to make the aircraft safe.

7.7.1.2. The MXG/CC, MOC, Munitions Control, WWM, QA and Wing Safety or equivalent will be notified of the impoundment action. **(T-2)**

7.7.1.3. The aircraft with unsafe munitions will be parked and isolated in an area approved by the weapons safety office or equivalent and airfield management. **(T-2)**

7.7.1.4. Investigate and report the incident IAW DAFI 91-204.

7.7.2. Ground:

7.7.2.1. The senior ground crew member will be in charge of the aircraft or equipment until relieved and will ensure involved persons remain at the scene. **(T-2)**

7.7.2.2. Protect other aircraft or equipment located near the incident if an explosive hazard exists. **(T-2)**

7.7.2.3. Do not change the position of any switches except as needed for safety. **(T-2)**

7.7.2.4. Limit maintenance actions to those actions required to make the aircraft or equipment safe. **(T-2)**

7.7.3. Preserve mishap evidence to the maximum extent possible. **(T-2)** An example would be segregating an aircraft gun versus destroying it if it poses no immediate danger. This allows for evaluation of all the evidence and the ability to recreate the mishap conditions.

7.7.4. If an incident, malfunction, or mishap is suspected to have occurred or caused by in-use, installed, or otherwise configured munition (live or inert), or a 20 or 30MM gun system jam creating a safety condition, notify the Global Ammunition Control Point Air Force Life Cycle Management Center, Munition Division (AFLCMC/EBH) Munitions Rapid Response Team: DSN: 312-777-2666; COMM: (801) 775-2666, and the MAJCOM munitions staff. **(T-2)**

7.7.4.1. Refer to DAFI 91-202 for additional information about the Munitions Rapid Response Team. **Note:** The Munitions Rapid Response Team can also provide units technical assistance in resolving recurring 20 or 30MM gun system jams and malfunction isolation.

7.7.5. For impoundments involving nuclear loaded weapon systems see **Paragraph 7.5.6**. **(T-2)**

Chapter 8

TOOL AND EQUIPMENT MANAGEMENT

8.1. Tool and Equipment Management. The objectives of the Tool and Equipment Management Program are to prevent and eliminate FOD to aircraft, engines, missiles, training, and support equipment, and to reduce costs through strict effective control and accountability of assets. To ensure standardization among maintenance units, commanders and key leaders are responsible for executing an effective tool program. MAJCOMs will identify small unique unit tool and equipment management requirements in a supplement, addendum or deviation as described in the purpose statement of this DAFI. DFT/CFT will adhere to local tool control policies and procedures provided in the MXG/MXO in-brief (see **Paragraph 5.2.1.9**) when working on aerospace equipment possessed by the unit. The AF enterprise Tool Accountability System is TCMax®. **(T-2) Exception:** N/A to aircraft/weapon system programs that provide tool and equipment accountability support as an internal function of the program (e.g., F-35 ALIS).

8.2. Guidelines for Program Management. Wings will document procedures for the control and management of all tools/equipment used for aircraft/aerospace equipment maintenance or which enter the flightline or aerospace equipment maintenance industrial areas, to include all wing organization's (Hospital, CE, vehicle Mx, Security Forces), to provide mission support in a wing level publication IAW DAFMAN 90-161. As a minimum, guidance will address the following:

8.2.1. Standardized procedures for security, control, and accountability of tools and equipment. **(T-3)**

8.2.1.1. DELETED.

8.2.2. Inventory requirements. **(T-3)** As a minimum, units will conduct and document an annual inventory of all tools and equipment. **(T-3)**

8.2.3. Procedures for warranted tool management. **(T-3)**

8.2.3.1. Procedures to tag/segregate unserviceable warranty tools. **(T-3)**

8.2.4. Procedures for control and management of replacement, expendable and consumable hand tools, HAZMATs, and other items contained in CTKs. **(T-3)**

8.2.5. Procedures for transfer of tools/CTKs at the job site (on-site transfers). **(T-3)**

8.2.5.1. Ensure tool accountability and control is maintained when transfer occurs between the individuals. As a minimum the individuals involved in the transfer will accomplish a joint inventory and document accordingly. **(T-3)**

8.2.6. Procedures for lost or missing tools. **(T-3)**

8.2.7. Assignment of Equipment Identification Designators (EID) for CTKs, non-CA/CRL equipment, and assignment of CTK numbers for tools. **(T-3)**

8.2.8. Procedures for issue, marking, and control of PPE, tools, or equipment (such as, hearing protectors, reflective belts, headsets) assigned/issued to individuals. **(T-3)**

8.2.8.1. At a minimum, individual issued equipment will be marked with first name initial, last name, and employee number. **(T-3)** For members without employee numbers,

organizational items will be marked with first name initial, last name, and organization. **(T-3)**

8.2.9. Procedures to ensure positive accountability and control of rags. **(T-3)**

8.2.9.1. A rag is defined as a remnant of cloth purchased in bulk or a standardized, commercial quality, vendor-supplied shop cloth used in general industrial, shop, and flightline operations.

8.2.9.1.1. Cheesecloth is considered a rag; however, paper products/paper towels are not considered rags.

8.2.9.2. Rags should be uniform in size and color.

8.2.9.3. Marking or identifying each shop rag with a CTK number is not necessary.

8.2.10. Procedures to limit numbers of personnel authorized to procure tools. **(T-3)**

8.2.11. Procedures for control of locally manufactured or developed tools and equipment. **(T-3)**

8.2.12. Procedures for FSRs/DFTs/CFTs when working on equipment within the unit. **(T-3)**

8.2.13. Standardized procedures and responsibilities for decentralizing CTKs, tools, and equipment outside tool room/support section to meet mission requirements. **(T-3)**

8.2.13.1. Inventory and accountability requirements described in this DAFI apply equally to all decentralized CTKs tools, and equipment. **(T-3)**

8.2.14. Procedures for control of response equipment permanently stored/located in trailers or vehicles. **(T-3)**

8.2.15. Procedures for requiring a second party or on-duty supervisor inspection of CTKs when conditions warrant a single person shift. **(T-3)**

8.2.15.1. The same individual that signs out a CTK cannot sign it back in. **(T-3)**

8.2.16. Procedures for controlled access to tool rooms. **(T-3)**

8.3. General Program Guidelines.

8.3.1. The Flight CC/SUPT will designate CTK custodians. **(T-3)**

8.3.1.1. CTK custodians are responsible for tool, HAZMAT, and consumable asset accountability and control. **Exception**: A separate person may be designated as the HAZMAT monitor.

8.3.2. Flight CC/SUPT and/or Section NCOICs/Chiefs (or equivalents) will determine the type, size, contents, and number of CTKs required for their work centers. **(T-3)**

8.3.2.1. The WWM will make this determination for load crew CTKs, when assigned. **(T-3)**

8.3.3. Design CTKs to provide for quick inventory and accountability of tools. CTKs and tools will be clearly marked with the Equipment Identification Designator (EID) (follow guidance below). **(T-3)**

8.3.4. CTK contents will be standardized to the maximum extent possible within functional elements of a squadron that have similar missions (such as, aircraft flights/sections and Combat Armament Support Team). **(T-3)**

8.3.5. Each tool, item of equipment, or consumable contained in a CTK will have an assigned location identified either by inlay cuts in the shape of the item, shadowed layout, label, or silhouette. **(T-3)**

8.3.5.1. No more than one item will be stored in a cutout, shadow, or silhouette. Tools too small to be etched individually may be place in CTKs as a set (such as, drill bits, Allen wrenches, apexes, or paired items like gloves, booties). **(T-3)**

8.3.6. A Master Inventory List (MIL) will be required for each CTK or series of identical CTKs. **(T-3)**

8.3.6.1. The WWM will approve/sign a single MIL to be used as the standard for all Load Crew CTKs on like mission-design-series aircraft; a copy will be maintained in each support section. **(T-3)**

8.3.6.2. When items such as dispatchable support equipment or dispatchable special tools are issued separately (not contained in a CTK) and contain multiple parts that are required for its use (such as, cartridges containing consumables, cables, hoses, adapters), a MIL of all the items will be provided with the support equipment or special tools to facilitate positive accountability of all items during checkout, transfer, and check in. **(T-3)**

8.3.6.3. The MIL resides in the TCMax®, but a hard copy of the signed MIL must reside with each dispatchable CTK to provide the ability to verify the inventory regardless of location. **(T-3)**

8.3.6.4. If items such as identification tags or dust caps are attached to tools/equipment, they will be secured in a manner that will minimize any possibility of FOD. **(T-3)**

8.3.6.4.1. Items not permanently attached, will be marked/etched with the appropriate CTK number. **(T-3)**

8.3.6.4.2. All items will be listed on the MIL. **(T-3)**

8.3.6.5. Consumables may be placed in CTKs. If so, they will be identified on the MIL as consumables. **(T-3)** Examples of consumables include safety wire, adhesive, wire bundle lacing, solder.

8.3.6.5.1. Do not include common hardware items such as bolts, nuts, and/or screws unless they are required for the tool to perform its intended function. Cartridges or equivalents containing consumable items whether disposable or not will be accounted for to mitigate FOD hazards. **(T-3)**

8.3.6.6. Tool sets placed within a CTK will be identified on the CTK MIL by total number of items in the set (such as, Allen wrench set - 9 each Allen wrenches + container for a total of 10). **(T-3)**

8.3.6.6.1. Items identified as too small to be marked, etched, or stamped, as approved by QA, will be annotated with a description of the individual items contained within the set on the CTK/MIL (such as, the variation in the size of the items contained within the set, Apex, file, drill bit, size). **(T-3)**

8.3.6.7. Missing, removed and/or broken tools/items will be documented in the TCMax® if they cannot be replaced immediately. **(T-3)**

8.3.6.7.1. In addition, for dispatchable CTKs, dispatchable support equipment, and dispatchable special tools containing multiple parts, missing, removed and/or broken tools/items will be documented on a MAJCOM/locally generated form, or on the hard copy MIL. **(T-3)**

8.3.6.7.1.1. If a MAJCOM/locally generated form is used, the form will be kept with each dispatchable CTK, dispatchable support equipment and dispatchable special tools. **(T-3)**

8.3.6.7.1.2. Pencil/pen may be used for hard copy MIL documentation and erased/lined through when cleared.

8.3.6.7.2. The EID will be removed from any permanently removed item/tool. **(T-3)**

8.3.6.7.3. A permanently removed (without planned replacement) item/tool constitutes a change to the inventory and requires a new MIL.

8.3.6.7.4. The CTK custodian has the authority to interchange "like" (form, fit, function) items.

8.3.7. Equipment and accessories that do not present a FOD potential and will not leave the work center, support section, or tool room, need not be included in a CTK; however, this equipment must have designated storage locations established. **(T-3)**

8.3.7.1. Designated locations may be work areas or stations.

8.3.8. The CTK Custodian will establish designated locations for test equipment and common accessories (such as, waveguides, attenuators, fittings, cables, adapters) that are not part of a CTK. **(T-3)**

8.3.8.1. As a minimum, designated locations will be labeled to identify the contents. **(T-3)**

8.3.8.2. Industrial shop machinery accessories/attachments (example, blades, arbors, chucks, gears) need not be controlled as tools; however, these items will be maintained in designated storage locations for accountability. **(T-3)**

8.3.8.2.1. As a minimum, storage cabinets/drawers will be labeled to identify the contents. **(T-3)**

8.3.9. Tools/expendable items used for titanium engine blade blending or oxygen system maintenance will be kept in special purpose kits separate from other tools. **(T-3)**

8.3.9.1. In addition to normal CTK identification, the titanium engine blade blending kits will be marked “For Titanium Engine Blade Blending Only”. **(T-3)**

8.3.9.2. In addition to normal CTK identification, oxygen system maintenance kits will be marked “For Oxygen System Use Only”. **(T-3)**

8.3.10. Discard removable (slide on) pocket clips and spare parts from tools when possible (flashlights, continuity testers, small screwdrivers) prior to placement in tool kits. **(T-3)**

8.3.10.1. Do not disassemble or damage tools for sole purpose of removing clips (example, tape measures, rubber switch guards).

8.3.11. Tools not controlled through CTK procedures are NOT authorized on the flightline, or in any maintenance area (for example, personal Mini Maglite® flashlights, Leatherman®, Buck Knives®). **(T-3)**

8.3.11.1. Units will mark and control equipment that a workcenter assigns/issues to an individual IAW MAJCOM supplements. **(T-3)**

8.3.11.2. Personally purchased tools are not authorized. **(T-3)**

8.3.12. Flashlights, lanterns, portable lighting devices and light sources will conform to the requirements of TO 00-25-172 when used during servicing operations; TO 1-1-3 when used during fuel cell maintenance; and DESR6055.09_AFMAN 91-201 when used in explosive environments. **Note:** Aircraft and equipment TOs may dictate additional restrictions.

8.4. TMDE Management Guidelines. Support Sections will designate a TMDE Monitor who will act as the focal point with the designated servicing PMEL (whether on-base or off-base) for managing the TMDE calibrations requirements for the owning work center. **(T-3)** The TMDE Monitor will:

8.4.1. Establish procedures for turn-in and pick-up of TMDE requiring calibration. **(T-3)**

8.4.2. Coordinate emergency calibration requirements. **(T-3)**

8.4.3. Review quarterly TMDE schedules and annual master identification (ID) lists within 5 duty days of receipt from servicing PMEL. **(T-3)**

8.4.3.1. Forward any corrections to the servicing PMEL within 3 duty days to have the PMEL Automated Management System/MIS updated. **(T-3)**

8.4.4. Take necessary actions to minimize the late delivery of TMDE for scheduled calibration. **(T-3)** Servicing PMEL will notify OWC of overdue TMDE under established procedures. **(T-3)**

8.4.5. Use PMEL Automated Management System or equivalent MIS (as coordinated with supporting PMEL) to control TMDE processed for maintenance. **(T-3)**

8.4.6. Ensure TMDE submitted for calibration has all required documentation complete, the AFTO Form 350 (as applicable) provides adequate malfunction description and accessories/ items required for calibration accompany the TMDE to include batteries (as applicable). **(T-3)**

8.4.7. Ensure classified TMDE is protected IAW AFI 16-1404.

8.4.8. Ensure TMDE shipped off base for calibration or repair and return is shipped by traceable means and IAW DAFI 24-602V2.

8.4.8.1. The TMDE Monitor will maintain a file consisting of all supporting documentation for each type of shipment. **(T-3)**

8.4.8.2. Safeguard any IUID marks during calibration/TMDE activities to the extent possible. In the event the UII is damaged during calibration activities, the TMDE Monitor will notify the responsible Equipment Custodian and/or EAE to replace the mark with the same UII. **(T-3)**

8.4.9. For deployment purposes, ensure equipment, tools, and HAZMAT items are properly identified, prepared, and documented IAW AFI 10-403.

8.5. Tool Accountability and Serviceability. Flight CC/SUPT and Section NCOICs/Chiefs, through CTK Custodians, are responsible for tool and equipment accountability and control (knowing where tools are and who has responsibility for them). When a person signs for a tool or piece of equipment, they are considered the user and accountable for the item until it is returned to the tool room and accountability transfers back to the CTK Custodian (through a representative or tool room employee).

8.5.1. All units must use TCMax® for accountability and control of tools and equipment. **(T-3)** Contractors and MEOs are not required to use TCMax® unless specified in the Performance Work Statement/Statement of Work. **Note:** Refer to **Paragraph 8.1** for exceptions.

8.5.1.1. Units are required to electronically back up TCMax® at least once a month. **(T-3)**

8.5.1.1.1. This backup must be kept physically and electrically separate from the computer that houses the tool control database. **(T-3)**

8.5.1.2. Units will use TCMax® to:

8.5.1.2.1. Track the issuance and receipt of all assigned tools, equipment, tool kits, HAZMAT items, TOs (does not apply to TOs, equipment and HAZMAT kept in a shop and not dispatched). **(T-3)**

8.5.1.2.1.1. HAZMAT items issued for one time use (oil cans, hydraulic cans, mixing compounds) are supply items and do not have to be tracked in TCMax®. However, HAZMAT and supply procedures will be followed. **(T-3)**

8.5.1.2.2. Track authorizations/restrictions for special tools/equipment (by individual). **(T-3)**

8.5.1.2.3. Track CTK and Support Section inspections. **(T-3)**

8.5.1.2.4. Track spare, lost, damaged, and/or removed tools. **(T-3)**

8.5.1.2.5. Develop and manage tool/equipment inventories. **(T-3)**

8.5.1.2.6. Develop and manage deployment kits (import/export). **(T-3)**

8.5.1.3. If TCMax® is not available (such as at a deployed location), units will use the AF Form 1297, Temporary Issue Receipt, a MAJCOM, or locally approved form for accountability and control of CTKs, equipment, and tools. **(T-3)**

8.5.2. The CTK Shift Supervisor will account for all dispatchable/decentralized CTKs, tools, and equipment at the beginning and end of each shift. **(T-3)**

8.5.2.1. Shift inventories must be documented by both outgoing and incoming personnel. **(T-3)**

8.5.2.2. CTKs present during tool room shift inventories do not need to be opened for inventory.

8.5.3. At least annually or when the CTK Custodian changes, conduct a comprehensive inventory of all dispatchable/decentralized tools, non-Custodian Authorization/Custody Receipt Listing (CA/CRL) equipment, and CTKs. **(T-3)**

8.5.3.1. The purpose of this inventory is to perform an extensive inspection of all tools and non-CA/CRL equipment, to include condition, identification markings, and accuracy of the MIL/CRL Supplemental Listing.

8.5.3.2. CTK Custodians will ensure all tools are inspected for serviceability IAW TO 32-1-101, *Use and Care of Hand Tools and Measuring Tools*.

8.5.3.3. CTK Custodians will document these inventories and maintain the most current inventory. **(T-3)**

8.5.4. Users will perform a visual inventory of all dispatchable/decentralized CTKs when issued for use, at the completion of each job or tasks, and when returned to the tool storage facility. **(T-3)** Users will refuse unserviceable items and return to CTK custodian. **(T-3)**

8.5.4.1. Users will accomplish a CTK inventory prior to operation of any aircraft or equipment when maintenance actions are performed (such as, engine run, landing gear retraction, flight control operational checks). **(T-3)**

8.5.4.2. Users will perform an immediate and complete inventory of all CTKs when returning to the work area after sheltering for real-world/exercise events. **(T-3)**

8.5.4.3. Users will ensure dispatchable tools, equipment, eTools and CTKs are locked and/or secured when left unattended. **(T-3)**

8.5.4.4. CTK's signed out to deployed ABDR Individual/Assessor are not considered "issued-for use" unless signed open on an AFSC Form 309, *AFSC Tool Control Inventory Record*, or issued from a local deployed support section for the purpose of inventory requirements.

8.5.5. eTools: Units will use the following procedure to maintain positive control of assigned eTools:

8.5.5.1. Manage eTools IAW TO 00-5-1, and this instruction. **(T-3)**

8.5.5.2. Track dispatchable eTools in TCMax®. **(T-3)**

8.5.5.3. Ensure only serviceable eTools with current technical data are available for checkout, and any missing plugs/covers/doors are documented IAW **Paragraph 8.3.6.7**. **(T-3)**

8.5.5.4. Make maximum use of eTool warranties. **(T-3)**

8.5.5.5. Ensure eTools are used for official and authorized purposes IAW TO 31S5-4-etool, 17 & 33 Series instructions, MAJCOM guidance, and this DAFI.

8.5.5.5.1. Not install unauthorized files or software (such as, games, mp3s). **(T-3)**

8.5.5.5.2. Not use unauthorized external media devices to retrieve data from removable hard drives. **(T-3)**

8.5.5.6. Coordinate with the local Cybersecurity Liaison and/or Information System Security Managers to identify publish local guidance on restrictions for the use of eTools/PEDs in classified processing areas. **(T-3)**

8.5.5.7. Establish procedures for shipping TOs, eTools, and required support equipment needed to ensure eTools availability to support mobility and deployed operational requirements. **(T-3)**

8.5.5.8. If applicable, units will update Defense Integration and Management of Nuclear Data Services (DIAMONDS) hardware and status IAW TO 11N-3150-8-1, *USAF DIAMONDS Policy and Procedures*. **(T-3)**

8.5.5.8.1. For accountability, DIAMONDS laptops and hardware must be managed and tracked in TCMax®, but do not require placement on unit equipment account IAW TO 11N-3150-8-1.

8.6. Tool and Equipment Marking and Identification.

8.6.1. To ensure tool rooms have unique identifiers, wings (or equivalent) must ensure other units within the same wing or Personnel Assignment Symbol (PAS) code do not duplicate the WWID. **(T-2)** MAJCOMs/ANG will develop, sustain, and review annually a complete listing of all the WWID utilized within their MAJCOM/ANG. MAJCOMs will update AF/A4LM with WWID changes as they occur. Reference the AF/A4LM SharePoint® site: **https://usaf.dps.mil/sites/haf-a4/A4L/AF_A4LM/Policy/SitePages/Home.aspx**

8.6.1.1. All units must permanently mark their tools and equipment with the standard EID. **(T-3)** GSU may use the parent wing EID. Replacement spare tools stored in the tool room do not need to be etched until placement in a specific CTK.

8.6.1.2. The EID will consist of nine characters (numbers/letters) of which the first four characters will be a unique WWID code. **(T-3)**

8.6.1.2.1. The WWID identifies the base (first and second character), unit (third character), and shop (fourth character). The remaining five characters are available for tool/CTK equipment numbering.

8.6.1.2.1.1. The first two characters of the WWID in the EID are based on the wing/unit PAS base code. Multiple wings (or equivalent) at the same base (example, ANG, AFR, and RegAF) must have different WWID codes. **(T-3)**

8.6.1.2.1.2. The third and fourth characters designate the unit and shop by using unique/distinguishable characters. To ensure tool rooms have unique identifiers, wings (or equivalent) must ensure other units within the same wing or PAS code do not duplicate the first 4 characters of the EID. **(T-3)**

8.6.1.2.1.3. Request additional "base" code information from AF/A4LM at: **AF/A4LM Maintenance Policy, AF.A4LM.Maintenance.Policy@us.af.mil**.

8.6.1.3. The unit will establish the remaining five characters (any combination of numbers/letters) for CTKs, tools, and dispatchable equipment identification. **(T-3)**

8.6.1.4. Units must place the 9-digit EID on all CTKs, tools not assigned to a box, and dispatchable equipment that is of sufficient size. **(T-3)**

8.6.1.4.1. The 9-digit EID must be placed on the outside of dispatchable CTKs. **(T-3)**

8.6.1.4.2. Tools located inside the toolbox may be marked with less than 9-digits but must contain the 4-digit WWID and will have identifying character(s) that ties the tool

back to the CTK. **(T-2)** For example, tools inside an assigned dispatchable CTK "U6JG00001" may be marked "U6JG1." Units may affix non-metallic barcode labels on tools to prevent re-etching as long as the use of the tool and its work environment does not normally result in excessive damage to the label making it unreadable.

8.6.1.4.3. Tools will be marked with the most current EID. **(T-3)**

8.6.1.4.4. All previous CTK identifiers will either be removed or marked out (this does not include PMEL markings). **(T-3)**

8.6.1.4.5. Small tool sets and/or items that cannot be marked as described in **Paragraph 8.3.6.6** above (such as drill bits, Allen wrenches in sets, apexes) will be maintained in a container marked with the EID and an identifying character(s) that ties the tool back to the CTK along with the number of tools contained. **(T-3)**

8.6.1.4.5.1. The container is counted as one of the items.

8.6.1.5. MXG/CCs may require use of the EID in addition to AFTO Form 66, *TMDE Bar Codes (Polyester Film)*, for TMDE routinely (example, once per week) dispatched from a work center or use of the AFTO Form 66 alone.

8.6.1.6. For items that physically or mechanically check tolerances that require calibration, do not etch, or stamp an EID in any manner that will affect calibration or the ability to calibrate. **(T-3)**

8.6.1.6.1. If marking is in question consult TO 00-20-14 and/or PMEL to validate applicable marking criteria.

8.6.2. Permanently mark (by etching or other means) grease guns, dispensing cans, spray bottles, pump oilers, and similar containers with the type of grease, fluid, or other liquids and Military Specification (MILSPEC) of the contents. **(T-3)** If the MILSPEC is subdivided into Grades, Classes, or Types, include that info on the permanent marking. **(T-3)**

8.6.2.1. If no MILSPEC exists, the item will be marked with the manufacturer's name, part number/NSN from the applicable Safety Data Sheet. **(T-3)**

8.6.2.2. Keep hoses and fittings separate for each type of grease. **(T-3)**

8.6.2.3. If containers are used to hold or apply substances classified as hazardous materials, ensure labeling requirements are IAW AFI 90-821, *Title 29 Code of Federal Regulations 1910.1200(f), Occupational Safety and Health Standards, Toxic and Hazardous Substances*. **(T-0)**

8.6.3. Prior to etching tools and equipment, consult applicable technical order to ensure no special circumstances apply for the item being etched (such as, fiberglass handled hammers are etched IAW TO 32-1-101 and safety glasses. **(T-3)**

8.6.4. CTKs, tools, and dispatchable equipment that may possess a unique serial/tracking number must be marked with an EID number. **(T-3)**

8.6.4.1. If the item cannot be marked, etched, or stamped, annotate the additional designator on the CTK contents list. **(T-3)**

8.6.5. Items that are assembled and are not intended to be disassembled during use, require only one mark/etch/stamp and one entry in the MIL (such as, scribes, flashlights, grease guns, feeler gauges). **(T-3)**

8.6.6. Remove the EID from unserviceable tools and tools removed from the CTK (with the exception of warranty tools where removal of EID may void the tool warranty) and update TCMax® and the MAJCOM/locally generated form or hard copy MIL accordingly. **(T-3)**

8.6.7. Ensure all tools which are accountable on a CA/CRL must be marked with a UII. **(T-3)** Units need to safeguard any IUID marks. In the event the UII is damaged, notify the responsible Equipment Custodian and/or EAE to replace the mark with the same UII.

8.7. Locally Manufactured, Developed, or Modified Tools and Equipment. All locally manufactured, developed, or modified tools and equipment used on aerospace equipment must be approved by the MXG/CC, their equivalent, or a designated representative and meet the requirements described in **Chapter 9**.

8.7.1. This procedure does not apply to tools and equipment authorized for local manufacture in MDS specific technical data or equivalent engineering approved document. QA will coordinate on all requests for approval and use of locally manufactured, developed, or modified tools or equipment. **(T-3)**

8.7.2. Work centers will review items and requirements every two years for applicability and current configuration. **(T-3)** See **Chapter 6** and **Chapter 9** for additional guidance.

8.7.3. Weapons loading, maintenance and armament systems locally designed equipment must be coordinated through the WWM. **(T-3)** Weapons loading, maintenance and armament systems locally designed equipment must meet the following requirements:

8.7.3.1. In the event munitions/armament LME, is not included in technical data or listed on the MMHE Focal Point website **https://cs2.eis.af.mil/sites/10134/sitepages/home.aspx**, contact the MMHE Focal Point AFLCMC/EBDW, 615 Apalachicola Road, Suite 101, Eglin AFB, FL 32542-6845 to establish/validate LME disposition.

8.7.3.1.1. Units must use MMHE Focal Point-designed munitions/armament LME for new procurements if a design exists and fills the requirement. **(T-2)**

8.7.3.1.1.1. Munitions/armament LME is specialized equipment designed to interface with or support munitions or armament suspension equipment (such as, tools, handling dollies, storage racks, maintenance stands, transport adapters). All munitions/armament LME contained on the MMHE Focal Point web site meets applicable DAFMAN 91-203 and USAF standards and is approved for local manufacture and use at unit level AF-wide. Drawing packages for these items are available to the unit via the MMHE Focal Point website.

8.7.3.1.1.2. Munitions/armament LME specifically designed to interface with or support munitions that are not contained in technical data or on the MMHE Focal Point website (such as, hardened/protective aircraft shelter missile racks, Y-stands, munitions chocks, specialized tools) must be coordinated at unit level and forwarded to the MAJCOM Functional Manager for coordination, evaluation, or both. **(T-2)**

8.7.3.1.1.2.1. If the MAJCOM Functional Manager determines the item has AF utility, the drawings will be forwarded to ACC/A4WC for review and addition to the MMHE Focal Point Master Project List that results in formal development and placement onto the MMHE Focal Point website.

8.7.3.1.1.3. Munitions/armament LME not designed to interface with or support munitions that are not contained in technical data or on the MMHE Focal Point web site must be approved by QA. **(T-2)**

8.7.3.1.1.3.1. Units are encouraged to forward any such approved LME for possible inclusion on MMHE Focal Point web site by sending an approved drawing package to the MAJCOM Functional Manager for coordination/evaluation.

8.7.3.1.2. All LME must meet applicable DAFMAN 91-203 and USAF standards.

8.7.3.1.3. All equipment designated for use with nuclear weapons test and handling must meet requirements in DAFI 91-101.

8.7.3.1.4. All weapons loading, maintenance and armament systems LME must be maintained and inspected for serviceability on a regular basis IAW applicable TO 00-20-series, TO 35D-1-2, *Maintenance Instructions WIPB-Miscellaneous Munitions Handling and Support (Munitions Related)*, and TO 35D-2-2 *Munitions Materiel Handling Equipment Miscellaneous And Locally Manufactured – Armament Related*.

8.7.3.1.4.1. AFTO Form 244, or equivalent, must be maintained for all LME items (racks, stands, adapters) except hand tools. **(T-3)**

8.7.3.1.4.2. Equipment without technical data must, as a minimum, be inspected every 180 days for corrosion, physical defect, and lubrication as required. **(T-3)**

8.8. Tool Room Operations and Tool Security.

8.8.1. Operations. Tool rooms will be set up to ensure accountability. **(T-3)**

8.8.1.1. Procedures will be established to ensure custodial control. **(T-3)**

8.8.1.2. Tools will not be issued individually from dispatchable CTKs. **(T-3)**

8.8.1.2.1. When a recurring need exists for common tools to be issued individually, (such as, hammers, screwdrivers, pliers, drills, wrenches) individual issue bins/drawers may be established as a CTK within the tool room. **(T-3)**

8.8.1.3. Process reports for tools that are lost, damaged, or destroyed, due to neglect IAW AFI 23-101. **(T-3)**

8.8.2. Security.

8.8.2.1. The tool room must be capable of being locked and afford protective measures such as monitoring, 24-hour coverage, or controlled key access. **(T-3)**

8.8.2.1.1. When all CTKs are not capable of being secured in the tool room, the Section NCOIC/Chief will design a process to prevent the unauthorized use or access to tools and equipment. **(T-3)**

8.8.2.1.2. Due to space and facility limitations, it may not be possible to store oversized tool kits in the tool room.

8.8.2.2. Locks will be used on tool kits stored outside the CTK to provide a physical barrier to opening the container lid, drawer or door and prevent the unauthorized removal of tools. **(T-3)**

8.8.2.2.1. Locks are not required on tools and equipment that are stored within secured tool rooms or work centers.

8.8.2.2.2. Tools and equipment will never be secured to the exterior of an aircraft. **(T-3)**

8.8.2.2.3. Tool kits located within high traffic, controlled movement areas or that could limit aircraft movement or be exposed to jet blast are required to be locked when unattended/not in use and moved to un-obstructive/exposed location. **(T-3)**

8.8.2.2.3.1. Alert Aircraft in Protection Level Areas 1, 2, and Alert Status Aircraft in Protection Level Area 3. CTKs in these areas that are directly supporting alert status aircraft do not have to be locked when unattended and not in use as long as they are inventoried at the beginning of each shift, after each maintenance task, and at the end of each shift.

8.9. Lost Item/Tool Procedures.

8.9.1. Authorization to clear Red X's when an item/tool cannot be located should be no lower than Maintenance Supervision IAW **Chapter 2**. **Exception:** For contingency operations with absence of Maintenance Supervision, aircraft commander assumes responsibility.

8.9.2. Supervisors need to ensure all assigned personnel are familiar with lost item/tool procedures. If an item/tool or a portion of a broken item/tool is discovered missing, the following procedures apply:

8.9.2.1. The person identifying the missing item/tool will search the immediate work area for the item/tool. **(T-3)**

8.9.2.1.1. If not found, after completing an initial search the individual will notify the expediter/Pro Super or equivalent. **(T-3)**

8.9.2.2. Place a Red X in the aircraft or equipment forms of all affected aircraft or equipment with a description of the item/tool and a specific, last known, location of the item/tool. **(T-3)**

8.9.2.3. Expediter/Pro Super or equivalent will immediately notify the Flight CC/SUPT, Support Section, MOC, and QA. **(T-3)**

8.9.2.3.1. Initiate a thorough search for the item/tool. **(T-3)**

8.9.2.3.2. Initiate the lost tool report if tool is not located during initial search. **(T-3)**

8.9.2.4. If it is suspected that the item/tool has fallen into an inaccessible or unobservable aircraft area, perform an NDI or use borescope equipment to locate the lost item/tool. **(T-3)**

8.9.2.4.1. If the item/tool is in an inaccessible area that poses no FOD threat and the action is to leave the item/tool in place, the x-ray (or equivalent) with the identification

of the exact item/tool location and copies of all information concerning the lost item/tool are maintained in the aircraft historical file until the item/tool is recovered. **(T-3)**

8.9.2.5. If at any time during the investigation the item/tool is found, notify the Flight CC/SUPT, Support Section, MOC, QA, expediter, Pro Super or equivalent, and the owning work center. **(T-3)**

8.9.2.5.1. If the item/tool is found, but is inaccessible, Maintenance Supervision may explore other possible actions to include having the unit or a DFT disassemble the aircraft to remove the item/tool.

8.9.2.5.1.1. If the aircraft MDS is one that has a PDM or is scheduled for depot modification, any inaccessible lost item/tool will be listed with location on the AFTO Form 345, Aerospace Vehicle Transfer Inspection Checklist and Certification, for removal by the depot. **(T-3)**

8.9.2.6. Maintenance Supervision will determine when the search for the lost item/tool may be discontinued. **(T-3)** If the item/tool is not found:

8.9.2.6.1. Notify the MOC and the MXG/CC when the search for the lost item/tool has been discontinued. **(T-3)**

8.9.2.6.2. Ensure lost item/tool report is completed IAW locally established procedures. **(T-3)**

8.9.2.6.3. If applicable, ensure the TCMax® is documented IAW **Paragraph 8.3.6.7**. **(T-3)**

Chapter 9

MATERIEL MANAGEMENT SUPPORT

9.1. General. Material management plays a critical role in optimizing mission generation capabilities. Although assigned to LRS, all DMS personnel must be integrated into daily mission generation operations both at home station and deployed. The critical nature of direct interaction between maintenance and materiel management activities at the point of maintenance provides units direct access to materiel management SMEs to accurately identify, communicate, acquire, or disposition materiel management support necessary to maximize combat capability. This **Chapter**, coupled with AFI 23-101, provides the minimum materiel management support requirements necessary to provide the best possible opportunity for success in meeting mission generation requirements. The AF has consolidated materiel management support under the AF Sustainment Center. The AF Sustainment Center provides fleet-wide supply support to all AF weapon systems and leverages consolidated repair facilities and ALCs capability to optimize weapon system availability.

9.2. Decentralized Materiel Support. Decentralized Materiel Support personnel coordinate maintenance and materiel management actions and manage supply transactions for the MXG. The duty location for DMS personnel is the applicable maintenance unit as agreed upon by the MXG and base 2S0 functional manager. Personnel rotations, as determined by the base 2S0 functional manager will be accomplished with consideration of operational, career development, and training requirements. **(T-3)**

9.2.1. In units with Decentralized Materiel Support personnel, the LRS Superintendent exercises control and career-field development opportunities for Decentralized Materiel Support (2S0XX) personnel. **(T-3)**

9.2.2. In units/work centers directly supported by Decentralized Materiel Support personnel, the Logistics Readiness Squadron Materiel Management Flight is responsible for ensuring materiel management support roles and responsibilities listed are completed IAW 23-series publications.

9.2.3. LRS Superintendent will ensure complete DMS coverage of MXG duty periods, to include weekend duty. **(T-3)**

9.2.4. At a minimum, DMS personnel will provide the following support functions to the maintenance unit: monitor and track assets in the repair cycle, resolve supply support problems, and report aircraft parts status and changes in base level repair capability to maintenance supervision. **(T-3)**

9.2.4.1. Decentralized Materiel Support personnel also support maintenance in processing issue requests, researching sources of supply, entering manual requisitions (part number only), updating exception code lists, and resolving other peculiar maintenance supply problems. **(T-3)**

9.2.4.2. DMS personnel will manage processes, in addition to those previously described, such as parts ordering, backorder review and validation, Readiness Spares Packages, and TNB. **(T-3)**

9.3. Supply Discipline. Supply discipline is the responsibility of all military and civilian personnel regardless of grade or position. Personnel at all levels need to ensure the practice of good supply discipline.

9.4. Readiness Spares Package Review. Maintainers play a critical role in the annual Readiness Spares Package review process. This role includes active maintenance participation in the base level validation process conducted by the LRS and their MAJCOM during the annual Readiness Spares Package pre-review process in preparation for the Weapon System Program Manager final review. Close maintenance-materiel management collaboration is essential to ensure RSPs are properly sized to support contingency maintenance requirements. See DAFMAN 23-122 for further details.

9.5. Bench Stock. Flight CCs/SUPT and/or Section NCOICs/Chiefs will determine the contents of their bench stock IAW qualification criteria in DAFMAN 23-122. **(T-3)** Examples of bench stock items include nuts, bolts, cotter keys, washers, resistors, capacitors, light bulbs, sealants, and batteries. Bench stock levels are managed and based predominantly on consumption. Monthly and semi-annual bench stock listings are provided by the LRS/DMS. A thorough review of these listings is extremely important to ensure that bench stock supports the mission efficiently and economically.

9.5.1. Bench stock assets are organizationally purchased and therefore organizationally owned. Appointment of DMS personnel as bench stock monitors must be agreed upon by the applicable Squadron Superintendents.

9.5.2. Mark bins containing 50 percent or less of the authorized quantity to facilitate monthly inventories. **(T-3)** Do not include items coded TCTO, unacceptable for AF use and critical in bench stock. Controlled Item Code S and C may be in bench stock with MAJCOM approval. Other controlled Item Codes are authorized with written approval from Unit Commander. See DAFMAN 23-122 for additional information.

9.5.3. Work center supervisors will:

9.5.3.1. Semi-annually complete a bench stock joint review with the Customer Support Liaison Element, Materiel Control. **(T-3)**

9.5.3.1.1. During these reviews, special emphasis needs to be given to items with no demands in the past year and items with excessive quantities not supported by demands. The continuance of stocking such items is the exception and not the normative process. See DAFMAN 23-122 for further details.

9.5.3.2. Work with DMS or LRS/materiel management activity to ensure demilitarization criteria is identified, and used or excess items are disposed of IAW procedures in DAFMAN 23-122.

9.6. Consumable Readiness Spares Package. The Consumable Readiness Spares Package process provides requirement and asset visibility, has automated transfer and deployment procedures, has the capability to provide the correct priority and project-coded replenishment requisitions, and eliminates redundant requirements. Additionally, Consumable Readiness Spares Package procedures provide MAJCOMs with a standard process to support consumable item requirements during contingency operations. Refer to DAFMAN 23-122 for Consumable Readiness Spares Package procedures and options.

9.7. Shop Stock. Shop stock includes gas cylinders, random length bar stock, sheet metal, plastic, fabric, electrical wire, and similar items not normally included in bench stocks. Maintain shop stock for day-to-day operations. Monitor shop stock to prevent materiel from becoming excessive or outdated. Shop stock should not normally exceed 90-days usage, or the unit of issue or unit pack, whichever is greater. Store shop stock near/adjacent to bench stock items, if practical, but do not mix them together. Clearly identify materiel as "Shop Stock" and label them with noun, national stock number or part number, unit of issue, and shelf-life, if applicable.

9.8. Operating Stock. Operating stock includes connector dust covers, hydraulic line caps/plugs, and similar items that are normally recovered after use and re-used. Store operating stock near/adjacent to bench stock items, if practical, but do not mix them together. Monitor operating stock to prevent it from becoming excessive or outdated. Retain partially used bench stock items in bench stock and not in operating stock. Identify, tag, and turn in items with no forecasted use IAW AFI 23-101. Clearly identify items as "Operating Stock" and label them with noun, national stock number or part number, unit of issue, and shelf-life as applicable.

9.9. Work Order Residue. Work order residue includes expendable bit/piece items left over from maintenance work orders or bench stock deletions. Store work order residue near/adjacent to bench stock items, if practical, but do not mix them together. Ensure excesses are consolidated for turn-in to LRS at least annually. Clearly identify items as "Work Order Residue" and label them with noun, national stock number or part number, unit of issue, and shelf-life as applicable. Control all work order residues used on or around aircraft, uninstalled engines, and AGE.

9.10. Adjusted Stock Levels. Adjusted stock levels are used when the demand level or consumption is inadequate to support the requirement. A single occurrence of a mission limiting status is not sufficient reason to establish an adjusted stock level but should result in an LRS/materiel management activity review of demand data for accuracy. The using work center, with assistance from LRS/materiel management activity, will prepare the request IAW DAFMAN 23-122 and provide adequate justification (such as, seasonal materiel requirements, long lead-time items, infrequent use components that cause an NMC condition and result in a new procurement or excessive lead-time to restock). Route the request through the applicable Squadron Maintenance Supervision for approval prior to submitting to LRS/materiel management activity. Using work centers will maintain a master file of approved adjusted stock level items and follow-up on all requests until completed. **(T-3)**

9.11. Shelf-life Items. Using work centers will control the quantity and inspect (Type I and Type II) shelf-life items kept in unit bench stock, operating/shop stock, and work order residue IAW DAFMAN 23-122. Personnel managing bench, shop, or operating stocks will:

9.11.1. Identify serviceable shelf-life items/locations with a colored and/or highlighted label that clearly states the items expiration date. **(T-3)**

9.11.2. Check expiration dates on issued items and do not accept outdated items. **(T-3)** Refer to DAFMAN 23-122 for outdated and/or unserviceable shelf-life items.

9.11.3. Not open shelf-life containers until needed and use the oldest items first. **(T-3)**

9.11.4. Ensure shelf-life material stored in other than original containers are marked with original shelf-life expiration codes. **(T-3)**

9.11.5. Recycle, reclaim, or turn-in for disposal, shelf-life items which are loose in the bin and expiration dates cannot be determined. **(T-3)**

9.12. Equipment Items. Flight CCs/SUPTs and/or Section NCOICs/Chiefs will review equipment items needed for mission accomplishment IAW AFI 23-101.

9.12.1. Equipment Custodians will contact the EAE for assistance in researching and preparing documents for gaining authorizations and ordering equipment items IAW AFI 23-101. Refer to DAFMAN 23-122, for the required procedures to order and deploy equipment items.

9.13. Special Purpose Recoverable Authorized Maintenance (SPRAM). SPRAM assets are fault isolation spares, shop standard spares, training spares, -21 TO spares (AME), test station spares, and stand-alone spares. These assets are Expendability, Recoverability, Reparability Code (ERRC) XD/XF items, which are controlled and managed as in-use supplies.

9.13.1. Flight CCs/SUPTs and/or Section NCOICs/Chiefs will review all SPRAM authorizations annually and certify as valid IAW AFI 23-101, DAFMAN 23-122, and DAFI 21- 103. **(T-3)**

9.14. Supply Assets Requiring Functional Check, Calibration, or Operational Flight Programming. Maintenance sections must identify items requiring functional checks, calibration, or operational flight programming prior to use. **(T-3)**

9.14.1. Maintenance sections will prepare a list of items, (including the repair section's organization and shop code) for items requiring functional checks, calibration, or operational flight programming. **(T-3)**

9.14.1.1. The list will be routed through Maintenance Supervision to the LRS. **(T-3)**

9.14.1.2. This list will be updated/validated IAW DAFMAN 23-122. **(T-3)**

9.14.2. The LRS/management materiel activity issues the items to repair sections when assets are initially received on station, when functional checks, calibration, or programming is due or when serviceability is doubtful.

9.14.3. If a Part issue requiring a functional check, ensure it is not restricted in the weapon system -6 TO. Refer to TO 00-20-3 for functional check and frequency requirements.

9.15. Time Compliance Technical Order (TCTO) Kit Procedures. TCTO kit management is a shared responsibility between maintenance and supply IAW TO 00-5-15 and AFI 23-101.

9.15.1. Initiate requests for kits, parts, and special tool requirements through LRS as outlined in **Chapter 14**.

9.15.2. Transfer TCTO kits with aircraft or equipment. DAFMAN 23-122, TO 00-5-15, and TO 00-5-1 contain detailed guidance for the transfer of TCTO kits.

9.15.3. Retain TCTO kits for aircraft returning to the unit for TCTO compliance.

9.16. Supply Points. Supply points may be established within individual work centers when time or resources required to move items dictates the need to do so.

9.16.1. Storage space for the supply points is provided by the supported work center.

9.16.2. Management of the supply point processes will be agreed to and documented by participating group commanders. **(T-3)** Participating group commanders will require appointment of supply point monitors to manage and account for supply point assets as part of their agreement. **(T-3)** LRS Materiel Management Activities will maintain overall accountability and control of supply point assets. **(T-3)**

9.16.3. Supply points must be reconciled semi-annually by the Supply Point Monitor. **(T-3)**

9.16.3.1. One of the semiannual reconciliations will be done at the same time as the annual supply point inventory IAW AFI 23-101.

9.17. Local Manufacture. Local manufacturing is an essential part of maintenance unit support. The applicable end-item TOs identify items subject to local manufacture and specific procedures for processing are in DAFMAN 23-122.

9.17.1. DELETED.

9.17.2. MXG directive at a minimum will include:

9.17.2.1. Procedures that specify coordination requirements to include QA, EAE, Wing/Base Safety, and endorsement by the approval authority. **(T-3)**

9.17.2.2. DELETED.

9.17.2.3. Identifying drawing, sample, technical data and DD Form 1348-6, *DoD Single Line Item Requisition System Document*, source requirements as required. **(T-3)**

9.17.2.3.1. Ensure guidance identifies that drawings are obtained from the appropriate repository (such as, Engineering Data Service Center or JEDMICS).

9.17.2.4. Establishing coordination process for all the appropriate fabricating sections to determine the bits and pieces required to manufacture the item. **(T-3)**

9.17.2.4.1. Coordinating bit and piece parts requirements and availability with the LRS/DMS.

9.17.2.5. Identifying all work centers that have action on the AFTO Form 350 for items requiring multiple section processing. **(T-3)**

9.18. DIFM Management.

9.18.1. DIFM inputs are critical to recording and getting credit for proper repair cycle times.

9.18.2. DIFM status codes are broken down into three categories: delayed maintenance time, repair time, and AWP time. Repair time is the only time recorded and used to determine the number of assets that should be stocked. Not using the proper codes when they change reduces the number of assets on base.

9.18.3. The roles and responsibilities for DIFM management are identified in AFI 23-101. The LRS/DMS provides the D23 or equivalent to assist each repair section in DIFM Management. The D23 is provided in both maintenance location and stock number sequence. Repair sections use the D23 to manage the flow of serviceable and unserviceable DIFM assets in the repair cycle and to ensure the DIFM status and location is updated.

9.18.3.1. If a parts request is backordered and the removal of the unserviceable DIFM item does not further limit or restrict the operational capability of the end item, it will be

removed and sent to the applicable support section for either repair, NRTS approval, or condemnation with a subsequent turn-in to LRS/materiel management activity (as a credit DIFM) IAW TO 00-20-3.

9.18.3.1.1. Repair assets to the fullest extent authorized.

9.18.3.2. Repairable components will be processed, repaired, and returned to the FSC within the required time frame IAW AFI 23-101.

9.18.3.3. The D23 will not be used to manage serviceable assets.

9.18.4. Repair Cycle Throughput. Throughput is the average time it takes to move individual items through the repair cycle. Timelines for turn-in are outlined in AFI 23-101.

9.18.5. Units will establish local procedures for the control of repair cycle assets throughout the maintenance repair cycle IAW AFI 23-101 and DAFMAN 23-122.

9.18.5.1. Procedures will include methods of accounting for all components and accessories, procedures for control of assets in AWP or AWM status, and procedures and responsibilities for cross CANN, removal of bits and pieces, and scheduling and control of repair cycle assets. **(T-3)**

9.18.6. AWP and cross-CANN assets will be controlled and managed IAW DAFMAN 23-122.

9.18.6.1. Maintenance activities will closely control reparable assets in AWP status. **(T-3)**

9.18.7. Maintenance Turn-In to Supply. Maintenance is responsible for DIFM items until the item is returned to LRS/DMS.

9.18.7.1. Work centers must properly tag and secure repair cycle assets and place items in a leak–proof containment liner (no leaks/stains/tears/punctures), as required. **(T-3)**

9.18.7.1.1. To prevent spillage, any item containing any type of residual fluid, regardless of hazard classification, will be drained, purged, preserved, capped, plugged, and placed in a leak-proof containment liner before placement into a serviceable reusable container for storage or shipment. **(T-3)**

9.18.7.1.2. The work center must comply with packaging, environmental control, inert certification, purge, and preservation requirements as specified in applicable TOs, DAFI 24-602V2, DAFMAN 24-604, and place sufficient copy(s) of the technical document(s) for handling, storage, shipping, and distribution of copies inside the container. **(T-3)**

9.18.7.2. Include AFTO Form 350, **Parts I** and **II**, and a condition tag or label with all items turned into supply IAW TO 00-20-3. **(T-3) Note:** Some DIFM assets may require additional tags.

9.18.7.2.1. Enter the correct action taken code on AFTO Form 350, **Part II.**

9.18.7.3. Accomplish proper reclamation and demilitarization actions on condemned repair cycle assets IAW DAFMAN 23-122 and AFH 23-123, Vol. 2, **Part I**, **Sec. 6C**.

9.18.7.4. DIFM items (serviceable or unserviceable) will be processed and turned in to LRS IAW AFI 23-101.

9.19. Tail Number Bins (TNB).

9.19.1. Establishment and management of TNBs is a shared responsibility between maintenance and supply. TNBs are storage locations established and controlled to store issued parts awaiting installation and parts removed to FOM. TNBs are set up by tail number, serial number, or identification number.

9.19.2. TNB items used to satisfy MICAP conditions are not CANNs. If a TNB asset is issued to satisfy a part request, maintenance personnel will:

9.19.2.1. Reorder the item and notify the expediter of the new document number. **(T-3)**

9.19.2.2. Update the aircraft forms and the MIS. **(T-3)**

9.19.2.3. If a due-out is created prior to transfer of these items, notify the LRS/materiel management activity to change the "mark-for" field on the due-out detail. **(T-3)**

9.19.3. Seal and store partially completed TCTO kits and parts in the TNB and mark the container or package with the tail number, serial number, or equipment identification number and TCTO number. **(T-3)**

9.19.4. Maintain security and control of TNB assets. **(T-3)**

9.19.5. Track property placed in the TNB by tail number, serial number, or equipment identification number. Each entry will indicate:

9.19.5.1. Date received. **(T-3)**

9.19.5.2. Noun/nomenclature. **(T-3)**

9.19.5.3. Document number. **(T-3)**

9.19.5.4. Status (FOM, Issue/Due-Out Release (ISU/DOR), TCTO). **(T-3)**

9.19.5.5. Removal information (date, time, signature, and employee number of the person who picked up the property). **(T-3)**

9.19.5.6. Remarks. **(T-3)** Enter “NONE” if no remarks are necessary.

9.19.5.7. Current JCN. **(T-3)**

9.20. CANN Actions. See **Chapter 11** for CANN procedures and responsibilities.

9.21. Bench Check and Repair Policy. Maintenance sections bench check items as part of the off equipment troubleshooting process. When workload requires, the Section NCOIC/Chief determines the priority for bench check actions. Specific procedures for bench check and repair policy are provided in TO 00-20-3. The following general guidelines apply:

9.21.1. Order required parts “fill or kill.”

9.21.1.1. If the part is not in stock and a MICAP condition exists, backorder the new request.

9.21.1.2. Determine local repair capability before requisitioning off-base support or going lateral support.

9.21.2. Remove the suspected item, fill out the AFTO Form 350, and annotate it as repair and return. Attach AFTO Form 350 to the item; place the item in the repair cycle; and annotate the name of the repair section on the form.

9.21.3. Bench-check, repair, take NRTS action, or condemn the item.

9.21.3.1. If the item is repaired or otherwise determined to be serviceable, the repair section informs the Support Section the item is available for pick-up so on-equipment maintenance action may resume.

9.21.3.2. If the item cannot be repaired, the repair section informs the Support Section to initiate a backordered request and takes appropriate NRTS and condemnation action on the unserviceable asset.

9.22. Maintenance Turn-Around Record Update Processing. Work centers processing TRNs will coordinate with LRS/DMS and follow requirements outlined in AFI 23-101, DAFMAN 23-122, and AFH 23-123.

9.23. Buildup Items. Maintain items requiring build-up prior to use (such as, wheels and tires) in supply points in a built-up configuration.

9.23.1. Send items to appropriate work centers for build-up and return them to the supply point for re-issue.

9.23.1.1. Use AF Form 1297 or control log to control assets sent for build-up when the supply point is operated by other than maintenance personnel.

9.23.1.2. Validate AF Form 1297 daily if over 10 days old.

9.23.2. Local procedures will be established to control assets when maintenance operates the supply point and assets are sent to another organization for build-up. **(T-3)**

9.24. DR Exhibits. DR exhibit procedures for issue, turn-in, and storage are contained in TO 00-35D-54 and AFI 23-101. DRs will be input into the JDRS at **https://jdrs.mil.**

9.25. Destruction of TOP SECRET Material. Destruction of TOP SECRET material requires a receipt according to DODM 5200.01, Vol 3, DOD Information Security Program: Protection of Classified Information and AFI 16-1404. A copy of the destruction certificate will be included with the turn-in documentation. **(T-0)**

9.25.1. Provide sensitive instruments interior container protection. **(T-3)**

9.25.2. Ensure a copy of the LRU/SRU historical record accompanies turn-in of all items. **(T-3)**

9.26. Certifying Items Associated With Explosives. Ensure items such as MERS, TERS, pylons, launchers, rafts, bomb racks, ejection seats, fire suppression bottles, gun systems and components are certified explosive-free prior to turn-in to LRS and/or Defense Logistics Agency (DLA) Disposition Services. **(T-3)** Refer to TO 11A-1-60 and DAFMAN 21-201 for specific certification requirements.

Chapter 10

MUNITIONS POLICY AND WEAPONS LOAD CREW PROGRAM

10.1. See AFMAN 21-206 for Munitions Policy and Weapons Load Crew Program.

10.1.1. - **Table 10.3**. DELETED.

Chapter 11

ADDITIONAL MAINTENANCE REQUIREMENTS AND PROGRAMS

11.1. Facility Housekeeping and Contamination Control. Units will publish housekeeping and contamination procedures which protect the health of workers and maintain areas as free as practical from surface contamination. **(T-3)** Units will:

11.1.1. Ensure Bioenvironmental Engineering approved workplace-housekeeping procedures are employed to prevent the spread of contamination within a work center. **(T-3)**

11.1.2. Emphasize controlling the source of the contamination and ensure workplace personnel follow proper work procedures, PPE use, and hygiene practices. **(T-3)**

11.1.3. Ensure housekeeping procedures will account for the dangers and hazard exposures found in the work center and will be consistent with mitigation methods outlined in DAFMAN 91-203. **(T-3)**

11.2. Personal Wireless Communications Systems Management.

11.2.1. Maintenance Communications. Reliable, redundant, cyber resilient, and effective communications systems are essential for efficient maintenance operations. These systems will provide accurate, timely, secure, programmable frequency and jam resistant communications needed to securely accomplish the maintenance mission in a fully deployed and isolated mode.

11.2.2. Commanders or designated representative will coordinate base Communication Squadron or equivalent to ensure compliance with Personal Wireless Communications Systems management requirements IAW AFI 17-210, DAFI 17-220, *Spectrum Management*, AFI 17-130, and DAFMAN 17-1203. The following general guidelines apply:

11.2.2.1. Allowance for specific radios is shown in AS 660, *Equipment Allowances for Non-Weapon Systems Communications Requirements*, Repair Cycle Data Listing. Process requests for specific radio equipment to support maintenance activities IAW AFI 23-101, AFI 17-210, DAFI 17-220, AFI 17-130, and AFH 23-123 V3, *Air Force Equipment Management*.

11.2.3. A VHF/UHF radio is authorized for use in maintenance operations to facilitate communications between aircraft and maintenance personnel. Additionally, aircrews may relay advance aircraft status information to maintenance personnel using VHF/UHF channels.

11.2.3.1. Maintenance Operations will coordinate procedures for use of these radio communications with operations and other essential wing organizations. **(T-3)**

11.2.3.2. For effective flightline operations, more than one non-tactical radio nets are authorized when large numbers or different types of weapon systems are assigned or when Allowance Standards specify.

11.3. MAJCOM/ANG Special Certification Rosters (SCR). The SCR is a management tool providing supervisors a clear and concise listing of personnel who have been appointed to perform, evaluate, and/or inspect work of a critical nature. Normally, only maintenance requirements that have a definite potential for personal injury or damage to equipment will be included in the SCR. Other tasks requiring special training or qualifications may be managed on the SCR. The SCR is used to build personnel rosters for deployments, shift schedules, and assess workforce capability.

AF/A4LM establishes mandatory SCR Item Titles in Column A of **Table 11.1**. Based on the evolving complexity of weapon systems and the associated task diversity the process of assigning prerequisite to SCR tasks are assigned to using MAJCOMs/ANG as follows: MAJCOMs/ANG A4s will coordinate with their applicable Lead Commands to develop and document SCR item "Prerequisite" criteria in Column B of **Table 11.1** based on task complexity of their assigned weapons systems. MAJCOMs/ANG may add additional items and remove non-applicable Items on their SCR using the standardized **Table 11.1** format provided. MAJCOM/ANG Supplements must include their complete SCR table when coordinating supplement approval with AF/A4LM as described in the opening **Paragraph** of this DAFI. Special Certification approval authority will be accomplished IAW notes at the bottom of the SCR. The MXG/CC and CD are not required to be on the SCR by virtue of their position as the SCR approval authority.

11.3.1. DELETED.

11.3.1.1. Squadron Maintenance Supervision approves individuals in their primary AFSC based on their experience and technical expertise regardless of their assigned skill or position. **(T-3)**

11.3.1.2. MXG/SEL will review and sign SCR actions for those individuals administratively assigned to MXO (QA, AFREP). **(T-3)**

11.3.1.2.1. MXG/SEL will coordinate with the Field Training Detachment (TD) CC/SUPT to validate currency of Field TD personnel on the SCR. **(T-3)**

11.3.1.3. WWM will review and sign WS SCRs. **(T-3)**

11.3.2. TFI units will establish a process for approving SCR additions in a MOA/MOU to provide visibility across participating organizations. **(T-3)**

11.3.3. The MXG/CC may waive selected 5-skill level personnel, in the rank of SrA or higher, for tasks normally requiring a 7-skill level requirement to facilitate the production effort. Waived 5-skill level personnel should be closely monitored and kept to the minimum required to accomplish mission generation.

11.3.3.1. Maintenance Supervision or equivalent will retain file copies of approved waivers. **(T-3)**

11.3.3.1.1. Approved waiver file copies may be discarded if SCR specifically identifies task as waived in the Maintenance Information System.

11.3.3.2. Certified weapons load crew chiefs (load crew member position number 1) by virtue of their task certification and position, serve as inspectors for weapons loading tasks only and do not require a waiver. **Note:** 2W0XX certified munitions inspectors are exempt from these requirements.

11.3.4. MAJCOM Waiver Policy. If local conditions require assignment of other than MAJCOM approved mandatory SCR grade (to include civilian equivalents) and skill level prerequisite requirements and cannot be fulfilled using the MXG/CC authority stated in **Paragraph 11.3.3** then the MXG/CC (or equivalent) must request a waiver from the MAJCOM. **(T-3)**

11.3.5. MAJCOMs may add additional mandatory critical tasks or inspections they deem necessary.

11.3.5.1. Identify each task on the SCR by a specific course code.

11.3.6. SCR Documentation. Flight CCs/SUPTs and Section NCOICs/Chiefs will review each individual's qualifications prior to recommending approval to perform SCR tasks to the appropriate approval level. **(T-3)**

11.3.6.1. AF Form 2426, *Training Request and Completion* or MAJCOM-approved (ANG locally approved) form is used by the work center supervisor to add or remove an individual to the SCR. Additionally, removal from the SCR may be accomplished by lining through the task on the SCR and notifying the training section to update the MIS.

11.3.6.2. The appropriate level of authority approves the individual for addition to the SCR as listed in **Table 11.1**.

11.3.6.3. On approval, the UTM IAW AFI 36-2650, loads the approved name into the Maintenance Information System.

11.3.6.4. Flight CCs/SUPTs and Section NCOICs/Chiefs will retain their copy of AF Form 2426 or MAJCOM-approved form until they verify proper loading. **(T-3)**

11.3.6.5. Appointment letters are not required if loaded in the MIS.

11.3.6.6. Work center supervisor, AMU/Flight supervision, Maintenance Supervision, SQ/ CC, or MXG/CC may decertify individuals at any time and remove them from the SCR.

11.3.7. Units will ensure a current copy of the SCR is taken on all deployments. **(T-3)**

Table 11.1. Mandatory Special Certification Roster and Prerequisites.

	A	B
ITEM	**Mandatory SCR Item Titles**	**MAJCOM/ANG Prerequisites**
1	All Systems “Red-X” (no egress, welding, munitions, fuel cell (in-tank work)) (Note 1)	Refer to MAJCOM Supplement
2	Exceptional Release (ER) (Note 1)	Refer to MAJCOM Supplement
3	“Red-X” Downgrade (Note 1)	Refer to MAJCOM Supplement
4	All Systems In Process Inspection (no egress, welding, munitions, fuel cell in-tank work) (Note 1)	Refer to MAJCOM Supplement
5	Installed Engine Run Certifying Officials (Note 1)	Refer to MAJCOM Supplement
6	Aircraft Inlet/Intake/Exhaust Certifying Officials (Note 1)	Refer to MAJCOM Supplement
7	Flexible Borescope Certifying Officials (Note 1)	Refer to MAJCOM Supplement
8	Engine Blade Blending Certifying Officials (Note 1)	Refer to MAJCOM Supplement
*9	“Red-X” by Mission Design Series (Notes 2 and 6)	Refer to MAJCOM Supplement
*10	IPI by Mission Design Series (Notes 2 and 6)	Refer to MAJCOM Supplement
11	“Red-X” and/or In Process Inspection - Limited (Note 2)	Refer to MAJCOM Supplement
*12	DELETED.	DELETED.
13	NWRM packaging (Notes 4 and 5)	Refer to MAJCOM Supplement
14	Installed Engine Run by Mission Design Series (Note 2)	Refer to MAJCOM Supplement
15	Engine Blade Blending	Refer to MAJCOM Supplement
16	QA hot pit certifying officials and QA hot pit certifier augmentees (squadron certifying officials) (Note 1)	Refer to MAJCOM Supplement
17	Hot Refueling PAD Supervisor/"A" Member (Note 2)	Refer to MAJCOM Supplement
18	Hot Refueling Team Member (“B” or “D” member) (Note 2)	Refer to MAJCOM Supplement
19	Aircraft to Aircraft Refueling Supervisor (Note 2)	Refer to MAJCOM Supplement

20	Uninstalled Engine Operations (Test Stand and ETS) Run by TMS (Note 2)	Refer to MAJCOM Supplement
21	Uninstalled Engine Run Certifying Officials by TMS (Note 1)	Refer to MAJCOM Supplement
22	Aircraft Inlet/Intake/Exhaust Inspection/Certification (Note 2)	Refer to MAJCOM Supplement
23	Engine Flexible Borescope Inspections (Note 2)	Refer to MAJCOM Supplement
24	Chief Servicing Supervisor (Heavy Aircraft/Commercial Derivative Aircraft) (Note 2)	Refer to MAJCOM Supplement
*25	Concurrent Servicing Supervisor/Aircraft Turnaround Supervisor (Fighter Aircraft) (Note 2)	Refer to MAJCOM Supplement
26	W&B Certified/Clear Red X (refer to TO 1-1B-50) (Note 2)	Refer to MAJCOM Supplement
27	Impoundment Official (refer to **Chapter 7**) (Note 2)	Refer to MAJCOM Supplement
*28	Impoundment Authority (refer to **Chapter 7** of this DAFI) (Note 1)	Refer to MAJCOM Supplement
29	CANN Authority (Note 1)	Refer to MAJCOM Supplement
30	Auxiliary Power Unit (APU) Operation (In Cockpit) (Note 2)	Refer to MAJCOM Supplement
*31	Calibration Limitation Approval (refer to TO 00-20-14) (Notes 2)	Refer to MAJCOM Supplement
32	CDDAR Team Chief (Note 1)	Refer to MAJCOM Supplement
33	Weapons Task Qualification Manager (WTQM) (Note 1)	Refer to MAJCOM Supplement
34	Weapons Task Qualification Crew (WTQC) (Note 2)	Refer to MAJCOM Supplement
35	NSS and T-9/T-10/T-11/T-12/T-20 sound suppressor Fire Control Panel (Note 2)	Refer to MAJCOM Supplement
36	Aircraft Rapid/Hot Defueling Supervisor (Note 2)	Refer to MAJCOM Supplement
37	Clear Red X when a lost item/tool cannot be located (refer to **Chapter 8**) (Note 1)	Refer to MAJCOM Supplement
38	Aircraft APU Run Certifying Officials (In Cockpit) (Note 1)	Refer to MAJCOM Supplement

Notes:
1. Approved by MXG/CC or equivalent may be delegated IAW **Paragraph 2.4.2.27.**
*2. Approved by Maintenance Supervision or equivalents. May delegate approval authority to the OIC/SUPT or Flight CC/SUPT.
*3. DELETED.
4. Munitions inspectors who are trained and certified may annotate serviceability tags for munitions items (TO 11A-1-10).
5. Appointed by the unit commander (or equivalent) of units possessing NWRM.
6. MAJCOMs determine the AFSC applicability.

11.4. Aircraft Grounding.

11.4.1. Aircraft grounding is defined in DAFMAN 11-401, *Aviation Management*.

11.4.1.1. Communication of a grounding, or a potential grounding event (TCTO, OTI, PM event) to weapon systems operating in a deployed environment and/or under the authority of an operational command must follow the grounding procedures outlined in DAFMAN 11-401 and 63-101/20-101.

11.4.1.1.1. Units must not directly communicate home station requirements to its deployed forces but provide communication through their respective MAJCOM. **(T-2)** **Note:** This section does not apply to conditions which are clearly limited to the affected unit/base (such as, lost tool, fluid contamination, aircraft and equipment damage of known origin, or other strictly local event). In these circumstances, the affected unit follows the impoundment procedures specified in **Chapter 7**.

11.4.2. Initial Investigation.

11.4.2.1. The OTI will require an inspection of a representative number of systems or units (aircraft, engines, missiles, or munitions) of the same mission and design to determine if the condition exists on other aerospace equipment within the wing's assigned aircraft/systems or equipment. **(T-2)**

11.4.2.1.1. If initial sampling indicates the discrepancy is widespread and has the potential for personal injury and/or further equipment damage, wings will coordinate with MAJCOM. **(T-2)**

11.4.2.2. If there is no repair or corrective action specified in technical data, QA will also submit a technical assistance request through the MAJCOM to the appropriate weapon system program manager IAW TO 00-25-107 or equivalent process. **(T-2)**

11.4.3. Grounding Authority. The approved procedures for grounding aircraft or stand-down for operational reasons are determined and executed IAW DAFMAN 11-401.

11.4.3.1. Notification and final reporting for grounding and release status will be accomplished IAW AFMAN 10-206, *Operational Reporting (OPREP)*.

11.4.3.2. Annotate aircraft grounding in the aircraft forms IAW TO 00-20-1.

11.5. Ramp Inspection Program. Public Law 99-661, section 2638, National Defense Authorization Act for Fiscal Year 198 requires a pre-flight safety inspection of all internationally

scheduled charter missions for the transportation of members of the Armed Forces departing the United States. **(T-0)**

11.5.1. Air Mobility Command (AMC) is lead for the DoD in the management and administration of the Ramp Inspection Program.

11.5.1.1. AMC will publish specific guidance for this Program in a supplement/addendum/or equivalent publication IAW DAFMAN 90-161 to communicate requirements and processes necessary for MAJCOMS to effectively comply with public law requirements in all using commands.

11.5.1.2. AMC will coordinate with other MAJCOMs as required to accomplish ramp inspections to ensure the maximum efficiency and utilization of resources.

11.5.1.3. When requested by AMC, MAJCOMs if able should provide support to reduce the TDY and manpower impact associated with the execution of this program.

11.6. Red Ball Maintenance. The term "Red Ball" is a traditional descriptor, recognized throughout aircraft maintenance, and defines a situation requiring a sense of urgency and priority actions. Red Ball maintenance normally occurs two hours prior to launch and until aircrew have released the aircraft back to maintenance. The Red Ball maintenance concept is intended to prevent late takeoffs and aborts by having qualified maintenance personnel available (such as, in a truck or standby in the shop) during launch and recovery operations to troubleshoot, isolate, and repair system malfunctions. Red Ball maintenance does not authorize technicians to take shortcuts or deviate from TOs, disregard personnel safety requirements or fail to properly document the aircraft forms and the MIS for all completed repair actions.

11.6.1. Units will ensure all maintenance repair actions (does not apply to incorrect switch settings due to operator error) are documented in the aircraft forms and MIS during Red Ball, launch, or EOR operations and cleared from the aircraft forms prior to flight. **(T-3)**

11.6.2. Maintenance repair actions must be cleared in the MIS as soon as possible. **(T-3)** It is imperative that maintenance documentation is performed regardless of the timing of the action in the generation and launching of the aircraft.

11.6.3. All grounding inputs must be cleared from the forms prior to flight. **(T-3)**

11.6.4. If aircraft status changes, an ER must be re-accomplished by a certified individual upon completion of maintenance and before the aircraft is released for flight IAW TO 00-20-1.

11.6.5. Units will develop written procedures to capture, document, and clear Red Ball maintenance actions in the event the MIS is down. **(T-3)**

11.6.5.1. Procedures must require MIS entry of Red Ball maintenance actions as soon as the MIS becomes operable. **(T-3)**

11.7. Maintenance Recovery Team. MAJCOMs will publish standardized procedures to recover assigned aircraft at remote locations.

11.7.1. Procedures at a minimum will identify how resources, including personnel, supplies, and equipment will be made available to support transient aircraft recovery.

11.7.2. If required, establish multiple command MOUs/MOAs/collaboration necessary to achieve efficient aircraft recovery and MIS documentation.

11.8. Foreign Object Damage (FOD) Prevention Program. All personnel (military, civilian, and contractors) working in, on, around, or traveling through areas near aircraft, flightline munitions, AGE, engines, or components thereof will comply with FOD prevention. **(T-2)** FOD prevention training requirements are outlined in AFI 36-2650. This section establishes minimum requirements for a FOD Prevention Program.

11.8.1. The WG/CD is responsible for ensuring an effective FOD prevention program is established.

11.8.2. Definition. FOD: Any damage to an aircraft, engine, aircraft system, component, tire, munitions, or SE caused by a foreign object(s) (FO) which may or may not degrade the required safety and/or operational characteristics of the aforementioned items.

11.8.3. FOD Prevention.

11.8.3.1. On aircraft, uninstalled engines, LRUs and AGE. Openings, ports, lines, hoses, electrical connections, and ducts will be properly plugged or capped to prevent FO from entering the systems. **(T-2) Note:** Do NOT place items (such as, trash bags, rags, cloths) inside open cavities or ducts. When no approved manufactured coverings and/or caps are available for use, securely cover open ducts and/or cavities externally to prevent foreign objects from being introduced. Prior to installation, inspect openings, cavities, and ducts for FO.

11.8.3.1.1. Items that are actively being disconnected, installed, and/or removed will be capped IAW technical data or at completion of the task. **(T-2)**

11.8.3.1.2. At no time will items, (such as, aircraft forms binders, video tape recorder tapes, checklists, tools.), be placed in or on engine intakes. **(T-2) Note:** Does not apply to technicians performing inlet maintenance, inspections and blade blending requiring lights, files, or other tools inside aircraft inlets.

11.8.3.1.3. Inventory all items IAW **Chapter 8**. **(T-2)**

11.8.3.2. MAJCOMs in coordination with Safety, applicable MDS Lead Commands and Weapon System Teams will review FOD, Incident, and Mishap reports to determine if MAJCOM directed IPI or KTL additions are needed to mitigate identified FOD trends.

11.8.3.2.1. Units will establish MDS specific procedures that ensure pre-launch removal and post-recovery installation of intake/inlet plugs and covers (such as, pitot tubes to include ejection seats as required) remain installed on aircraft as close to crew show as possible to prevent FOD, as determined by MXG/CC guidance. **(T-3)**

11.8.3.2.2. Units will establish MDS specific FOD prevention guidance that standardizes mitigation procedures when performing high FOD risk maintenance task (use of plugs/barrier paper, tape, inlet/intake/ECS maintenance or equivalent tasks). **(T-2)**

11.8.3.2.3. Technicians will ensure engine inlet run-up screens and anti-personnel guards are used IAW applicable weapon system TOs. **(T-2)**

11.8.3.3. Covers (such as, engine, pitot tube(s) to include ejection seat) need to remain installed on aircraft as close to crew show as possible to prevent FOD, as determined by MDS/local MXG/CC guidance.

11.8.3.4. Technicians should use a light source of sufficient illumination to inspect the aircraft intakes and exhaust for FO/FOD.

11.8.3.5. Whenever physical entry into an aircraft intake or exhaust is required, technicians will wear a pocket-less, zipper-less, button-less, bunny-suit marked "Intakes Only" and cloth over-booties or stocking feet, (Boots may be worn if not restricted for use by TO/MAJCOM and are authorized by the MXG or equivalent), boots if worn must be inspected and FOD removed from boots prior to installing cloth over-booties. **(T-2)**

11.8.3.5.1. When performing intake inspections while wearing a Chemical Warfare Defense Equipment, pockets will be emptied, and all accessories removed. **(T-2)**

11.8.3.5.1.1. During exercises/inspections, the Chemical Warfare Defense Equipment will be removed, and the bunny-suit will be utilized. **(T-2)**

11.8.3.5.1.2. Chemical Warfare Defense Equipment will only be worn during “real world” situations. **(T-2)** To minimize the potential for FOD and intake damage where Chemical Warfare Defense Equipment zippers are exposed, cover them with any type of tape and account for the tape upon completion of the inspection. **(T-2)**

11.8.3.6. Each base will develop a local flightline clothing policy that addresses wearing of hats, badges, and passes aimed at FOD prevention while considering climate and safety. **(T-2)** As a minimum, it will include the following requirements:

11.8.3.6.1. Restricted area badges will be secured with a subdued non-metallic cord or plastic armband when worn on the flightline. **(T-2)**

11.8.3.6.2. Restricted area badges will be removed when performing intake/inlet/exhaust inspections if personnel physically enter these areas. **(T-2)**

11.8.3.6.3. Metal insignias/badges will not be worn on the flightline. **(T-2)**

11.8.3.6.4. Wigs, hairpieces, metal hair fasteners, earrings, or any other jewelry/loose items that may fall off without notice, are not authorized on the aircraft and industrial work areas. **(T-2)**

11.8.3.6.5. Escorts of visiting personnel will ensure FOD prevention measures are taken. **(T-3)**

11.8.3.7. All maintenance production areas must have FO containers readily accessible. **(T-2)**

11.8.3.7.1. All vehicles driven primarily on the flightline for direct aircraft maintenance support activities must be equipped with secured and lidded FO containers. **(T-2) Note:** Permanently affixed FO containers must be approved by Vehicle Management prior to installation IAW AFI 24-302.

11.8.3.8. Control all work order residue used on or around aircraft, uninstalled engines, and AGE. **(T-2)**

11.8.3.9. Rags will be controlled and accounted for IAW **Chapter 8**. **(T-2)**

11.8.3.9.1. Rag control applies to all organizations and personnel performing aircraft, missile, munitions, and equipment maintenance.

11.8.3.10. FOD walks are mandatory to remove FO from ramps, runways, taxiways, maintenance areas and access roads.

11.8.3.10.1. In addition, mechanical/vacuum sweepers, magnetic bars or sweeping by hand are highly encouraged to supplement FOD walks.

11.8.3.11. When FOD is discovered on a transient aircraft, depot input/output or CRF engine, the host FOD monitor, or aircrew must notify the owning organization within 24 hours. **(T-2)**

11.8.3.11.1. An informational copy of the FOD report must be provided to the owning organization's flight safety office and FOD monitor to ensure compliance with DAFI 91-204. **(T-2)**

11.8.3.11.2. For depot input/output or CRF engine. If the FOD is found during the receiving inspection at one of the aforementioned locations, it will be tracked/charged (if necessary) to the owning MAJCOM unit. **(T-2)** If discovered any other time at one of the aforementioned locations, it will be tracked/charged to the ALC or CRF. **(T-2)**

11.8.3.12. Ensure local FOD Prevention Program addresses the elimination of FOs to include aircraft cockpits and flight decks before and after flight. **(T-2)**

11.8.3.12.1. When an item is lost on or in the vicinity of aircraft or equipment, lost item/tool procedures in **Chapter 8** will be followed.

11.8.3.12.2. DELETED.

11.8.3.12.3. These procedures will be documented in the wing tool/equipment management publication referenced in **Paragraph 8.2**. **(T-2)**

11.8.3.13. Use extreme care during engine ground runs. Jet blast and helicopter hover power check areas need to be free of debris that could cause FOD.

11.8.3.14. Special emphasis is required for items such as: remove before flight streamer attachment, safing pin condition, hinge pin security, dust and FO prevention cover condition/security, and aircraft forms binder condition. Periodically check these types of items for FO prevention compliance.

11.8.3.14.1. Units will account for -21 equipment and covers IAW DAFI 21-103.

11.8.3.14.2. Weapons Expediters must ensure all mission specific safing gear is controlled and accounted for to preclude loss and potential FOD. **(T-2)**

11.8.3.15. Refer to DAFI 13-213, *Airfield Driving and* DAFMAN 91-203, for vehicle FOD check requirements.

11.8.3.16. Grounding wires/points:

11.8.3.16.1. Two Allen head screws, or equivalent, will be utilized to secure cable to grounding clip. **(T-2)**

11.8.3.16.1.1. Screw heads will be coated with sealant or screws will be staked in order to prevent screws from backing out. **(T-2)**

11.8.3.16.1.2. Unused screws will be removed. **(T-2)**

11.8.3.16.2. All grounding points will be kept clean of debris at all times and will be a high interest item for FOD walks. **(T-2)**

11.8.3.17. Use of magnetic bars on the flightline is optional. If used, the magnetic bars will be towed by, or attached to vehicles primarily used on the flightline and will be inspected and made FOD free daily. **(T-2)**

11.8.3.18. A locally manufactured tool for removing debris from tire treads is authorized for use and will be identified to the vehicle by using the vehicle ID number. **(T-2)**

11.8.3.19. Remove metal identification bands from all tubing (except aircraft installed egress system components) and cables on the aircraft.

11.8.3.19.1. With the exception of factory-installed ID tags attached to cargo chains/devices to identify the type being used, remove metal identification bands from cargo tie-down chains/devices prior to use around aircraft.

11.8.3.19.2. Do not remove manufacturer installed metal identification bands from hydraulic hoses.

11.8.3.19.3. Mark hydraulic lines IAW TO 42E1-1-1, *Organizational, Intermediate and Depot Maintenance; Aviation Hoses and Tube Manual.*

11.8.3.20. Use X-ray, borescope, and other equipment to locate FO in inaccessible areas.

11.8.3.21. WG/CD may institute real-time FOD detection (automated FOD detectors) based upon risk analysis IAW AFI 90-802 and DAFI 91-202.

11.8.4. FOD Prevention Responsibilities.

11.8.4.1. The WG/CD will be assigned as the FOD Prevention Program Manager and will appoint a qualified maintenance AFSC, civilian equivalent or contractor if designated by SOW or PWS, to the position of FOD Monitor. **(T-2)**

11.8.4.1.1. The appointed individuals name will be posted in a prominent place within the unit on a locally developed visual aid which also provides contact information. **(T-2)**

11.8.4.2. The WG/CD will:

11.8.4.2.1. Ensure all personnel actively support the FOD Prevention Program. **(T-2)**

11.8.4.2.2. Provide local guidance to ensure each FOD mishap is investigated, and action taken to solve any underlying problems. **(T-2)**

11.8.4.2.3. Review all unit FOD mishap reports and analyze the reports and other data for trends identifying areas requiring management action. **(T-2)**

11.8.4.2.4. Coordinate FOD prevention needs with the airfield manager and other agencies when construction is in progress on or near the flightline, or other areas where FOD incidents could occur. **(T-2)**

11.8.4.2.5. Ensure FOD prevention is part of QA inspections. **(T-2)**

11.8.4.2.6. Coordinate with the airfield manager to identify and properly mark FOD checkpoints. **(T-2)**

11.8.4.3. Tenant Unit FOD Prevention Responsibilities. The host base FOD Prevention Program Manager will incorporate tenant units in the host unit program. **(T-2)**

11.8.4.3.1. Tenant units will establish their own FOD Prevention Program but will still participate in the host program and comply with host program requirements. **(T-2)**

11.8.5. FOD Monitor. The Wing FOD Monitor's office will be located within QA or at the discretion of the WG/CD. **(T-3)** The Wing FOD Monitor, at a minimum, will:

11.8.5.1. Inform all wing agencies of FOD hazards. **(T-2)**

11.8.5.2. Develop wing procedures to document and perform spot checks of "high risk" areas weekly. **(T-2)**

11.8.5.3. Be involved in each FOD investigation and help ensure corrective actions are sound. **(T-2)**

11.8.5.4. Monitor and recommend changes to FOD prevention training. **(T-2)**

11.8.5.4.1. Those units having several types of aircraft assigned will have their FOD prevention training incorporated into one wing/center training program. **(T-2)**

11.8.5.4.2. Units will ensure an initial FOD awareness and responsibilities briefing is given to all newly assigned personnel. **(T-2)**

11.8.5.5. Periodically inspect and report damaged pavement, flightline construction, or other hazards in or near aircraft parking ramps or taxiways to the airfield manager and monitor status to ensure timely repairs. **(T-2)**

11.8.6. FOD Investigation and Reporting.

11.8.6.1. When suspected or confirmed FOD is discovered, the MOC will be notified immediately. **(T-2)**

11.8.6.1.1. Upon notification, the MOC will immediately notify the Wing FOD Monitor, and Wing Safety, IAW DAFMAN 91-223.

11.8.6.2. Units must make every attempt to determine the root cause of FOD-related mishaps before returning engines and modules to the depot for investigation. **(T-2)**

11.8.6.2.1. If engines/modules are returned to the depot, an information DR will be completed and forwarded IAW procedures outlined in DAFI 91-204 and TO 00-35D-54.

11.8.6.2.2. All FOD-mishap engines and modules returned to the depot must be properly marked on the outside of the packaging as a FOD-mishap asset. **(T-2)**

11.8.6.2.3. Mark container or package in red with the following statement, "FOD mishap investigation required." **(T-2)**

11.8.6.3. FOD incidents are classified as preventable and non-preventable. Only preventable FOD over $60K (parts and labor) are to be chargeable to the FOD rate. FOD is considered preventable except when the damaged can be attributed to the following:

11.8.6.3.1. Caused by natural environment or wildlife. This includes hail, ice, animals, insects, sand, and birds. Report this type of damage IAW DAFI 91-204. Do not include these in the FOD rates.

11.8.6.3.2. From internal engine materiel failure as long as damage is confined to the engine.

11.8.6.3.3. Caused by materiel failure of an aircraft component if the component failure is reported as a DR using the combined mishap DR reporting procedures of DAFI 91-204 and TO 00-35D-54.

11.8.6.3.4. Found during depot overhaul for maximum operating time.

11.8.6.4. Additionally, the following apply:

11.8.6.4.1. Engine damage caused by improper anti-ice/de-ice procedures by either flight or ground crews are considered preventable.

11.8.6.4.2. Engine or airframe damage caused by gunnery or rocket mission ricochets are considered non-preventable provided mission parameters were not exceeded and range cleaning was sufficient.

11.8.6.4.3. Engine and propeller damage caused by rocks, stones, wood, or other objects ingested during low hover operations or unimproved runway landings are considered non-preventable, provided mission parameters were not exceeded.

11.8.6.4.4. MAJCOMs will determine reporting criteria for FOD incidents that result in a blade blending requirement IAW applicable tech-data.

11.8.6.5. Preventable FOD over $60K incurred at ETS or on trim pad will be chargeable. **(T-2)**

11.8.6.6. Appropriate MAJCOM offices will assist in resolving any questionable FOD issues, preventable or non-preventable.

11.8.6.7. The Wing FOD Monitor will provide an initial report of all FOD incidents to the MAJCOM FOD monitor within 24 hours of occurrence. **(T-2)**

11.8.6.7.1. A follow-up report will be required every 45 days until closeout. **(T-2)** Use the FOD report format as listed in **Attachment 6**.

11.8.6.7.2. MAJCOMs will determine FOD standards, MDS specific flying hour source data, period of time for calculation, reporting procedures, and meeting frequency for units that exceed standards in their supplement to this DAFI.

11.8.6.8. FOD rates are computed by MDS as follows: Number of Preventable FODs (damage exceeding $60K) ÷ Aircraft Flying Hours X 10,000 = FOD Rate. **Note:** ALCs compute FOD rates as follows: Number of Preventable FODs (damage exceeding $60K) ÷ Aircraft Flying Hours X 1,000 = FOD Rate. ALCs compute aircraft flying hours by using acceptance flights, functional check flights, ground runs, and the number of un-installed ETS starts.

11.8.7. FOD Prevention Committee Meeting. This meeting is mandatory for units that exceed the MAJCOM-established standard. **(T-2)**

11.8.7.1. - 11.8.7.1.1. DELETED.

11.8.7.2. Meeting agenda items should include issues that resulted in the wing exceeding the FOD standard, such as:

11.8.7.2.1. Total number of airframes, engine, and tire FOD incidents during the reporting period. Indicate quantity and cause. Current status of all other pending incidents will be discussed.

11.8.7.2.2. Mechanical/vacuum sweeper status.

11.8.7.2.3. Review and refinement of the existing FOD prevention program.

11.8.7.2.4. New directives/actions established to minimize FOD.

11.8.7.2.5. Status and condition of engine run-up screens as applicable.

11.8.7.2.6. Results of X-rays for FOs during engine bay inspections, acceptance inspections, and PH inspections. Maintenance trends should be discussed when an increase in FO is discovered during these X-rays.

11.8.7.2.7. Identification of potential FOD sources.

11.8.7.2.8. Lost tools/items.

11.8.7.2.9. Increased potential for FOD within the next 30-60 days.

11.8.7.2.10. Dropped objects. Pay particular attention to those that result in downstream FOD.

11.8.7.2.11. Breakdown of FOD inspections/assessments.

11.8.7.2.12. Cockpit FO incidents.

11.8.7.2.13. Recognition of personnel making significant contributions to FOD prevention (such as, golden bolt program, FOD poster contests, or other FOD recognition programs locally developed at each unit).

11.8.8. Bird Strikes. Consult TO 1-1-691 for bird strike clean-up procedures and DAFMAN 91- 223, *Aviation Safety Investigation and Reports* for bird strike reporting procedures.

11.9. Dropped Object Prevention (DOP) Program. A dropped object is any aircraft part, component, surface, or other item lost during aircrew operations (unless intentionally jettisoned) from engine start to engine shutdown. Inadvertently released munitions are not considered dropped objects and will be reported IAW DAFI 91-204. **Note:** Missing Chaff/Flare/Decoy endcaps/LO coating are not reportable dropped objects.

11.9.1. Responsibilities. All units, which fly, service, or maintain aircraft, will develop a DOP Program with the following provisions: **(T-2)**

11.9.1.1. MAJCOM DOP monitors or aircraft functional managers will act as OPR for all dropped object inquiries IAW MAJCOM established standards.

11.9.1.2. The WG/CD serves as the Wing DOP Program Manager and will appoint a Wing DOP Monitor. **(T-2)**

11.9.2. Investigation. The DOP Monitor will investigate each dropped object incident. **(T-2)**

11.9.2.1. Every effort needs to be made to determine the precise cause to ensure positive corrective action is accomplished. Anytime a materiel or design deficiency is the cause, or suspected cause, a DR will be submitted IAW TO 00-35D-54, even when an exhibit is not available.

11.9.2.2. Investigation results will be distributed to each appropriate work center for inclusion in personnel training and education programs. **(T-2)**

11.9.3. Reporting. Units will follow MAJCOM DOP Program reporting procedures. **(T-2)**

11.9.3.1. Transient Aircraft. The host Wing DOP Monitor will be responsible to investigate dropped objects from a transient aircraft. **(T-2)**

11.9.3.1.1. The host Wing DOP Monitor will provide the home station Wing DOP Monitor with sufficient data to generate a report for trending and tracking purposes. **(T-2)**

11.10. Aircraft Structural Integrity Program (ASIP). The ASIP includes requirements for collection and evaluation of aircraft usage data to update or confirm the original design or baseline spectrum and to adjust maintenance intervals on an individual aircraft basis. The Loads/Environment Spectra Survey data is collected via flight data recorders of instrumented aircraft to evaluate the loads spectrum. The Individual Aircraft Tracking data is collected via flight data recorders or manual forms such as "bubble sheets" and the data is used to make maintenance/inspection/force structure decisions. Both the Loads/Environment Spectra Survey and Individual Aircraft Tracking usage data programs are established by applicable MDS-specific TOs and DAFI 63-140 and require coordinated action by a number of base-level maintenance activities to achieve the required data capture rates. An effective ASIP aircraft usage data collection program is essential to establish, assess and support inspections, maintenance activities, repairs and required modification/replacement actions. MAJCOMs will:

11.10.1. Publish ASIP roles and responsibilities for each assigned weapon system IAW DAFI 63-140.

11.10.2. Ensure operational units continuously meet authorized reporting requirements established by Program Offices.

11.10.3. Document causes and corrective actions for units that fail to meet reporting requirements and retain until resolved or relief of the reporting requirement is granted from the Program Office in writing.

11.11. Identification Friend or Foe (IFF) Program.

11.11.1. MAJCOMs will establish an Identification Friend or Foe Program for aircraft in their command (if equipped).

11.11.1.1. MAJCOM programs will identify additional requirements necessary to ensure status of Identification Friend or Foe systems meets mission requirements.

11.11.2. DELETED.

11.11.3. Equipped aircraft will be checked prior to its first sortie of the day during contingency operations. **(T-2)**

11.12. Radar Warning Receiver/Radar Threat Warning Testing.

11.12.1. MAJCOMs will identify weapon systems with enhanced on-board diagnostics and internal testing capabilities which do not require external testing in their supplement to this instruction (if equipped).

11.12.1.1. MAJCOMs will determine non-contingency system functional check requirements necessary to ensure Radar Warning Receiver/Radar Threat Warning systems are maintained operationally ready to meet mission requirements IAW the MESL or MDS equivalent.

11.12.2. DELETED.

11.12.2.1. The Radar Warning Receiver/Radar Threat Warning Manager if assigned, will coordinate test procedures with the Wing Electronic Warfare Officer and the MXS, if applicable. **(T-2)**

11.12.2.2. The Radar Warning Receiver/Radar Threat Warning Manager if assigned will ensure each unit accomplishes the required minimum number of checks as defined below. **(T-2)**

11.12.2.2.1. For contingency missions, the Radar Warning Receiver/Radar Threat Warning Manager will coordinate with the Electronic Warfare Officer/Electronic Combat Officer who will determine system check requirements and specific threats to be simulated. **(T-3)**

11.12.3. When an aircraft is found to have a malfunctioning Radar Warning Receiver/Radar Threat Warning system prior to flight, the Aircraft Commander (AC) determines the course of action based on operational needs and requirements.

11.13. Cannibalization Program.

11.13.1. General. CANN actions may be necessary when a condition prevents the accomplishment of a mission, and the required assets are not immediately available from supply. Prior to performing a CANN action, verify the required component cannot be sourced from LRS, TNB or back shop. When authorizing a CANN, the expenditure of man-hours and potential damage to equipment need to be weighed against the expected benefit. High risk CANNs should not be performed unless priority aircraft are involved, or lack of ready equipment will impede mission accomplishment. See **Table 1.2** (Reference AFTTP 3-4.21V1).

11.13.2. Definition. CANN is the authorized removal of a specific assembly, subassembly, or part from one weapon system, system, support system, or equipment end item for installation on another end item to satisfy an existing supply requisition and to meet priority mission requirements with an obligation to replace the removed item. Weapon systems, support systems, or equipment include aircraft, missiles, drones, RPA, uninstalled engines, uninstalled engine modules, aircrew and/or launch crew training devices, Communications-Electronics equipment, AGE, TMDE, serviceable uninstalled pods, and guns.

11.13.3. Responsibilities. CANN Authorities (CA) will be tracked in the MIS and SCR (see **Table 11.1**). **(T-2)**

11.13.3.1. CA will be SNCOs, officers or civilian equivalents. **(T-2)** These personnel are typically Pro Supers.

11.13.3.2. Those who are authorized to approve CANNs will not further delegate their responsibility. **(T-2)**

11.13.4. If an assembly is cannibalized to satisfy a condition caused by lack of bits and pieces (such as, washers, nuts, and bolts), the assembly is counted as a CANN, and the bits and pieces are considered transfer actions. Bits and pieces removed from an end item (without removing the assembly) for installation on another end item are considered individual CANN actions.

11.13.5. When a required part cannot be delivered and installed on time, the CA may approve the CANN of parts before the initiation of CANN documentation (such as, Red Ball maintenance). The CA will give this approval only after confirming the part is not readily available in LRS, TNB, forward supply points, or back shops. **(T-2)**

11.13.5.1. The CA will notify the appropriate supply activity to change the "mark-for" components in the document number. **(T-2)**

11.13.5.2. The CA will also ensure complete documentation is accomplished for each CANN action. **(T-2)**

11.13.6. When TCIs, serially controlled items, items affecting compliance of a TCTO, or other components with inspection requirements that align to specific hourly, calendar, or event limits are considered for CANN, the CA will coordinate with PS&D or EM to ensure adequate time remains on the item to justify the CANN and to ensure appropriate records are updated. **(T-2)**

11.13.6.1. If the CANN action takes place, the performing work center will update the MIS and notify PS&D or EM. **(T-2)**

11.13.7. Installed engines are not end items; installed engines are considered a LRU (similar to a radar component, gun, seat, canopy, radio, multifunction display unit).

11.13.7.1. If a functional LRU is removed from one end item to put on another end item to fill a "hole" which was caused by a supply requisition, (the requisition could be against the LRU), then this is considered a CANN.

11.13.8. Restrictions.

11.13.8.1. Egress system component CAD/PAD cannibalization actions are considered "High-Risk" and should not be performed unless priority aircraft are involved (example, higher headquarters/alert status), or lack of ready equipment will impede mission accomplishment.

11.13.8.1.1. To ensure system integrity and validation of the explosive CAD/PAD listing, cannibalization of egress explosive and seat components require MXG approval. **(T-3)**

11.13.8.1.2. After cannibalization actions, Egress Red X discrepancies in the aircraft AFTO Form 781As will not be cleared until verification that CAD/PAD S/N content matches the S/N content entries in the MIS. **(T-2)**

11.13.8.1.3. Only (2A6X3) Egress personnel will accomplish this action. **(T-2)**

11.13.8.2. CANN actions involving parts from ABDR training aircraft, AF Museum Aircraft, Maintenance Training Devices, GITA, TAA, or DLADS will not be accomplished without authorization from the Program Office. **(T-2)**

11.13.8.2.1. Parts will not be removed from static display/AF Museum Aircraft except as authorized by AFI 84-103. **(T-2)**

11.13.8.2.2. If the part is approved for CANN, it must not be put into service until all necessary inspections (such as, NDI, pressure checks, operational checks, TCTOs) have been accomplished using specific guidance from the item manager to ensure proper serviceability. **(T-2)**

11.13.8.3. Units will not CANN parts from aircraft possessed by AFMC (B or D PIC) without first coordinating through the MAJCOM functional manager who will request approval from the applicable PM. **(T-2)**

11.13.8.4. An aircraft that has been extensively cannibalized will not be launched on an overseas or cross-country sortie/mission on the first flight following CANN rebuild without the owning MXG/CC or equivalent approval. **(T-2)**

11.14. Hangar Queen Aircraft.

11.14.1. General. The objective of this program is to ensure the entire fleet remains healthy and all possible management actions are carried out to ensure aircraft do not remain inoperative for extended periods. MAJCOMs will establish a Hangar Queen Management Program.

11.14.2. Definitions. A "Hangar Queen" is a unit-possessed aircraft that has not flown for at least 30 calendar days. Aircraft are exempt from accruing Hangar Queen time for up to 10 days immediately following DFT/CFT repair or maintenance; however, if an aircraft is not flown after the 10th day, the 10 days are included in the total number of days since last fly date to determine the Hangar Queen category computation. Hangar Queen aircraft will be further defined by the following three categories:

11.14.2.1. Category 1: Aircraft that have not flown for 30 to 59 calendar days. **(T-2)**

11.14.2.2. Category 2: Aircraft that have not flown for 60 to 89 calendar days. **(T-2)**

11.14.2.3. Category 3: Aircraft that have not flown for 90 or more calendar days. **(T-2)**

11.14.3. All aircraft placed on higher HHQ alert status are exempt from the Hangar Queen Management Program and reporting throughout the duration of alert status/posturing.

11.14.4. An aircraft is released from Hangar Queen status after the first flight. The following examples are provided to clarify when an aircraft becomes a Hangar Queen:

11.14.4.1. A unit-possessed aircraft has not flown for 20 calendar days, enters depot status for 5 more calendar days, and then returns to unit possession on the 26th non-fly day; the unit has up to 10 calendar days to fly the aircraft to avoid Hangar Queen status. If this aircraft does not fly on the 10th calendar day (35th non-fly day), the aircraft will become 36-day Category 1 Hangar Queen on the next day.

11.14.4.2. A unit-possessed aircraft has not flown for 2 calendar days, then enters depot status for 1 calendar day and is returned to unit possession, the unit must fly the aircraft in the next 27 calendar days to avoid becoming a Category 1 Hangar Queen.

11.15. Ground Instructional Trainer Aircraft (GITA). GITA are permanently grounded aircraft declared excess to future operations or flying requirements by higher headquarters and will be re-designated by the addition of the prefix "G" to the basic MDS. GITA are not maintained in

a flyable condition but maintain system/subsystem operational condition for purposes of maintenance training and will be carried in assignment/PIC outlined in DAFI 21-103 and AFI 16-402. This section does not apply to ABDR training aircraft. ABDR training aircraft are managed by AFSC/LZDB (ABDR Program Office (PO)). This **Chapter** does not apply to training equipment maintained by Contract Logistics Support contracts administered by commands other than AETC.

11.15.1. Only those items requested by the PM are considered for removal. If the item does not affect training and if approved by MXG/CC, the part will be removed and turned in as per the ALC MXG/CC's (or equivalent) instructions. **(T-2)**

11.15.1.1. Units are responsible for storing uninstalled or removed equipment that is not required for training. **(T-3)**

11.15.2. Training Aid Aircraft (TAA). TAA are permanently grounded aircraft that, at a minimum, require an aircraft fuselage that was previously in the AF inventory as an aircraft.

11.15.2.1. Assigned TAA are not maintained in airworthy condition, and only the system/subsystem required for the specific training requirements will be maintained in operational condition for purposes of required maintenance/organizational training. **(T-2)**

11.15.2.2. TAA used for training are not terminated from the AF inventory IAW AFI 16-402. TAA requests for use by non-maintenance AFSCs require coordination through AFMC/LCMC and the PM prior to approval of assignment via an AF Form 913. **(T-3)**

11.15.2.3. Questions about the designation of an aircraft used for training should be directed to the MAJCOM AVDO.

11.15.2.4. Permanently grounded missiles retain their original MDS without a prefix.

11.15.2.5. Upon assignment of a permanently grounded GITA/TAA, the MXG will contact the applicable MAJCOM to coordinate "save list" requirements identified by the applicable PM. **(T-2)**

11.15.2.5.1. "Save list" items removed will be turned into LRS for shipment. **(T-3)**

11.15.2.5.2. If an item on the "save list" is not removed, the reason for not removing it will be annotated and coordinated with the applicable MAJCOM. **(T-2)**

11.15.2.5.3. If items on the "save list" are required for training and an unserviceable item will suffice, units will coordinate with the applicable MAJCOM for receipt of the unserviceable item(s). **(T-2)**

11.15.2.5.4. All unserviceable items furnished by ALC will be marked/identified as "unserviceable" in a conspicuous manner (such as, Red X or Red dot system). **(T-2)**

11.15.3. MAJCOM Responsibilities. MAJCOMs will determine use of MIS for permanently grounded GITA records management.

11.15.3.1. MAJCOMs will coordinate "save list" requirements/changes with the applicable PMs.

11.15.4. MXG/CC Responsibilities. MXG/CC or equivalent will:

11.15.4.1. - 11.15.4.2. DELETED.

11.15.4.2.1. GITA maintenance includes on- and off-equipment maintenance of active systems and subsystems and necessary actions to maintain the aircraft in a safe and presentable condition.

11.15.4.2.2. TAA require minimal maintenance on systems/subsystems used to meet training requirements and should be maintained in a safe and presentable condition.

11.15.4.2.3. Determine which system and subsystem are required to support the training. Consider present, future, and cross-utilization of systems when making determinations. These systems will be maintained in the same configuration as operational equipment. **(T-3)**

11.15.4.2.4. - 11.15.4.2.7. DELETED.

11.15.4.2.7.1. Prior-to-use inspections will be conducted by the using organization employing a tailored weapon system pre-/post-dock checklist. **(T-3)**

11.15.4.2.7.2. Conduct periodic maintenance inspections using a tailored work deck. **(T-3)**

11.15.4.2.8. DELETED.

11.15.4.2.8.1. When changes in requirements occur, initiate a new memorandum.

11.15.4.2.8.2. Ensures copies of all GITA/TAA memorandums to the MAJCOM AVDO. **(T-2)**

11.15.4.2.9. DELETED.

11.15.4.2.10. DELETED.

11.15.4.2.10.1. Owning units not having maintenance capability will establish MOAs or MOUs with organizations which can provide maintenance support. **(T-2)**

11.15.4.2.11. - 11.15.4.2.11.2. DELETED.

11.15.4.2.12. DELETED.

11.15.4.2.12.1. When an item is removed or replaced, supervisors will ensure this action is documented in the aircraft forms. **(T-2)** Include the authority for removal (such as, message number, telecon, letters, and dates) and condition of installed/replacement items.

11.15.4.2.12.2. When the limited save list actions have been done, a copy of the completed list will be forwarded to the appropriate PM and the local documentation function which will be added to the TAA historical record. **(T-2)**

11.15.4.2.12.3. W&B handbook requirements will be maintained IAW TO 1-1B-50 and applicable -5 series TOs. **(T-2)**

11.15.4.2.12.4. Operating and maintenance technical data will be readily accessible whenever the GITA/TAA is in use or undergoing inspection. **(T-2)**

11.15.4.2.12.5. DELETED.

11.15.4.2.12.5.1. The GITA/TAA Manager must be qualified to operate GITA/TAA systems and appropriate support equipment to conduct GITA/TAA

maintenance. **(T-3)**

11.15.4.2.12.5.2. The GITA/TAA Manager will accomplish and/or coordinate maintenance actions for the GITA/TAA and ensure GITA/TAA documentation is accurate and complete. **(T-3)**

11.15.4.2.13. For equipment designated as trainers, only the systems required for technical training (or those required to ensure safety or system integrity) need to be maintained. **Note:** This does not apply to "temporarily" grounded aircraft or operational equipment or systems on loan from MAJCOMs or ALCs.

11.15.5. Technical Data Applicability.

11.15.5.1. Operational systems on GITA/TAA are maintained IAW applicable technical data. The specific policy governing the use and modification of technical data is contained in TO 00-5-1.

11.15.5.1.1. Some systems may be operated and maintained with original contractor data because formal technical data was never developed and/or the contractor data was never assigned a TO number.

11.15.5.2. Inspection and lubrication requirements may be adjusted to correspond with training requirements and equipment usage and to prevent over or under inspection.

11.15.5.3. When significant savings may be achieved, the commander or contract project manager must request deviations or changes to technical data requirements, including substitution of materiel from the weapon system program manager.

11.15.5.3.1. If deviations are approved, the unit will retain approved deviations/changes in the GITA historical records. **(T-3)** In all cases, safety or design function must not be compromised.

11.15.5.4. TCTOs. The QA function or other designated agency will be responsible for determining applicability of TCTOs for GITAs. **(T-2)** TCTO upgrades are not required on TAA.

11.15.5.4.1. Ensure timely completion of TCTOs on systems designated for configuration management and proper configuration status accounting is maintained.

11.15.5.4.2. Accomplish TCTOs on systems not designated for configuration management as required to ensure safety of operation or as directed by the PM.

11.15.4.2.11.2. DELETED.

11.16. Aircraft Inlet/Intake/Exhaust Certification.

11.16.1. MAJCOMs will determine the requirement to implement an Aircraft Inlet/Intake/Exhaust Certification program and certification frequency requirements.

11.16.2. DELETED.

11.17. Engine Run Training and Certification Program.

11.17.1. A comprehensive engine run certification program will be developed and strictly enforced to prevent safety mishaps and potential loss of life. **(T-2)**

11.17.1.1. DELETED.

11.17.1.2. All maintenance personnel authorized to start and operate aircraft engines, APUs, and uninstalled engines and APUs will be trained and certified to operate engines at TO determined power settings. **(T-2)**

11.17.1.3. Aircraft engine motoring will only be performed by qualified engine run personnel. **(T-2)** Exception: Rotary wing maintenance personnel qualified through OJT may motor engines IAW prescribed TO.

11.17.1.4. The following minimum requirements will be used to certify engine run personnel:

11.17.1.4.1. The MT will serve as the OPR and focal point for the management and development of the engine run certification program, engine run certification test question bank, and written tests for their respective weapon system. **(T-2)**

11.17.1.4.2. Pre-run training will be conducted in the trainee's work center through OJT. **(T-2)** Pre-run training is designed to prepare the trainee for successful completion of initial engine-run training. As a minimum, pre-run training will include:

11.17.1.4.2.1. An evaluation by immediate supervisor or NCOIC/Flight Chief to determine the individual's level of maturity and experience prior to being selected for engine-run training. **(T-2)**

11.17.1.4.2.2. The trainee will review and become familiar with engine-run operations to include emergency procedures IAW the applicable aircraft general system type TO and engine run checklist. **(T-2)**

11.17.1.4.2.3. MTs may develop a handout to facilitate learning engine-run procedures, engine limitations, and emergency procedures.

11.17.2. Certifying Officials. Certifying official certification requirements are listed in **Table 11.1**.

11.17.2.1. Instructor Pilots (IP) can also be used as certifying officials during the practical engine-run demonstration.

11.17.2.2. Certifying officials must maintain proficiency in the same manner as other technicians; certifying officials must recertify each other. **(T-2)**

11.17.3. Instructors. Individuals selected as instructors will possess a 7-skill level or civilian equivalent, a qualified contractor, or AFETS/CETS personnel. **(T-2)**

11.17.3.1. AFMAN 11-218, *Aircraft Operations and Movement on the Ground*, aircraft and engine TOs, commercial aircraft/engine operating procedures, and special test project engineering procedures will be used to develop engine run certification training programs. **(T-2)**

11.17.4. Installed Engine Run Personnel. Prior to entering engine run training, personnel will meet the following requirements:

11.17.4.1. Personnel will be selected IAW criteria established in **Table 11.1**. **(T-2)** MXG/CCs may designate contractors in writing to run aircraft engines.

11.17.4.2. Qualified to operate the aircraft APU as applicable. **(T-2)**

11.17.4.3. Qualified as a brake operator. **(T-2)**

11.17.4.4. Qualified in basic radio and interphone systems operation. **(T-2)**

11.17.4.5. Qualified on marshalling signals. **(T-2)**

11.17.5. The initial engine run certification program will consist of following three phases, each of which will be successfully completed before progressing to the next phase:

11.17.5.1. Phase 1. **(T-2)** Phase 1 is formal classroom training. Classroom instruction will include:

11.17.5.1.1. General aircraft familiarization to include, as a minimum, basic MDS airframe characteristic, aircraft safe-for-maintenance procedures, cockpit configuration and systems, throttles and aircraft controls, egress, normal and emergency braking systems, and aircraft system/subsystems related to safe engine operation. **(T-2)**

11.17.5.1.2. A thorough review of TO procedures with emphasis on and notes, cautions, and warnings. **(T-2)**

11.17.5.1.3. Engine/APU operation, to include normal operational parameters and limitations. **(T-2)**

11.17.5.1.4. Ensuring aircraft, engine, and APU emergency procedures are memorized. **(T-2)**

11.17.5.1.5. UHF/VHF radio operation, Air Traffic Control tower procedures, and emergency radio transmissions. **(T-2)**

11.17.5.1.6. A two-part closed book examination (students will successfully complete **Part I** before taking **Part II**). **(T-2)** The examination will consist of the following:

11.17.5.1.6.1. **Part I** - Students will be given a written/computer-based examination on all boldface emergency procedures or all emergency procedures identified in applicable technical data requiring a passing score of 100 percent. **(T-2)**

11.17.5.1.6.2. **Part II** - Students will be given a written examination covering normal engine run procedures and limitations requiring a minimum passing score of 90 percent, corrected to 100 percent. **(T-2)**

11.17.5.1.7. Personnel failing the written/computer-based examination will receive additional instruction before being re-tested. **(T-2)**

11.17.5.1.8. Students will not be given the same **Part II** test during re-testing efforts. **(T-2)**

11.17.5.1.9. After a second failure of the two-part closed book examination, the SQ/CC (or equivalent) will determine if personnel may retest and continue with the program. **(T-3)**

11.17.5.2. Phase 2. **(T-2)** Phase 2 is simulator training. All maintenance personnel requiring engine run certification will receive simulator training on each specific aircraft MDS and APU. **(T-2)**

11.17.5.2.1. Phase 2 simulator training will be accomplished in an Aircrew Training Device, Cockpit Trainer, flight simulator, Maintenance Training Device, or approved Technology Development Trainer. **(T-2) Note:** If any of the above are not available, a similar MD(S) simulator may be used if the procedures are the same or "dry run" procedures will be accomplished in an aircraft to ensure procedural knowledge.

11.17.5.2.2. As a minimum, students will demonstrate knowledge and proficiency in the following areas:

11.17.5.2.2.1. Proper run clearance procedures. **(T-2)**

11.17.5.2.2.2. UHF/VHF radio operation, Air Traffic Control tower procedures, and emergency radio transmissions. **(T-2)**

11.17.5.2.2.3. Normal APU, engine start, run, and shutdown procedures. **(T-2)**

11.17.5.2.2.4. Augmenter or thrust reverser operation (as applicable). **(T-2)**

11.17.5.2.2.5. Applicable aircraft systems/subsystems normal operating parameters. **(T-2)**

11.17.5.2.2.6. Ensure TO emergency bold face items are memorized. **(T-2)**

11.17.5.2.2.6.1. Instructors will evaluate the student on response time and ability to handle emergency situations to include egress procedures. **(T-2)**

11.17.5.3. Phase 3. **(T-2)** Phase 3 is practical demonstration. Each individual will receive a practical engine run evaluation after successful completion of Phase 1 and Phase 2 training. **(T-2)** For fighter-type aircraft, it is preferable to conduct the evaluation in an NSS, or on a trim pad. As a minimum, the student will demonstrate successful completion of the following areas without any discrepancies based on a go/no-go standard:

11.17.5.3.1. Run clearance procedures. **(T-2)**

11.17.5.3.2. UHF/VHF radio operation, Air Traffic Control tower procedures, and emergency radio transmissions. **(T-2)**

11.17.5.3.3. Normal APU, engine start, run, and shutdown procedures, including notes, cautions, and warnings. **(T-2)**

11.17.5.3.4. Augmenter or thrust reverser operation as applicable, including notes, cautions, and warnings. **(T-2)**

11.17.5.3.5. Applicable aircraft systems/subsystems normal operating parameters, including notes, cautions, and warnings. **(T-2)**

11.17.5.3.6. Ensure TO emergency bold face items are memorized. **(T-2)** Instructors will evaluate the student on response time and ability to handle emergency situations. **(T-2)**

11.17.5.3.7. Egress procedures. MAJCOM/Lead Command, TO, and checklist procedures for the applicable MDS will be demonstrated without error. **(T-2)**

11.17.6. Annual recertification for certifying officials and engine run certified personnel will be accomplished by successfully completing the written test (**Part I** and **Part II**) administered by the MT and demonstrating proficiency of normal and emergency procedures to a certifying

official by operating one of the following: Aircrew Training Device, Cockpit Trainer, authorized Technology Development Trainer (if assigned or available), or aircraft as appropriate. **(T-2)**

11.17.6.1. Personnel failing the written examination will receive additional instruction before being re-tested. **(T-2)**

11.17.6.2. Students will not be given the same **Part II** test during re-testing efforts. **(T-2)**

11.17.6.3. After a second failure of the two-part closed book examination, the individual will be decertified. **(T-2)**

11.17.6.3.1. The SQ/CC (or equivalent) will determine if personnel may retest and continue with the program, and whether they must attend all three phases of initial training prior to being recertified. **(T-2)**

11.17.6.4. Certified individuals who PCS to the same MDS, and engine type and model must be approved by the SQ/CC (or equivalent) and complete an initial evaluation by a certifying official prior to becoming run qualified at the gaining base. **(T-2) Note:** MAJCOMs will determine if additional training is required for the specific engine series.

11.17.6.4.1. The evaluation will include, as a minimum, familiarization of local procedures and requirements. **(T-2)**

11.17.6.4.2. Carry over the date of original class completion from previous documentation (certificate, training record, MIS printout).

11.17.7. Documentation. Qualifications of installed engine run certifying officials and engine run certified personnel, will be documented in the MIS and entered on the SCR. **(T-2)**

11.17.8. Proficiency. MAJCOMs will determine proficiency requirements for maintenance personnel authorized to operate installed engines.

11.17.8.1. Units will track run proficiency requirements in the MIS. **(T-2)**

11.17.8.2. Supervisors will ensure individuals who fail to maintain proficiency are decertified. **(T-2)**

11.17.8.2.1. Decertified individuals will recertify IAW **Paragraph 11.17.6**. **(T-2)**

11.17.9. Engine run certification tests are controlled items and will be handled IAW DAFMAN 36-2664, *Personnel Assessment Program*, and administered only by MT personnel or regional training centers. **(T-2)**

11.17.10. Aircraft APU Installed Operation Training. The following requirements and standards will apply to qualifying maintenance personnel on operating the aircraft APU:

11.17.10.1. When conducting initial operator qualification training for APU, use the applicable video or other training program. **(T-2)**

11.17.10.2. A two-part closed book examination consisting of the following: **Note:** MAJCOMs will determine examination applicability requirements for PMA only APU operations in their supplement/addendum to this DAFI.

11.17.10.2.1. **Part I** - Students will be given a written/computer-based examination on all boldface emergency procedures or all emergency procedures identified in applicable technical data requiring a passing score of 100 percent**. (T-2)**

11.17.10.2.2. Students will successfully complete **Part I** before taking **Part II. (T-2)**

11.17.10.2.3. **Part II** - Students will be given a written/computer-based examination covering normal APU run procedures and limitations requiring a minimum passing score of 90 percent, corrected to 100 percent. **(T-2)**

11.17.10.3. Personnel failing the examination will receive additional instruction before being re-tested. **(T-2)**

11.17.10.4. Students will not be given the same **Part II** test during re-testing efforts. **(T-2)**

11.17.10.5. After a second failure of the two-part closed book examination, the individual will be decertified. **(T-2)**

11.17.10.5.1. The SQ/CC (or equivalent) will determine if personnel may retest and continue with the program prior to being recertified. **(T-2)**

11.17.10.5.2. Individuals must attend all three phases of initial training prior to being recertified. **(T-2)**

11.17.10.6. **Part III** Personnel must then accomplish an on-equipment practical evaluation for certification completion. **(T-2)**

11.17.10.7. Personnel will be recertified annually using the initial certification procedures. The practical evaluation portion will be accomplished by operating one of the following: Aircrew Training Device, Cockpit Trainer, authorized Technology Development Trainer (if assigned or available), or aircraft as appropriate (or as determined by the certifying official). **(T-2) Note:** Recertification is not required if the individual is engine run certified and has maintained annual engine-run certification requirements.

11.17.11. Documentation. Qualifications of APU run certifying officials and APU run certified personnel, will be documented in the MIS and entered on the SCR. **(T-2)**

11.17.11.1. If applicable, MAJCOMs will define SCR applicability requirements for PMA only APU operations in their supplement/addendum to this instruction.

11.17.12. Proficiency. MAJCOMs will determine proficiency requirements for maintenance personnel authorized to operate APUs.

11.17.12.1. Units will track run proficiency requirements in the MIS. **(T-2)**

11.17.12.2. Supervisors will ensure individuals who fail to maintain proficiency are decertified. **(T-2)**

11.17.13. Certification tests are controlled items and will be handled IAW AFI 36-2605 and administered only by MT personnel. **(T-2)**

11.17.14. Uninstalled Engine Operation on Test Stands and Cells (includes Jet Fuel Starter /APU uninstalled operations). All personnel identified for uninstalled engine run qualification will complete an uninstalled engine run training program prior to certification. **(T-2)** The following minimum requirements will apply:

11.17.14.1. Certification Requirements. Individuals will be certified for each specific engine TMS authorized to run IAW criteria established in **Table 11.1**. **(T-2)**

11.17.14.2. Certifying Officials will be designated IAW criteria established in **Table 11.1**. **(T-2)**

11.17.14.3. Instructors. Individuals selected as instructors will be 7-skill level or civilian equivalent, a qualified contractor, or an AFETS/CETS representative, and be run certified on each TMS (if they are to be certifying officials). **(T-2)**

11.17.14.4. Training. Uninstalled engine run training will consist of the following three phases:

11.17.14.4.1. Phase 1. Phase 1 is formal training. Instruction will include, as a minimum, the following areas:

11.17.14.4.1.1. General engine familiarization to include, as a minimum, basic engine description, component location, and functions. **(T-2)**

11.17.14.4.1.2. Thorough familiarization of control cabs, NSSs, ETSs, and T-9 fire suppression control panels (if applicable). **(T-2)**

11.17.14.4.1.3. Thorough review of TO procedures with emphasis on notes, cautions, and warnings. **(T-2)**

11.17.14.4.1.4. Uninstalled engine operation to include normal operating parameters and limitations. **(T-2)**

11.17.14.4.1.5. Ensuring uninstalled engine emergency procedures are memorized. **(T-2)**

11.17.14.4.1.6. Local communication procedures. **(T-2)**

11.17.14.4.1.7. A two-part closed book examination (students will successfully complete **Part I** before taking **Part II**) consisting of the following:

11.17.14.4.1.7.1. **Part I** - Students will be given a written/computer-based examination on all boldface emergency procedures or all emergency procedures identified in applicable technical data requiring a passing score of 100 percent. **(T-2)**

11.17.14.4.1.7.2. **Part II** - Students will be given a written/computer-based examination covering normal engine run procedures and limitations requiring a minimum passing score of 90 percent, corrected to 100 percent. **(T-2)**

11.17.14.4.1.8. Personnel failing the examination will receive additional instruction before being re-tested. **(T-2)**

11.17.14.4.1.9. Students will not be given the same **Part II** test during re-testing efforts. **(T-2)**

11.17.14.4.1.10. After a second failure of the two-part closed book examination, the individual will be decertified. **(T-2)**

11.17.14.4.1.10.1. The SQ/CC (or equivalent) will determine if personnel may retest and continue with the program prior to being recertified or be removed

from program. **(T-2)**

11.17.14.4.1.10.1.1. Individuals must attend all three phases of initial training prior to being recertified. **(T-2)**

11.17.14.4.2. Phase 2. Phase 2 is the control cab evaluation. After successful completion of formal training, students will properly demonstrate the following minimum requirements to a certifying official without discrepancies using the go/no-go standard:

11.17.14.4.2.1. Proper uninstalled engine start, run, and shutdown procedures, including notes, cautions, and warnings (engine not operating). **(T-2)**

11.17.14.4.2.2. Proper uninstalled engine boldface emergency procedures, including notes, cautions, and warnings (engine not operating). **(T-2)**

11.17.14.4.2.3. Knowledge of normal uninstalled engine operating limits, including notes, cautions, and warnings. **(T-2)**

11.17.14.4.2.4. Augmenter or thrust reverser operation (as applicable), including notes, cautions, warnings, and emergency procedures. **(T-2)**

11.17.14.4.3. Phase 3. Phase 3 is the practical evaluation. Each individual will receive a practical uninstalled engine run evaluation after successful completion of classroom training and control cab evaluation from a certifier. **(T-2)** As a minimum, the student will demonstrate successful completion of the following areas without discrepancies based on a go/no-go standard:

11.17.14.4.3.1. Run clearance procedures. **(T-2)**

11.17.14.4.3.2. Emergency communication procedures. **(T-2)**

11.17.14.4.3.3. Normal uninstalled engine start, run, and shutdown procedures, including notes, cautions, and warnings. **(T-2)**

11.17.14.4.3.4. Augmenter or thrust reverser operation (as applicable), including notes, cautions, and warnings. **(T-2)**

11.17.14.4.3.5. Proper emergency procedure corrective actions during all bold face uninstalled engine emergency conditions. **(T-2)**

11.17.14.5. Recertification. Recertification for certifying officials and uninstalled engine run qualified personnel will be accomplished annually. **(T-2)**

11.17.14.5.1. The following three requirements must be met to obtain recertification:

11.17.14.5.1.1. Successfully completing the written test (**Part I** and **Part II**) administered by the MT. **(T-2)**

11.17.14.5.1.2. Passing a control cab evaluation demonstrating knowledge of normal and emergency procedures to a certifying official. **(T-2)**

11.17.14.5.1.3. Completing a practical engine run demonstration. **(T-2)**

11.17.14.5.2. Personnel failing the written examination will receive additional instruction before being re-tested. **(T-2)**

11.17.14.5.3. Students will not be given the same **Part II** test during re-testing efforts. **(T-2)**

11.17.14.5.4. After a second failure of the two-part closed book examination, the individual will be decertified. **(T-2)**

11.17.14.5.4.1. The SQ/CC (or equivalent) will determine if personnel may retest and continue with the program prior to being recertified. **(T-2)**

11.17.14.5.4.2. Individuals must attend all three phases of initial training prior to being recertified. **(T-2)**

11.17.14.6. Proficiency. MAJCOMs will determine proficiency requirements.

11.17.14.6.1. Supervisors will ensure individuals who fail to maintain proficiency are decertified. **(T-2)**

11.17.14.6.1.1. Decertified individuals will recertify IAW **Paragraph 11.17.14.5**. **(T-2)**

11.17.15. Fire Control Panel Operation in NSS. This section applies to all NSS designed for enclosed aircraft and uninstalled engine operation (such as, T-9, T-10, T-11, T-12, and T-20) with fire suppression systems. Only qualified personnel will be certified to use the NSS Fire Suppression Systems. **(T-2)** The following certification requirements will apply:

11.17.15.1. Meet criteria established in **Table 11.1**. **(T-2)**

11.17.15.2. Training will consist of formal training using TOs and hands on familiarization and will include the following minimum requirements:

11.17.15.2.1. NSS Fire Suppression System familiarization and operation. **(T-2)**

11.17.15.2.2. Emergency procedures, including local notification procedures. **(T-2)**

11.17.15.3. NSS supervisor, contractor, AFETS/CETS personnel or individual designated by the NSS supervisor will serve as certifying official(s). **(T-2)**

11.17.15.4. Annual recertification of NSS Fire Suppression System certified personnel will be accomplished utilizing the same criteria as initial certification. **(T-2)**

11.18. Engine Blade Blending Training and Certification Program.

11.18.1. General. All units will have a comprehensive training program to ensure technical standards are met, and proficiency is maintained. **(T-2)** The number of individuals authorized to inspect and repair blades should be sufficient to meet mission requirements and production needs. Personnel will be selected for certification IAW criteria established in **Table 11.1**. **(T-2)** MXG/CCs may designate contractors in writing to complete blade blending certification.

11.18.2. Responsibilities and Management. The MT or TD will be responsible for management and development of the blade blending training program. **(T-2)**

11.18.2.1. At a minimum, the course will include care and handling of equipment, applicable technical data, fault isolation/damage assessment/defect size determination, techniques required to correctly inspect and repair blades and performance of an engine blade blend. **(T-2)**

11.18.2.2. Prior to placement on the SCR, members must complete formal blade blending training (MT or TD course) and initial engine blade blending certification will be mandatory. **(T-2)**

11.18.3. - 11.18.3.3. DELETED.

11.18.4. Certification Officials. Certifying officials will be selected IAW criteria established in **Table 11.1**.

11.19. Engine Flexible Borescope Inspection Training and Certification Program. The purpose of this program is to ensure individual knowledge and proficiency levels; proper care and use of equipment; and standardization of program requirements.

11.19.1. All units maintaining engines using flexible borescopes will establish a comprehensive training program. **(T-2)** Certification procedures described here are only for engine borescope certification.

11.19.1.1. Training will be annotated in training records. **(T-2)**

11.19.2. MAJCOMs will:

11.19.2.1. Ensure an engine flexible borescope formal training course is developed, tracked, and managed by MT/TD.

11.19.2.2. Ensure engine flexible borescope proficiency and annual recertification (by a certifying official) requirements are established by course code.

11.19.2.3. Ensure time, training and documentation currency requirements are established for engine flexible borescope certified personnel who PCS to the same MDS/engine.

11.19.2.4. Determine training requirements for personnel using borescopes for non-engine type inspections (such as, behind ejection seats, wing boxes) to include, as a minimum, proper use, and care of borescopes.

11.20. Flying Crew Chief (FCC) Program. The purpose of the FCC Program is to enhance mission effectiveness by providing qualified maintenance support for aircraft at locations other than home station. The FCC flies in Mission Essential Personnel status. FCC's typically fly with the aircraft for the purpose of accomplishing ground maintenance at the TDY location. The duty period typically starts when the FCC shows at the aircraft prior to departure. FCCs are qualified in their duty AFSC and are required to obtain, maintain, and apply basic knowledge in several other aircraft maintenance AFSCs. They are responsible for launch, recovery, inspection, servicing, generation, and maintenance of aircraft in austere locations and locations where specific MDS maintenance capability may not be available.

11.20.1. MAJCOMs may authorize/develop an FCC Program under the direction of AF/A4LM for maintainers who are required to regularly fly and maintain aircraft.

11.20.1.1. FCCs will be selected per mission requirements as directed by MAJCOMs and qualify for Special Duty Assignment Pay (SDAP) IAW AFI 36-3017, *Assignment Incentive Pay and Special Duty Assignment Pay*.

11.20.2. The FCC program only applies to personnel assigned to positions on the Unit Manning Document with a "C" prefix for the Duty AFSC.

11.20.3. The following situations will not qualify the FCC for SDAP:

11.20.3.1. Occasional flights where the aircraft is used as transportation in lieu of commercial air.

11.20.3.2. Incentive or indoctrination flights.

11.20.3.3. Deployments where additional maintenance personnel are required at the designated location to supplement assigned maintainers.

11.20.4. Qualifying missions. A mission consists of one or more sorties with a mission number as entered on the AFTO Form 781, *Aircrew/Mission Flight Data Document*. The mission must meet at least one of the following criteria to qualify for this program:

11.20.4.1. The FCC is required to accomplish maintenance at locations other than home station to prepare the aircraft for its next departure. **(T-2)**

11.20.4.2. The FCC is required to perform in flight maintenance tasks, if required IAW MDS TO requirements or Special/Alert sorties assigned with a mission number with documented agreement between the Operations and Maintenance Squadron Commanders. **(T-2)**

11.20.5. FCC Program responsibilities.

11.20.5.1. AF/A1PA oversees the overall SDAP and provides guidance in AFI 36-3017.

11.20.5.2. AF/A4LM is the SDAP functional manager for FCCs.

11.20.5.2.1. AF/A4LM sets criteria for FCCs, validates MAJCOM FCC reports, and forecasts FCC SDAP budget needs.

11.20.5.2.2. AF/A4LM approves/disapproves FCC position increases/decreases in coordination with AF/A1PA.

11.20.5.3. MAJCOMs implement the FCC Program and will appoint in writing an FCC Program Manager to enforce standards and prepare the annual report.

11.20.5.4. MAJCOM FCC Program Managers will determine which squadrons will participate in the FCC Program and will:

11.20.5.4.1. Validate and forward squadron FCC SDAP requests (**Attachment 5**) to AF/A4LM and AF/A1PA.

11.20.5.4.2. Annually validate FCC SDAP positions.

11.20.5.4.3. Assign FCC SDAP positions with an AFSC prefix of "C" and an appropriate SEI on command manpower documents.

11.20.5.4.4. Establish command unique training requirements and set additional qualification standards for their FCCs as needed.

11.20.5.4.5. Maintain quarterly and annual FCC reports (**Attachment 3** and **Attachment 4**).

11.20.5.4.6. Prepare and submit the command annual FCC report to AF/A4LM at **AF.A4LM.Workflow@us.af.mil** and AF/A1PA by 15 August each year. Submit the biennial FCC report to AF/A1PA upon request.

11.20.5.4.7. Review and approve/disapprove ACR for changes of the "C" prefix to an AFSC on the UMD.

11.20.5.4.8. Review and recommend approval/disapproval of ACRs for additions, deletions of the "C" prefix to an AFSC on the UMD.

11.20.5.5. MAJCOM (A1M) Command Manpower and Organization Responsibilities. A1M will:

11.20.5.5.1. Coordinate and obtain approval/disapproval from MAJCOM for Installation Manpower and Organization Office ACRs pertaining to validation of "C" prefix to AFSCs on the UMD.

11.20.5.5.2. Assign the "C" prefix to AFSCs upon approval from MAJCOM FCC Program Manager. This provides MAJCOM functional managers and unit senior maintenance managers the visibility of squadron FCC SDAP positions. **Note:** FCC SDAP positions do not affect a unit's manpower authorizations.

11.20.5.6. SQ/CC's will:

11.20.5.6.1. Administer the squadron FCC Program IAW AFI 36-3017, AFMAN 36-2100, *Military Utilization and Classification*, and this instruction.

11.20.5.6.2. Ensure FCCs fly only when required for the mission. **(T-2)**

11.20.5.6.3. Appoint and remove personnel from the FCC Program IAW AFMAN 36-2100.

11.20.5.6.3.1. Assign FCCs for a minimum of one year, unless removed for cause. **(T-2)**

11.20.5.6.4. Ensure only qualified FCCs and assistant FCCs who meet minimum requirements IAW AFI 36-3017 receive SDAP and fly a minimum of three qualifying missions per quarter. **(T-2)** An indicator of having too many FCCs may be reflected in a unit whose FCCs routinely do not meet minimum quarterly requirements.

11.20.5.6.5. Assign no more than two FCCs per aircraft (an FCC and assistant FCC) to each qualifying mission unless otherwise approved by MAJCOM. **(T-2) Exception**: SQ/CC may assign the minimum number of additional FCCs when required to maintain proper work-rest cycles or to meet TO requirements.

11.20.5.6.6. Appoint in writing a Unit FCC Program Manager. **(T-2)**

11.20.5.7. Unit FCC Program Managers will:

11.20.5.7.1. Track status and prepare unit reports. **(T-2)**

11.20.5.7.2. Ensure personnel possess the appropriate SEI for their MDS aircraft. **(T-2)**

11.20.5.7.3. Provide a letter to their Installation Manpower and Organization Office and an information copy to the MAJCOM FCC Program Manager to change, add, or delete a "C" prefix to the AFSC on the UMD. **(T-2)**

11.20.5.7.3.1. The letter will contain the unit designation, function account code, AFSC, position number, and a POC. **(T-2)**

11.20.5.7.4. Ensure FCCs and assistant FCCs are aligned in a duty position with a "C" prefix by initiating an DAF Form 2096, *Classification/On-the-Job Training Action*, or special order. **(T-2)**

11.20.5.7.5. Counsel FCCs and assistant FCCs on SDAP termination (AFI 36-3017, **Table 3** lists reasons for termination). **(T-2)**

11.20.5.7.5.1. SDAP stops on the dates listed in this table. As long as a “C” prefix is attached to an AFSC the member will receive SDAP. **(T-2)**

11.20.5.7.6. Review, update, and authenticate the monthly SDAP roster. **(T-2)** The SDAP roster is the only administrative tool used to start, stop, or continue the FCC pay entitlement.

11.20.5.7.6.1. If changes are made on the monthly SDAP roster, an DAF Form 2096 or special order must be submitted to the Military Personnel Section (MPS). **(T-2)**

11.20.5.7.6.2. Authentication of the monthly SDAP roster validates that each FCC is meeting the full intent of the program. **Note:** AFI 36-3017 provides commanders conditions concerning pay entitlements.

11.20.5.7.7. Submit SDAP position increase/decrease requests to MAJCOM FCC Program Manager by message, e-mail, or letter stating the number of positions to be increased/decreased with a brief justification. **(T-2)**

11.20.5.7.7.1. MAJCOMs will forward requests to AF/A4LM for final approval.

11.20.5.7.8. Provide information for processing DD Form 1610, *Request and Authorization for TDY Travel of DoD Personnel*, for FCCs. **(T-3)**

11.20.5.7.9. Ensure TDY orders authorize FCCs to travel in Mission Essential Personnel status. **(T-2) Note:** Aeronautical orders do not apply to this program, as FCCs are not aircrew members.

11.20.5.7.10. Monitor training qualifications and currency to ensure only qualified FCCs are scheduled for missions. **(T-2)**

11.20.5.7.10.1. As a minimum, maintain a folder for each FCC containing training qualifications, immunizations, military passport information, appointment letters, and FCC Mission Reports. **(T-2)** If the unit mobility section already maintains these source documents, either electronic or paper copies may be maintained.

11.20.5.7.11. Coordinate scheduling of FCCs through Flight CC/Chiefs and operations schedulers. **(T-2)**

11.20.5.7.12. Maintain a Unit FCC Program Manager’s Continuity Book. **(T-2)** As a minimum the continuity book will include:

11.20.5.7.12.1. Lists of required instructions with web addresses (including AFI 36-3017, AFMAN 36-2108 and this instruction). **(T-2)**

11.20.5.7.12.2. Unit FCC Program Manager appointment letter, DAF Form 2096 or special orders. **(T-2)**

11.20.5.7.12.3. Manpower correspondence assigning "C" prefix AFSC. **(T-2)**

11.20.5.7.12.4. Quarterly and annual FCC status reports, SDAP position requests and miscellaneous FCC and SDAP correspondence. **(T-2)**

11.20.5.7.13. Report program status by Fiscal Year (FY) quarters to MAJCOM FCC Program Manager NLT the 15th day of the month following each FY quarter and report FY annual program status to the MAJCOM NLT 15 July each year. **(T-2)**

11.20.5.7.13.1. Annual report will consist of the previous FY 4th quarter and current FY 1st, 2nd, and 3rd quarters (1 Jul - 30 Jun). **(T-2)**

11.20.5.7.14. Submit funding requests for flight clothing, per diem, and other related expenses for the annual budget (for safety during flight, flight clothing is mandatory for FCCs and Assistant FCCs). **(T-2)**

11.20.5.8. Installation Manpower and Quality Office will:

11.20.5.8.1. Forward ACR to MAJCOM to add, delete, or change "C" prefixes on AFSCs existing on the UMD. **(T-2)**

11.20.5.9. Enroute supervisors will:

11.20.5.9.1. Not assign FCCs to work other enroute aircraft. **(T-2)** However, FCCs left at an enroute location and awaiting transportation may be assigned to work other enroute aircraft.

11.20.5.9.2. Brief FCCs on local safety precautions, maintenance practices, and limitations. **(T-2)**

11.20.5.9.3. Coordinate with the Pilot in Command (PIC) and FCC to obtain transportation to/from quarters. **(T-2)**

11.20.5.10. The FCC will:

11.20.5.10.1. Establish duty shifts and rest periods with the PIC and enroute supervisor based on maintenance and mission requirements. **(T-2) Note:** Consider the duration of the flight, the ability to rest during the flight, and the quality of the rest during the flight. FCCs do not automatically enter crew rest with the aircrew upon arrival at an enroute/transient location unless the duty day was exceeded.

11.20.5.10.1.1. If the FCC's safety is jeopardized by fatigue, the FCC's duty day must end. **(T-2)**

11.20.5.10.2. Upon arrival at enroute locations, determine their ability to perform duties safely and effectively. **(T-2) Note:** The FCC's primary job is preparing the aircraft (inspect, service, aircraft forms maintenance) for the next mission.

11.20.5.10.2.1. Notify Tanker Airlift Control Center/Logistics Cell of planned crew rest periods and or establish an alternate point of contact during scheduled rest periods to minimize rest cycle interpretations. **(T-2)**

11.20.5.10.3. Coordinate with the PIC to ensure crew integrity for quarters is maintained. **(T-2)**

11.20.5.10.4. Coordinate with the PIC to ensure the FCC Performance Feedback Form in **Attachment 2** is completed by the PIC and provided the Unit FCC Program Manager upon return to home station. **(T-2)**

11.20.6. FCC qualifications and responsibilities.

11.20.6.1. FCCs should be a 2AX AFSC 5- or 7-skill level.

11.20.6.2. As a minimum, the FCC must be qualified and certified on the following MDS applicable items:

11.20.6.2.1. Possess a SEI of the aircraft assigned to the FCC. **(T-2)**

11.20.6.2.2. Refuel/defuel member and supervisor; concurrent servicing supervisor (as applicable). **(T-2)**

11.20.6.2.3. Tow member, tow supervisor, and tow brake operator. **(T-2)**

11.20.6.2.4. LOX/GOX servicing, nitrogen, and tire servicing. **(T-2)**

11.20.6.2.5. Tire and brake change; launch; recovery; marshalling; pre-flight, thru-flight and post-flight inspection. **(T-2)**

11.20.6.2.6. APU operation/quick air start system. **(T-2)**

11.20.6.2.7. Engine run. **(T-2)**

11.20.6.2.8. Kneeling operation and cargo door/ramp/visor operation on applicable MDS. **(T-2)**

11.20.6.2.9. All applicable powered/non-powered AGE. **(T-2)**

11.20.6.2.10. Qualified to operate, troubleshoot, service, and perform maintenance on their aircraft's critical systems as required by the MAJCOM. **(T-2)**

11.20.6.3. Assistant FCC qualifications and responsibilities.

11.20.6.3.1. Assistant FCCs must be a 5-level A1C or above with at least a SEI on their assigned aircraft and must accompany a fully qualified FCC. **(T-2)**

11.20.6.3.2. As a minimum, the Assistant FCC will be qualified and certified on the following MDS applicable items:

11.20.6.3.2.1. Refuel/defuel member. **(T-2)**

11.20.6.3.2.2. Tow member and tow brake operator. **(T-2)**

11.20.6.3.2.3. LOX/GOX servicing, nitrogen, and tire servicing. **(T-2)**

11.20.6.3.2.4. Tire and brake change; launch; recovery; marshalling; pre-flight, thru-flight and post-flight inspection. **(T-2)**

11.20.6.3.2.5. APU operation/quick air start system. **(T-2)**

11.20.6.3.2.6. Cargo door/ramp/visor operation on applicable MDS. **(T-2)**

11.20.6.3.2.7. All applicable powered/non-powered AGE. **(T-2)**

11.20.7. Work/rest plan (see **Chapter 1**).

11.20.8. MAJCOM FCC Program reporting.

11.20.8.1. MAJCOMs will forward a yearly report to AF/A4LM by 15 August.

11.20.8.2. Use previous FY 4th quarter, and current FY 1st, 2nd, and 3rd quarters. Late reports may postpone FCC waiver requests. Refer to **Attachment 3** and **Attachment 4** for reporting criteria.

11.20.9. Waivers.

11.20.9.1. Forward unit waiver requests to the MAJCOM FCC Program Manager, who will either disapprove/return to unit, or recommend approval/forward to AF/A4LM for final approval IAW DAFMAN 90-161. **(T-2)**

11.20.9.1.1. All approved waivers are reviewed annually as part of the annual report unless otherwise stipulated by the approval authority.

11.20.9.1.2. Waiver renewals. Submit a brief justification for waivers requiring renewal.

11.21. Maintenance of Flash Blindness Protective Devices.

11.21.1. MAJCOMs will define responsibilities across maintenance for sustainment of flash blindness protective devices for assigned aircraft in a supplement to this instruction. As a minimum, MAJCOM supplements will assign responsibilities that ensure:

11.21.1.1. Units maintain aircraft thermal protective devices, shields, and associated hardware IAW aircraft TOs.

11.21.1.2. Units will establish a training program to qualify individuals to install, inspect, and when required, seal aircraft thermal protective devices and shields. **(T-2)**

11.22. WRM External Nestable Fuel Tank Build-Up. MAJCOMs will ensure units sustain the capability to support assigned wartime taskings. External Nestable Fuel Tank Build-Up is a wartime capability, supported/tasked through a UTC to provide a critical wartime skill that compensates for the expenditure of aircraft fuel tanks (refer to **Chapter 4**). With exception of the core 2A6X4 personnel, augmentees may come from any group or squadron within the wing. MAJCOMs, as applicable, will:

11.22.1. Ensure units adhere to the direction outlined in their Mission Capability statement and DOC statement IAW DAFI 10-401 governing the quantity, size, and composition of fuel tank build-up teams.

11.22.2. Provide guidance for UDMs to ensure personnel tasked/selected for WRM Nestable Fuel Tank Build-Up team augmentees are not tasked for other wartime UTCs.

11.22.2.1. MAJCOMs must ensure UDMs responsible for deploying 2A6X4 personnel are designated as the focal point for WRM Nestable Fuel Tank Build-Up team assembly and are required to develop/maintain a written plan. The plan must be kept current, reviewed annually, and contain the following:

11.22.2.1.1. Specific manning positions across the wing to be tasked as Nestable Fuel Tank Build-Up team augmentees. **Note:** The applicable independent Nestable Fuel Tank Build-Up UTC Manpower Force Packaging System will be used as a guide to construct the teams.

11.22.2.1.2. Guidelines for activation of the tank build-up teams are established.

11.23. Protective Aircraft Shelters (PAS). MAJCOMs that possess PAS will publish guidance for aircraft maintenance operations in a PAS environment. At a minimum, MAJCOM guidance and procedures will address:

11.23.1. PAS marking and floor plans.

11.23.2. Electrical Requirements.

11.23.3. Refueling/Defueling Operations.

11.23.4. Shelter Door Operations.

11.23.5. Aircraft Engine Operation.

11.23.6. Aircraft Positioning inside the PAS.

11.23.7. Aircraft Winching (Hot/Cold).

11.23.8. Placement and Storage of Munitions in the PAS.

11.23.9. Collocating Nuclear and Conventional Munitions (AF Munitions).

11.23.10. External Fuel Tank storage.

11.23.11. PAS maintenance and Inspection requirements not covered by existing publications (such as, grounding and ventilation, mods).

11.24. Combat Sortie Generation. Combat sortie generation is a process by which mission capable aircraft are generated in a minimum amount of time, during peacetime or wartime, through separate 2AXXX and 2WXXX tasks or by Concurrent Servicing Operations. Combat sortie generation may include fueling, munitions/ammunition loading/unloading, aircraft reconfiguration, -6 TO inspections, and other servicing requirements, IAW applicable MDS TOs, Technical Order Data (TOD), IETM, TO 11A-1-33, *Handling and Maintenance of Explosives-Loaded Aircraft*, TO 00-25-172 and other applicable directives. Procedures can be compressed through pre-positioning resources and concurrent performance of tasks.

11.24.1. Wings will determine when to exercise combat sortie generation procedures. Procedures may be used during actual contingencies, scheduled exercises, and daily flying operations.

11.25. Hot Refueling Procedures. For the purpose of this instruction hot refueling is the transfer of fuel into an aircraft having one or more engines running. The purpose of hot refueling is to reduce aircraft ground time, personnel and equipment support requirements and increase system reliability by eliminating system shut down and subsequent restart. Refer to the following sources for additional guidance: TO 00-25-172, TO 00-25-172 CL-4, *Checklist -- Aircraft Fuel Servicing with R-9, R-11, and Commercial Fuel Servicing Trucks and with Fuels Operational Readiness Capability Equipment (FORCE)*, TO 37A9-3-11-lCL-l, *Checklist, Operational and Organizational Maintenance Hot Refueling and Hot Integrated Combat Turnaround Procedures, Aircraft Fuel Servicing Unit Type GRU 17/E Pantograph PACAF Type IV Hydrant Servicing*, and DAFMAN 91-203. **Exception:** N/A for MAJCOMs/Mx units not tasked to maintain hot pit refueling capabilities.

11.25.1. Hot Refueling Site Types. In addition, the process for certifying a site on Foreign Nation is outlined in section **11.25.8**. Personnel will not perform hot refueling operations until the location, equipment requirements, and personnel qualifications are certified IAW this instruction and TO 00-25-172. **(T-2)**

11.25.1.1. Site Certification. MAJCOMs will develop hot refueling site certification requirements. **(T-2)** Site certification team composition will be at a minimum IAW TO 00-25-172, **paragraph 6.5**. **(T-2)**

11.25.1.1.1. The following questions will be addressed as part of the site certification:

11.25.1.1.1.1. Has the aircraft been approved by System Safety Engineering Analysis (SSEA) for hot pit refueling? **(T-3)**

11.25.1.1.1.2. Is adequate area provided to position the aircraft safely (evaluate ability to reposition due to wind direction)? **(T-3)**

11.25.1.1.1.3. Is the ramp level to prevent drainage that could cause environmental impact? Request the fire department dump water to verify flow, if questionable. **(T-3)**

11.25.1.1.1.4. Is the location adequate for the number of aircraft to be serviced? **(T-3)**

11.25.1.1.1.5. Has a hot brake holding area been established? **(T-3)**

11.25.1.1.1.6. Is there proper clearance between the hot pit area and hot brake holding area to prevent conflict? **(T-3)**

11.25.1.1.1.7. Is there proper clearance between the hot pit and Explosive Clear Zone/Hot Cargo Pad/Airfield Clearance Zones to prevent violations of any area/zone? **(T-3)**

11.25.1.1.1.8. Is the hot pit adequately clear of the aircraft/vehicle traffic area? **(T-3)**

11.25.1.1.1.9. Is the hot pit and cursory check area of the ramp clear of FOD potential? **(T-3)**

11.25.1.1.1.10. Does the location provide for rapid access of emergency equipment and egress of aircraft/equipment? **(T-3)**

11.25.1.1.1.11. Are adequate grounding points available? **(T-3)**

11.25.1.1.2. QA or responsible unit will maintain site certification documentation and a master listing of hot pit refueling sites administered by the MXG. **(T-2)**

11.25.1.1.2.1. QA or responsible unit will coordinate with Fuels Base Support Manager to ensure Base Support and Expeditionary (BaS&E) Planning Tool is updated for hot pit site certification listing any time sites are added, changed, or deleted. **(T-2)**

11.25.1.1.3. Each unit hot refueling site will be certified by a unit certification team, and approved by Installation Commander, when one of the following occurs:

11.25.1.1.3.1. Construction of new hot refueling sites. **(T-2)**

11.25.1.1.3.2. Change in the unit MDS, or when an additional MDS is acquired. **(T-2)**

11.25.1.1.3.3. Change in refueling equipment. **(T-2)**

11.25.1.1.3.4. Changes in the certified site areas which affect/change in the previous certification. **(T-2)**

11.25.1.1.4. - 11.25.1.1.10.4. DELETED.

11.25.2. Hot refueling site master listing. This listing must contain the following information for all hot refueling sites established and/or sustained by an AF installation or equivalent:

11.25.2.1. All sites must be identified by coordinates on a map. **(T-3)**

11.25.2.1.1. Each facility within the distance identified in TO 00-25-172, must be identified as to its use/contents and its distance in feet from the refueling site/operation. **(T-3)**

11.25.2.1.2. Other refueling sites, aircraft parking areas, also need to be identified and all distances must be shown even if a violation exists. **(T-3)**

11.25.2.1.3. The request cover letter will state if there are no violations. **(T-3)**

11.25.2.1.4. Procedures such as aircraft taxi routes should also be shown. Use arrows or dotted lines to show taxi directions, both entry and exit. **(T-3)**

11.25.2.1.5. Address any restrictions to normal operations and actions required IAW with TO 00-25-172. **(T-3)**

11.25.2.2. State the type of equipment used for hot refueling at each site, (such as, hose carts, truck). **(T-3)**

11.25.2.2.1. Show the location of any fixed fuel pits and usual location of cart or truck if used. **(T-3)**

11.25.2.2.2. Unit-approved sites will be identified on the aircraft parking plan. **(T-3)**

11.25.2.2.3. OSS, CE, and QA and will maintain copies of hot refueling sites on file. **(T-3)**

11.25.2.3. State whether or not all hot refueling areas comply with the quantity-distance separation requirements of DESR6055.09_AFMAN 91-201 in relation to surrounding exposed sites/potential explosion sites.

11.25.3. Hot refueling requires detailed procedures be published in appropriate TOs and unit-developed Local Checklists. Unit Local Checklists will be developed IAW **Chapter 6** and include detailed procedures, normal and emergency, to meet requirements of the local environment. **(T-3)**

11.25.3.1. Units will forward Local Checklists to their respective QA office for approval. **(T-3)**

11.25.4. Units will publish procedures to supplement this section and outline local requirements and additional precautions as necessary for hot refueling, including hot refueling with ordnance, when authorized, IAW TO 00-25-172. **(T-3)**

11.25.5. Units tasked to perform hot refueling operations will ensure hot refueling crews are available to meet mission requirements. **(T-3)** MXS maintenance personnel may be utilized.

11.25.6. Temporary Sites. Temporary sites allow site certification and use for specific exercises, contingencies, and bare base operations in support of Agile Combat Employment. Temporary sites will be approved by installation commander or appropriate host. **(T-2)**

11.25.6.1. Temporary Site Certification. MAJCOMs will develop site certification team requirements. **(T-2)**

11.25.6.1.1. and 11.25.6.1.2. DELETED.

11.25.6.2. The following questions will be addressed as part of the site certification:

11.25.6.2.1. Has the aircraft been approved by system safety engineering analysis (SSEA) for hot pit refueling?

11.25.6.2.2. Is adequate area provided to position the aircraft safely (evaluate ability to reposition due to wind direction)?

11.25.6.2.3. Is the ramp level to prevent drainage that could cause environmental impact? Request the fire department dump water to verify flow, if questionable.

11.25.6.2.4. Is the location adequate for the number of aircraft to be serviced?

11.25.6.2.5. Has a hot brake holding area been established?

11.25.6.2.6. Is there proper clearance between the hot pit area and hot brake holding area to prevent conflict?

11.25.6.2.7. Is there proper clearance between the hot pit and Explosive Clear Zone/Hot Cargo Pad/Airfield Clearance Zones to prevent violations of any area/zone?

11.25.6.2.8. Is the hot pit adequately clear of the aircraft/vehicle traffic area?

11.25.6.2.9. Is the hot pit and cursory check area of the ramp clear of FOD potential?

11.25.6.2.10. Does the location provide for rapid access of emergency equipment and egress of aircraft/equipment?

11.25.6.2.11. Are adequate grounding points available?

11.25.6.3. - 11.25.6.5. DELETED.

11.25.7. Units will develop a checklist addressing the following at a minimum:

11.25.7.1. Required conditions and materials **(T-2)**

11.25.7.2. Site certification procedures **(T-2)**

11.25.7.3. Preparation for operations. **(T-2)**

11.25.7.4. Map Overlays **(T-2)**

11.25.8. Foreign nation site certification. Provides maintenance units the capability to conduct hot refueling operations. The completion of the site certification assures by MDS that safe hot refueling can be accomplished at locations in support of operations or exercises.

11.25.8.1. Unit Responsibility. At a minimum, requesting unit will accomplish hot refueling site certification IAW this instruction and TO 00-25-172. Owning/Host MAJCOM/A4 should be included in site certification process to help facilitate and advocate for required resources.

11.25.8.2. MXG QA Responsibility. MXG QA review site certification package prior to approval. Develop and maintain completed and approved site certification package. Completed package will be sent to MAJCOM/A4 for their records.

11.25.8.3. MAJCOM/A4 with Unit responsibility (i.e., ACC, AFGSC, etc.). Facilitate and advocate for requesting unit for required resources, as needed.

11.25.8.4. Host MAJCOM/A4 (i.e., PACAF, USAFE, etc.). In coordination with owing MAJCOM, facilitate and advocate for requesting unit for required resources, as needed. Develop and maintain file of approved packages.

11.25.8.4.1. - 11.25.8.4.5. DELETED.

11.25.8.5. Approval Authority. The requesting unit WG/CC is the approving official for the final site certification package. **Exception:** For deployed unit(s)/Task Force, commander with operational command is the approving authority for the final site certification package.

11.25.8.5.1. - 11.25.8.6. DELETED.

11.25.9. Hot Refueling Team Members and Duties. MAJCOMs will determine team member's prerequisites for each position. **(T-2)**

11.25.9.1. Pad Supervisor. Responsible for overall supervision of hot refueling operations when two or more aircraft are simultaneously hot refueled on the same pad (multiple hot refueling). Maintains full view and control of multiple hot refueling operations.

11.25.9.1.1. - 11.25.9.1.2. DELETED.

11.25.9.2. Refuel supervisor "A" member. Individual will be refuel task qualified, capable of supervising hot refuel crew. **(T-2)**

11.25.9.3. Refuel crew "B" member. Individual will be task qualified. **(T-2)**

11.25.9.4. Fuels specialist with 2F0X1 AFSC, or equivalent, "C" member. Individual will be refuel task certified on the specific facility/equipment, and task qualified for aircraft hot refueling. **(T-2)**

11.25.9.5. Additional refuel crew "D" member. Individual will be task qualified. **(T-2)** Use "D" members as required by applicable aircraft technical data.

11.25.10. Hot refueling team members and QA/Unit certifying officials/evaluators may be multi- MDS qualified.

11.25.10.1. After initial certification on each MDS, personnel must update their hot refueling currency by performing hot refueling on each MDS. **(T-2) Exception:** Fuels specialist will maintain certification and proficiency IAW DAFI 23-201, *Fuels Management*.

11.25.10.2. Section NCOICs/Chiefs will ensure personnel maintain proficiency on each MDS. **(T-2)**

11.25.11. Conducting Hot Refueling Training, Certification and Documentation. [For additional information, refer to AFI 11-235, *Specialized Refueling Operations*]. **Note:** Fuels specialist training will be conducted IAW DAFI 23-201 and CFETP. Qualification training of hot refueling personnel will be conducted in three distinct phases. **(T-2)** The three hot refueling qualification training phases are as follows:

11.25.11.1. Phase 1. "Familiarization" phase. Designated instructors familiarize trainees with applicable technical data, procedures, and guidance for hot refueling. Place special emphasis on procedures for hot refueling with ordinance loaded, when authorized.

11.25.11.2. Phase 2. "Hands-on" phase. Apply information learned in Phase 1 to develop in-depth knowledge and proficiency in all facets of hot refueling. Training will include proper operation, preventive maintenance, use of hand signals and emergency procedures. **(T-2)** Simulate hot refueling by performing all hot refueling tasks without aircraft engines running (cold pit). Designated instructors will demonstrate tasks then require trainees to perform tasks, practice emergency procedures, critique performance and provide additional training as required. **(T-2)**

11.25.11.3. Phase 3. "Demonstration/Certification" phase. Trainees will demonstrate hot refueling under the supervision of designated certifying officials with aircraft engine(s) running. **(T-2)** The Squadron Certifying Officials will certify individuals upon successful demonstration of hot refueling. **(T-2)** If Phase 3 training has not been completed within 30 days of Phase 2 training, Phase 2 training must be repeated. **(T-2)**

11.25.11.4. Qualification training will:

11.25.11.4.1. Stress safety requirements, emergency procedures and equipment inspection in all three phases of training. **(T-2)**

11.25.11.4.2. Ensure procedures in TO 37A9-3-11-1CL-1, TO 00-25-172, and TO 00-25-172CL-4 are taught to all team supervisors and members. **(T-2)**

11.25.11.4.3. Allow Phase 2 and Phase 3 training to be conducted utilizing joint sessions including 2F0X1 AFSC personnel and all maintenance AFSCs. **(T-2)**

11.25.11.4.4. Utilize both fuels (2F0X1) and maintenance AFSC instructors for joint sessions (T-2)

11.25.11.4.5. Be conducted by MT (QA if MT not available). **(T-2)**

11.25.11.5. QA hot pit certifying officials and QA hot pit certifier augmentees (squadron certifying officials) will train, evaluate, and certify unit personnel. **(T-2)** QA hot pit certifying officials will ensure augmentees conduct evaluations using procedures outlined in this instruction, applicable aircraft TOs and local procedures. **(T-2)**

11.25.11.6. DELETED.

11.25.12. Document training for personnel performing, evaluating, supervising, or instructing hot refuel operations as follows:

11.25.12.1. Document all aircraft maintenance and 2F0X1 AFSC personnel Phases 1, 2, and 3 initial training in MyLearning. **(T-2)**

11.25.12.1.1. For AFSCs where "refuel aircraft with engines operating" is not contained in MyLearning, use DAF Form 797/MIS to document initial hot refuel training. **(T-2)**

11.25.12.1.2. Track recurring hot refueling certification in the MIS (initial and annual) IAW with TO 00-25-172 and this DAFI. **(T-2)**

11.25.12.2. 2F0X1 AFSC personnel will use MyLearning/DAF Form 1098, *Special Tasks Certification and Recurring Training*, to document Phases 1, 2, and 3 initial/recurring hot refuel training. **(T-2)** Fuels (2F0X1) certifying officials will be appointed by the LRS/CC IAW DAFMAN 36-2689. **(T-2)**

11.25.13. Track hot refueling members, by position, on the SCR. **(T-2)**

11.25.14. Unique proficiency, certifying, and decertifying actions for hot refuel team members will be outlined in MAJCOM supplements/addendums to this DAFI. **(T-2)**

11.26. Aircraft Rapid/Hot Defueling.

11.26.1. Rapid defueling presents hazards which are not normally encountered in normal defueling operations. Owning MAJCOMs will develop and sustain a rapid defueling capability to meet routine and contingency mission requirements IAW TO 00-25-172 and MDS-specific TOs.

11.26.1.1. Rapid defueling operations are considered hot defueling operations whenever the provider/source aircraft has an engine running.

11.27. 406 MHz Emergency Locator Transmitter Systems Program.

11.27.1. Units will ensure procedures are established to update the Emergency Locator Transmitter registration database whenever 406 MHz Emergency Locator Transmitter–equipped aircraft are transferred to other commands/wings, Emergency Locator Transmitter that are taken out of service, removed for maintenance, or destroyed. **(T-0)**

11.27.2. Aircraft maintenance functions must register and track status of fixed-mounted aircraft 406 MHz Emergency Locator Transmitter systems. **(T-0)**

11.27.3. IAW DoDI 3002.02, *Personnel Recovery and 406 MHZ Search and Rescue (SAR) Emergency Beacons in the Department of Defense*, USAF 406 MHz Emergency Locator Transmitter systems must be registered in the DoD Joint Search and Rescue Satellite Aided Tracking Electronic Tracking System database. **(T-0)**

11.27.3.1. The POC for JSETS registration is the Personnel Recovery Mission Software Help Desk at **PRMSMail@jricp.osis.gov**.

11.27.3.2. The governing agencies are the Joint Personnel Recovery Agency and the Electronic Services Command at Hanscom AFB, MA. Refer to AFMAN 10-207, *Command Posts*, for Command Post or C2 function responsibilities regarding 406 MHz Emergency Locator Transmitter and Personal Locator Beacon systems.

11.28. Crashed, Damaged or Disabled Aircraft Recovery (CDDAR) Program.

11.28.1. Installation/WG/CCs responsible for active airfields/runways, and flying missions will implement a CDDAR Program IAW TO 00-80C-1, *Crashed, Damaged, Disabled Aircraft Recovery Manual*. **(T-2)** The program must be designed to provide a response and/or recovery capability of assigned host, tenant, and consider transient aircraft consistent with the following considerations: (1) urgency to open the runway for operational use; (2) prevention of secondary damage to the aircraft; and (3) preservation of evidence for mishap or accident investigations IAW DAFI 91-202 and DAFI 91-204.

11.28.2. Responsibilities:

11.28.2.1. MAJCOMs will:

11.28.2.1.1. Ensure flying units maintain a CDDAR capability IAW 00-80C-1.

11.28.2.1.2. Designate a MAJCOM CDDAR OPR. As a minimum, the CDDAR OPR will:

11.28.2.1.2.1. Standardize CDDAR equipment inventory accountability and reporting requirements by MDS for all on hand CDDAR equipment prescribed by TO 00-80C-1, allowance standard and applicable weapons system TOs across assigned units with active airfields/runways.

11.28.2.1.2.1.1. Review unit's annual CDDAR equipment inventories to identify and document equipment shortfalls.

11.28.2.1.2.1.2. Coordinate AS change request with the applicable AFMC AS activity IAW AFI 23-101.

11.28.2.1.2.1.3. Ensure excess CDDAR equipment is redistributed to fill internal shortfalls prior to units turning equipment into supply/DLADS as excess.

11.28.2.1.2.2. Participate as member of CDDAR Working Group. **(T-2)**

11.28.2.2. AETC will:

11.28.2.2.1. Develop, sustain, and administer the CDDAR training program.

11.28.2.3. AFMC will:

11.28.2.3.1. Utilize AFSC/LZDB to serve as AF CDDAR Program OPR (**AFSC.LZDB.CDDAROPR@us.af.mil**) with the following responsibilities:

11.28.2.3.1.1. Provide CDDAR Program guidance to MAJCOM CDDAR OPRs. **(T-2)**

11.28.2.3.1.2. Provide routine communication to MAJCOM CDDAR OPRs on relevant matters such as new technology, guidance changes, significant events, equipment recall notifications, and best practices. **(T-2)**

11.28.2.3.1.3. Coordinate and consolidate MAJCOM CDDAR OPR inputs on CDDAR policy, training, and technical data, and present this information to the appropriate agency as required. **(T-2)**

11.28.2.3.1.4. Develop, manage, and chair a CDDAR Working Group to address

equipment requirements, priorities, and funding. The CDDAR Working Group members will consist of MAJCOM CDDAR OPRs. The CDDAR Working Group will make efforts to gain economy of scale when requesting new equipment. **(T-2)**

11.28.2.3.2. Provide approved tech-data outlining equipment procedures to safely respond and/or recover aircraft from a CDDAR event.

11.28.2.3.3. Provide timely engineering support to facilitate resolution of unique CDDAR events which cannot be resolved by existing tech-data.

11.28.2.3.4. Develop, manage, and maintain AS needed to sustain a weapon system for peacetime and wartime operations IAW AFI 23-101.

11.28.2.4. - 11.28.2.5.7. DELETED.

11.28.2.6. CDDAR Team Chief and alternate will:

11.28.2.6.1. Be designated as the unit's subject matter expert on aircraft recovery operations and equipment and will be thoroughly familiar with and perform their Team Chief duties IAW TO 00-80C-1. **(T-2)**

11.29. Aircraft Battle Damage Repair (ABDR). ABDR is an effective force multiplier contributing to wartime sortie production by assessing and repairing battle damaged aircraft rapidly to support flying operations. ABDR repairs will be accomplished during contingency or wartime only. However, weapons system program managers may approve ABDR repairs during peacetime on a case-by-case basis using trained ABDR Technicians.

11.29.1. Responsibilities:

11.29.1.1. The Directorate of Logistics (AF/A4L) will provide overall policy and guidance for the USAF ABDR Program.

11.29.1.2. AFMC will:

11.29.1.2.1. Assume management responsibility for USAF ABDR Programs.

11.29.1.2.2. Publish a MAJCOM instruction to implement the ABDR requirements contained in this instruction.

11.29.1.2.3. Develop and manage ABDR policy for pre-positioning of tools, materiel kits, related SE, and management of ABDR training aircraft.

11.29.1.2.4. Support development and publication of ABDR TOs for new weapon systems.

11.29.1.2.5. Maintain ABDR UTCs for AFMC organizations.

11.29.1.2.6. Plan for and develop capability to repair battle/crash damaged aircraft.

11.29.1.2.6.1. Ensure plans include procedures to add additional repair capabilities into operating locations and provide aircraft evacuation alternatives.

11.29.1.2.7. Plan, program, and submit ABDR funding requests.

11.29.1.2.8. Maintain an ABDR Technical Support Office to advocate and provide day-to-day management of tasks associated with development, implementation, maintenance, and support needed to enhance the USAF ABDR capability.

11.29.1.2.9. Provide support in determining technical requirements, repair techniques, repair materials, assessment aids and Research & Development (R&D) efforts.

11.29.1.2.10. Manage TO 1-1H-39, *Aircraft Battle Damage Repair General Technical Manual*, and the engineering handbook for ABDR engineers and support initiatives to develop, publish, and maintain weapon system-specific –39 TOs.

11.29.1.2.11. Ensure the status of aircraft permanently grounded for ABDR training is reported IAW DAFI 21-103.

11.29.1.2.12. Establish Aircraft Battle Damage Evaluator training program, manage course documentation and provide training to MT Instructors as required. **(T-2)**

11.29.1.3. MAJCOMs will:

11.29.1.3.1. Establish a command focal point to work ABDR issues with AFMC.

11.29.1.3.2. In conjunction with AFMC, develop a command ABDR Concept of Operations and ensure Concept of Operations covers unit plans for repair of battle/crash damaged aircraft during combat operations.

11.29.1.3.2.1. Address ABDR in mission need statements for new weapon systems that support or engage in combat operations.

11.29.1.3.2.2. Incorporate ABDR in command war planning documents.

11.29.1.3.2.3. Task AFMC ABDR UTCs to support OPLANs.

11.29.1.3.2.4. Develop plans for the reception and employment of AFMC ABDR teams at the onset of hostilities.

11.29.1.3.2.5. Formalize integration and bed down requirements in applicable BSP IAW AFI 10-404.

11.29.1.3.2.6. Provide unit level weapon-system-specific tools (other than common hand tools) and equipment needed to repair battle/crash damaged aircraft.

11.29.1.3.2.7. USAFE and Pacific Air Forces (PACAF) will store and maintain serviceability, accountability, and status reporting to include Financial Improvement and Audit Readiness reporting of AFMC owned and provided WRM ABDR trailers IAW established procedures. **(T-2)**

11.29.1.3.2.8. Provide technical support to the ABDR Technical Support Office for live fire or similar testing.

11.29.1.3.3. – 11.29.1.3.10. DELETED

11.29.1.4. Unit Responsibilities. Units will:

11.29.1.4.1. Utilize trained Aircraft Battle Damage Evaluators to evaluate aircraft battle damage and mishap damage sustained during combat or contingency operations. **(T-3)**

11.29.1.4.2. Ensure shelf-life items listed in TO 1-1H-39 and weapon system-specific –39 TOs are maintained at required levels to support ABDR requirements. **(T-3)**

11.29.1.4.3. Ensure aircraft battle damage is documented on an AFTO Form 97, *Aerospace Vehicle Battle Damage Incident Debrief/Assessment/Repair Record* or AFTO Form 97B, *Aircraft Battle Damage Evaluator Checklist* as required IAW TO 1-1H-39. Completed forms will be forwarded to the Aircraft Battle Damage Repair Program Office. **(T-2)** CLASSIFIED messages must be sent to SIPR: **usafsaf.wright-patt.afsc-lg.mbx.afsc-lzd-abdr-tso@mail.smil.mil** and UNCLASSIFIED messages must be sent to NIPR: **AFSC.LZD.ABDRTSO@us.af.mil** for filing in the historical archives. **(T-2)**

11.29.1.5. Aircraft Battle Damage Evaluator/Training:

11.29.1.5.1. Aircraft Battle Damage Evaluator training provides MXG/CC's with ABDR knowledgeable forces and prepares units to execute Air Tasking Orders in a denied airspace with potential heavy losses. Aircraft Battle Damage Evaluator roles and responsibilities are outlined in TO 1-1H-39.

11.29.1.5.2. Maintenance Supervision will determine the proper mixture of personnel to attend Aircraft Battle Damage Evaluator training. **(T-3)**

11.29.1.5.3. Aircraft Battle Damage Evaluator formal training will be IAW the approved ABDR course control documents. **(T-2)**

11.29.1.5.4. Aircraft Battle Damage Evaluators will complete unit provided refresher training every 24 months. **(T-2)**

11.29.1.5.5. Course documents and instructor training is provided by the ABDR Technical Support Office NIPR, and can be requested at: **AFSC.LZD.ABDRTSO@us.af.mil**

11.30. Egress/Cockpit Familiarization Training.

11.30.1. All non-egress personnel who access aircraft cockpits with egress systems maintained and managed by 2A6X3 Egress Systems personnel must complete initial and refresher familiarization training. **(T-2)**

11.30.1.1. As a minimum, initial and refresher egress/cockpit familiarization training will include location and installation procedures of egress system safety devices, cockpit entry/exit procedures, procedures for determining whether or not an egress component is expended, emergency procedures associated with an expended egress component, and local maintenance concerns identified by the egress work center supervisor. **(T-2)**

11.30.1.2. New personnel to the unit must receive initial familiarization training prior to accessing cockpits unless last duty position involved same mission design aircraft as current duty position. **(T-2)**

11.30.1.3. Personnel not requiring initial training will attend refresher training when they become due. **(T-2)**

11.30.1.4. Initial egress familiarization training will normally be hands-on using an aircraft. **(T-2)**

11.30.1.4.1. Due to the diverse egress systems across all weapon systems, units desiring to use an aircraft maintenance trainer in lieu of an aircraft must submit a request from the MXG/CC to the MAJCOM for approval/disapproval. Approving

MAJCOM must coordinate with the MDS lead command to ensure no technical/other mitigating factors exist and to provide transparency. **(T-2)**

11.30.1.5. Refresher familiarization training will be conducted annually using an aircraft, maintenance trainer or media, which is approved and designated by the egress work center supervisor. **(T-2)**

11.30.1.5.1. Non-egress personnel may administer training media (slideshow/video) during refresher familiarization training.

11.30.1.5.2. Direct students to the egress section if technical assistance is required and/or questions are raised concerning course subject matter.

11.30.1.6. Only egress personnel, certified on assigned egress system(s), should instruct initial egress familiarization training. **(T-2)** MXG/CC may authorize MT personnel to instruct this training provided they are currently certified to perform egress maintenance.

11.30.1.7. Training media must meet approval of the 2A6X3 AFSC MAJCOM Functional Manager (MFM) or current media produced by the 367 Training Support Squadron listed on the Defense Imagery at **http://www.defenseimagery.mil**. **(T-2)**

11.30.1.8. Individuals overdue for annual egress familiarization training will not access aircraft cockpits until they complete familiarization training. **(T-2)**

11.30.1.9. Units with unique, experimental, or test aircraft requirements.

11.30.1.9.1. If training courses are not available through AETC, units must use interagency training before considering non-government training sources. **(T-2)**

11.30.1.9.1.1. If courses in both of these sources are not available, units will establish a documented training program that meets the intent of this instruction. **(T-2)**

11.30.1.9.1.2. Training will be conducted by the most qualified personnel and must be approved by the MFM prior to implementation. **(T-2)**

11.30.2. MAJCOMs in coordination with the applicable lead command will identify emergency aircraft egress/evacuation training and frequency requirements in their supplement to this DAFI for personnel assigned to weapon systems that do not have aircraft egress systems maintained and managed by 2A6X3 personnel.

11.31. Aircraft Defensive Systems Loading Program.

11.31.1. Aircraft Defensive Systems Loading Program provides instruction required to install/remove chaff/flare on unique mission aircraft in units where there are no 2W1 AFSC authorizations assigned.

11.31.2. Authorized units will establish a program to train and qualify personnel to perform these tasks IAW procedures outlined in DAFMAN 21-201 and this **Chapter**.

11.31.3. Units will work with the installation Weapon System Manager (WSM) and Airfield Operations Flight to develop written instructions for handling chaff/flare-loaded aircraft IAW DESR6055.09_AFMAN 91-201 and DAFI 91-202.

11.31.3.1. As a minimum, written instructions will include procedures for launch/recovery/parking of chaff/flare-loaded aircraft; chaff/flare storage and transportation; and partially ejected flares and minimum requirements outlined in DESR6055.09_AFMAN 91-201.

11.31.4. The MXG/CC will appoint 7-skill or 9-skill level individual with maintenance AFSC as the Weapons Task Qualification Manager (WTQM). **(T-2) Note:** Units with 2W1 AFSCs assigned will comply with training/qualification requirements in **Chapter 10**.

11.31.5. WTQM and Weapons Task Qualification Crew (WTQC) responsibilities. The WTQM/WTQC provide oversight of chaff/flare loading operations to ensure they are conducted safely by providing initial and recurring load training, serving as the focal point for all chaff/flare loading issues, and observing loading operations during training. The WTQM and WTQC will not participate in load operations during training. **(T-2)**

11.31.5.1. WTQM. The WTQM typically holds a 2A871X AFSC; however, other flightline personnel with the 2AX7X AFSC may perform this function. The WTQM develops and oversees the chaff/flare loading standardization program, sets standards, and develops local policies and procedures. The WTQM will be tracked on the SCR. **(T-2)** The WTQM will:

11.31.5.1.1. Receive initial and recurring load qualification training from a WTQC and maintain currency on chaff/flare loading tasks. **(T-2)**

11.31.5.1.2. Once trained and qualified, the WTQM will develop and administer the unit's chaff/ flare load training program and train/qualify home station WTQC personnel. **(T-2) Note:** In the event a unit is initially tasked and has no qualified instructors, it will be necessary for the WTQM to become certified at a unit with qualified trainers. The WTQM will:

11.31.5.1.2.1. Ensure sufficient numbers of personnel are qualified to load chaff/flare to support the unit's mission requirements. **(T-2)**

11.31.5.1.2.1.1. A course code will be loaded in the MIS to identify trained personnel and qualification status. **(T-2)**

11.31.5.1.2.2. Establish time standards for initial and recurring loading tasks. **(T-2)**

11.31.5.1.2.2.1. Lead wings will develop time standards for each MDS for qualification purposes. **(T-2)**

11.31.5.1.2.2.2. The senior evaluator has the discretion to add to the time standard if inclement weather or equipment failure is the cause for exceeding the time standard.

11.31.5.1.2.3. As a minimum, the WTQM will identify the number of qualified personnel, names and employee numbers, MDS qualification, Defensive Systems, equipment type, qualification date, and date(s) recurring training is due. **(T-2)**

11.31.5.1.2.4. The WTQM will select, train, evaluate, and qualify a minimum of two personnel as the WTQC on safe and reliable munitions loading procedures. **(T-2)**

11.31.5.1.2.4.1. The WTQM will evaluate and re-certify WTQC members

annually. **(T-2)** WTQC members will be tracked on the SCR. **(T-2)**

11.31.5.1.3. Review and approve/disapprove RCs that pertain to chaff/flare loading technical data. **(T-2)**

11.31.5.1.4. Develop a local Task Assignment List by utilizing lead wing-developed MDS-specific Task Assignment Lists for use during training for all chaff/flare loading operations. **(T-2)** A Task Assignment List is derived from applicable MDS munitions load checklist (TO 33-1-20-series) and identifies the load crew members' responsibilities by step.

11.31.5.1.5. Ensure chaff/flare loading CTKs are standardized to the maximum extent possible. **(T-2)**

11.31.5.1.5.1. Chaff/flare loading CTKs must include all tools and equipment necessary to support applicable MDSs and AME configurations. **(T-2)**

11.31.5.1.6. Coordinate the scheduling of personnel for chaff/flare load training. **(T-2)**

11.31.5.1.6.1. The WTQM may delegate this duty to the WTQC.

11.31.5.1.7. Coordinate with PS&D, or the Regional Training Center, if applicable, to obtain chaff/flare dispensing system-equipped aircraft for training purposes. **(T-2)**

11.31.5.1.8. Ensure training magazines match the characteristics and "feel" of live magazines (such as, weight, dimensions). **(T-2)**

11.31.5.2. WTQC. The WTQC assists the WTQM in managing the chaff/flare loading standardization program. The WTQC's primary purpose is to train and qualify personnel to load chaff/flares but may also perform chaff/flare load duties. The lead WTQC member is typically a 7-skill level technician with the 2AX7X AFSC. Initial training will be conducted using inert munitions. **(T-2)** The number of trained WTQC members should be based on current/anticipated workloads and their ability to maintain proficiency on all applicable MDSs. WTQC members are qualified by the WTQM. The WTQC members will:

11.31.5.2.1. Provide personnel with initial and recurring load qualification training. **(T-2)** One WTQC member will be required to conduct practical training. **(T-2)**

11.31.5.2.2. Monitor personnel qualifications to ensure required academic and practical training is complete. **(T-2)**

11.31.5.2.2.1. Disqualify individuals if recurring requirements are not met. **(T-2)**

11.31.5.2.3. Spot-check personnel to evaluate proficiency. **(T-2)**

11.31.5.2.3.1. The WTQC will disqualify personnel who violate safety, technical data, and reliability procedures, or fail to demonstrate proficiency. **(T-2)**

11.31.5.2.4. Develop/coordinate training schedules and provide to PS&D for inclusion in the appropriate schedule (monthly, weekly). **(T-2) Note:** Enroute WTQMs forward training requirements to the UTM, who coordinates for ground training aircraft with the Regional Training Center.

11.31.6. Training Requirements. Personnel are considered qualified upon successful completion of training provided by a qualified WTQC.

11.31.6.1. Initial qualification will be conducted using inert munitions. **(T-2)**

11.31.6.2. Live munitions may be used during annual qualification to maintain currency. Load qualification training consists of academic and practical training.

11.31.6.3. Document the initial and recurring load qualification training requirements in MyLearning or other approved training process if MyLearning is unavailable (i.e., 623A, *Individual Training Record*) **(T-2)**

11.31.6.4. Academic and practical training must be provided during initial and recurring load qualification training. **(T-2)**

11.31.6.4.1. Academic training is required before practical training is accomplished. **(T-2)**

11.31.6.4.2. Initial practical training must be completed within 14 days of successfully completing initial academic training. **(T-2)**

11.31.6.4.2.1. Practical training should duplicate operational conditions as closely as possible.

11.31.6.4.3. Recurring practical task qualification is administered at least annually. **(T-2)**

11.31.6.4.3.1. As a minimum, practical training will include chaff/flare module serviceability criteria, actual chaff/flare loading, and operation of support equipment/AGE used during loading operations. **(T-2) Note:** Weapons task qualification academic training may fulfill the requirements for explosive safety training if the requirements of DAFI 91-202 are included.

11.31.6.5. Academic training is administered every 12 months. **(T-2)** As a minimum, academic training will include:

11.31.6.5.1. Familiarization with chaff/flare loading publications, including TO 11A-1-33, MAJCOM, and local procedures. **(T-2)**

11.31.6.5.2. Aircraft and munitions familiarization. **(T-2)**

11.31.6.5.3. Safety, security, and emergency procedures. **(T-2)**

11.31.6.5.4. Support, test, handling equipment, and special tools familiarization. **(T-2)**

11.31.6.5.5. Task Assignment Lists and aircraft specific 33-1-2 series TOs must be available at the load-training site. **(T-2) Note:** Training course control documents will be coordinated annually through the Wing Safety and MT. **(T-2)**

11.31.6.6. Personnel qualified on a specific task on a specific MDS are considered qualified to perform that task on all series of that MDS; however, the member must be familiar with differences within the MDS (such as, cockpit switch locations). **(T-2)**

11.31.6.6.1. The WTQM or WTQC will provide practical, on-aircraft training on these differences and document these qualifications for each dispensing system in the qualification status or equivalent system. **(T-2)**

11.31.7. Disqualifying Chaff/Flare Load Personnel. Disqualification will be documented in A - Changed to MyLearning, or other approved training process if MyLearning is unavailable (i.e., 623A), and the qualification status system. **(T-2)**

11.31.7.1. Although not all-inclusive, the following criteria constitute grounds for disqualifying personnel from chaff/flare loading duties:

11.31.7.1.1. Failing to complete recurring training.

11.31.7.1.2. Committing a safety or reliability error.

11.31.7.1.3. Lack of proficiency.

11.31.8. Transient Aircraft.

11.31.8.1. Apply the following when working transient aircraft:

11.31.8.1.1. Under no circumstances will personnel attempt chaff/flare load operations without current technical data. **(T-2)**

11.31.8.1.2. If current technical data is available, then qualified personnel may perform chaff/flare load operations. **(T-2)**

11.31.8.1.3. If current technical data is available but no one is qualified on the transient aircraft type, then the MXG/CC (or Air Mobility Squadron (AMS)/CC at enroute locations) may authorize the WTQC or WTQM to de-arm and/or unload the aircraft.

11.31.8.1.3.1. The WTQM will submit a written request to the MXG/CC (or AMS/CC at enroute locations) identifying personnel selected to perform the task, aircraft type and (if applicable) number of aircraft to be de-armed and unloaded. **(T-2)**

11.31.8.1.3.1.1. Approved requests will be maintained for 90 days. **(T-2) Note:** This is a temporary, one-time authorization to facilitate required maintenance when qualified personnel are not available.

11.31.9. Identification of Chaff/Flare-Loaded Aircraft. Verify chaff/flare load status of aircraft by checking AFTO Form 781A/C before performing any maintenance.

11.31.9.1. Explosive placards are not required on AMC aircraft.

11.31.9.2. If an aircraft is loaded with chaff/flare, it will be safed IAW applicable technical data prior to performing any maintenance. **(T-2)**

11.31.9.3. Before loading chaff/flares, review the AFTO Form 781C, A*vionics Configuration and Load Status Document*, for defensive systems inspection status. **(T-2)**

11.31.9.3.1. If chaff/flare is loaded on aircraft, ensure/verify applicable MIS documentation requirements are completed. **Note:** Do not load chaff/flares if the aircraft is overdue a scheduled DS inspection.

11.31.10. Tracking and Reconciliation of Chaff/Flare-Loaded Aircraft.

11.31.10.1. Expenditure tracking and processing will be handled by Munitions Personnel (2W0X1) IAW DAFMAN 21-201, **Chapter 7**.

11.31.10.2. Munitions personnel will not use the direct input method to process flightline chaff/flare expenditures; all chaff/flare expenditures will be returned to the Munitions Storage Area (MSA) for verification by munitions personnel before processing expenditures in Theatre Integrated Combat Munitions Systems (TICMS). **(T-2)**

11.31.11. Additional Requirements (as applicable).

11.31.11.1. Document DS software version data and aircraft inspections (such as, 90-, 120-, or 180-day checks) on AFTO Form 781C. **(T-2)**

11.31.11.2. For software version data, enter the following information in the remarks section for each reprogrammable system: type system; installed Operational Flight Program (OFP) version; and/or Mission Data File (MDF) version (such as, ALE-47, OFP XXXX, MDF XXXX).

11.31.11.2.1. If a system contains multiple OFPs, list all applicable versions (such as, ALE-47, Programmer OFP XXXX, Sequencer OFP XXXX, MDF XXXX).

11.31.12. Chaff/Flare Build-up. Chaff/flare magazine build-up will only be accomplished by personnel with 2W0 AFSC or qualified contractors. **(T-2)**

11.31.12.1. Units will only perform chaff/flare build-up in facilities/locations approved by the installation WSM IAW DESR6055.09_AFMAN 91-201. **(T-2)**

11.31.12.2. Units must have an approved explosive site plan or explosives facility license on file with Wing Safety prior to initiating chaff/flare build-up or storage operations. **(T-2)**

11.32. Aircraft and Equipment Decontamination.

11.32.1. Maintenance organizations need to have the Ability to Survive and Operate in a Chemical, Biological, Radiological, Nuclear, and high-yield Explosives (CBRNE) environment and have the capability to decontaminate operational aircraft, vehicle, and SE.

11.32.2. Units will employ AF and locally developed TTPs IAW DAFI 10-2503, *Chemical Biological, Radiological, Nuclear, (CBRN) Defense Program*. **(T-2)**

11.32.2.1. TTPs provide the fundamental counter-chemical warfare (CCW) tools to survive to operate and maximize combat sortie generation capabilities in a CBRNE environment.

11.32.3. The following references in addition to MDS-specific technical data should be utilized when developing unit decontamination programs: DAFMAN 91-203, AFI 10- 2501, AFTTP 3-4, *Airman's Manual*, TO 00-110A-1, *Guidelines for Identification and Handling of Aircraft and Material Contaminated with Radioactive Debris*, TO 00-20-1, TO 11C15-1-3, *Chemical Warfare Decontamination, Detection and Disposal of Decontamination Agents*, TO 11D1-3-8-1, *Decontamination Apparatus, Power Driven, Portable Type A/E32U- 8, (Engineered Air)*.

11.33. End-of-Runway (EOR) Inspection.

11.33.1. EOR is MDS specific, PM directed inspection of aircraft systems identified in the Dash 6 TO or equivalent and published in Dash 6 work cards IAW TO 00-20-1. (N/A to aircraft that do not have an EOR -6 TO requirement).

11.33.2. If local requirements dictate, publish additional guidance to TOs for EOR inspections IAW TO 00-20-1 and TO 00-5-1. **Note:** Safing, arming, and de-arming of live munitions will be accomplished by personnel qualified IAW Chapter **4**, **5**, and **10**.

11.33.3. The EOR team chief (identified by a reflective vest) will carry an EOR checklist and ensures each item is inspected as required. **(T-2)** On aircraft with a ground intercom system, units are only required to establish verbal communications with the pilot when communication beyond the standard EOR marshalling hand signals is required unless otherwise directed by MDS specific technical data.

11.34. Wing Avionics Manager (WAM).

11.34.1. WAM Duties and Responsibilities.

11.34.1.1. Will be in the minimum grade of MSGT, 7 Level or equivalent, and 2A Avionics AFSC. **(T-3)**

11.34.1.2. Act As the Wing Avionics Functional Manager. **(T-2)**

11.34.1.3. Serve as the maintenance group focal point for all avionics related interactions between PMs, MAJCOMs, Lead Commands, Wings, Operations and Maintenance or equivalent activities to discern and implement changes in avionics configuration requirements. **(T-2)**

11.34.1.4. Ensure RAMPOD updates are completed IAW DAFI 21-103.

11.34.1.5. Ensure classified pods/components and equipment are stored in authorized areas IAW AFI 16-1404. **(T-2)**

11.34.1.6. Ensure classified aircraft/Support/Test equipment are stored in authorized areas IAW AFI 16-1404. **(T-2)**

11.34.1.7. Meet quarterly with MXG SEL to review avionics manning status and ensure manning resources are strategically distributed to provide the greatest possibility for mission success. **(T-2)**

11.34.1.8. Serve as the MXG Identify Friend or Foe Program Manager IAW **Paragraph 11.11** of this publication. **(T-2)**

11.34.1.9. Serve as the MXG Radar Warning Receiver/Radar Threat Warning program manager IAW **Paragraph 11.12** of this publication. **(T-2)**

11.34.1.10. Serve as the MXG EW program manager and EW Integrated Reprogramming focal point. **(T-2)**

11.34.1.11. Serve as MXG focal point for external organizations 406 MHz Emergency Locator Transmitter Systems Program IAW **Paragraph 11.27**. **(T-2)**

11.34.1.12. Coordinate with the wing EW POC to ensure compliance with DAFMAN 10-703, *Electronic Warfare Integrated Reprogramming*. **(T-2)**

11.34.1.13. Track wing assigned ECM, electronic attack and sensor pods, and associated support equipment. **(T-2)**

11.34.1.14. Coordinate all pod shipments as directed by MAJCOM to/from base or operating location. **(T-2)**

11.34.1.15. Track all incoming and outgoing pod parts and SE until received or arrived at destination. **(T-2)**

11.34.1.16. Coordinate with Electronic Combat Pilot/Electronic Warfare Officer to ensure most current MDF to configure Radar Warning Receiver/Radar Threat Warning to meet mission requirements. **(T-2)**

11.34.1.17. Serve as the MXG focal point for external organizations on all cybersecurity matters pertaining to aircraft interface equipment. **(T-2)**

11.35. Fire Extinguisher Requirements.

11.35.1. Unit coordinate with Fire Emergency Services Flight and Airfield Operations Flight to ensure required number of portable fire extinguishers are available for on and off installation operational requirements. Refer to DAFMAN 91-203, TO 00-25-172, *Ground Servicing of Aircraft and Static Grounding/Bonding*.

11.36. Air Force Repair Enhancement Program (AFREP).

11.36.1. The AFREP optimizes AF resources and repair capability of aerospace parts and equipment by increasing the wing-level (referred also as field-level) participation with the appropriate Program Office. This is accomplished by field-level identification and recommendation of candidates for reparability consideration by the appropriate PO.

11.36.1.1. The AFREP is an optional program.

11.36.1.2. Unit leadership must verify mission benefit outweighs the cost and obtain MAJCOM AFREP Manager Approval prior to program implementation.

11.36.2. AFREP is repairing consumable/expendable items (XF3 and XB3). Repair Network is repairing XD2 (recoverable) and XF3 (field level/condemnable). The concept is to make recommendations to the PM of consumable/expendable items which the field-level has identified as desirable candidates to be considered for conversion to field-level repair, limited repair or even full depot-level repair, contract or organic as directed by the Depot Source of Repair process in AFI 63-101/20-101, in addition, ensure repair cost/benefit analysis takes into consideration the total costs to the AF as outlined in Air Force TO 00-20-3, *Maintenance Processing of Reparable Property and Repair Cycle Asset Control System*.

11.36.2.1. The approval authority to change the SMR/ERRC codes, or select, use, arrange for, contract with, qualify sources of repair, or authorize the initiation of any local or other repair action rests solely with the PM.

11.36.2.2. Repair Approval. Personnel must coordinate any operational change to the system, end item, modified configuration, or maintenance procedure prior to implementation IAW AFI 63-101/20-101. For example, additional base-level repair or contract repair of any item beyond the provisions which already exist in field-level TOs. **(T-2)**

11.36.2.3. Field-level personnel, including AFREP work centers, will not contract out or arrange for repair services without prior written authorization by the PM and approval by the MAJCOM AFREP Manager. **(T-2)** The PM responsible for the system or end item will retain responsibility for making any decision stemming from such a recommendation.

Field-level TOs do not give permission for local contract or off-base repair of any item, only on-base repair to the extent specified by the SMR code for a given item.

11.36.3. Operational Safety, Suitability & Effectiveness (OSS&E). OSS&E is an outcome of properly planned and applied systems engineering.

11.36.3.1. Organizations responsible for preserving OSS&E of AF systems or end items must ensure that operational use, configuration changes, maintenance repairs, aging, part substitutions, and similar activities and events do not degrade baselined characteristics of systems or end items over their operational life.

11.36.3.2. OSS&E is an integrated effort to ensure items are not allowed to degrade as a result of maintenance, repairs, parts substitutions, and similar activities.

11.36.3.2.1. The program manager is responsible for the assurance of OSS&E throughout the life cycle of each configuration of each component of each system. Only the PM may convert an item from non-repairable to reparable.

11.36.4. Requirements. Given authorized repair of a consumable/expendable item, the PM will determine the SMR/ERRC code validity. All resulting changes are linked with Supply Chain Manager Consideration for that item.

11.36.4.1. Supply Chain Management issues must be considered as a matter of law, given these issues affect Congressionally Authorized budget authority and funds allocated to accomplish specifically different supply chain functions (spares buys versus repairs).

11.36.4.1.1. Any personnel, organization, or AFREP work center may request SMR/ERRC code changes IAW TO 00-25-195 and AFH 23-123, Volume 2, **Part 2**, *Integrated Logistics System-Supply (ILS-S), Standard Base Supply System Operations*, **Chapter 8**.

11.36.4.2. Non-repairable (XB3) assets submitted to PM for repair approval will contain RC (SMR/ERRC change) IAW TO 00-25-195 and a MAJCOM published form for the AFREP Vendor Repair Approval that will include all supply data, full justification, and test/repair procedures. This document will be reviewed by the MAJCOM AFREP Manager IAW **Paragraph 11.36.8**.. **(T-2)**

11.36.4.3. Repairable (XF3) assets submitted to PM for vendor repair approval will be submitted on MAJCOM published form. The form must contain all current vendor certifications and governing technical procedures utilized for test/repair by vendor. This document will be reviewed by MAJCOM AFREP Manager and signed off.

11.36.5. Asset Turn-In. Items repaired IAW technical data will be turned in to the supply system following guidance in DAFMAN 23-122 and TO 00-20-3. **(T-2)**

11.36.6. AFREP Reporting Instructions: Wing AFREP Managers will provide quarterly updates to the MAJCOM AFREP Manager. **(T-2)**

11.36.6.1. MAJCOM AFREP Managers will report yearly activity updates from October 1 to September 30 and file their yearly report with AF/A4LM by 15 October. **(T-2)**

11.36.6.1.1. The quarterly/yearly updates will include at a minimum the nomenclature and total number of items repaired, total cost avoidance, and total cost savings. **(T-2)**

11.36.7. AF/A4L Roles and Responsibilities.

11.36.7.1. Prepares, publishes, and reviews AF-level policy and guidance for AFREP.

11.36.7.2. Perform annual program analysis to verify mission benefits outweigh costs.

11.36.8. MAJCOM AFREP Manager Responsibilities.

11.36.8.1. Administer/manage the MAJCOM AFREP in coordination with the applicable Program Office.

11.36.8.2. Perform annual analysis on program viability.

11.36.8.3. Mandate use of Program Office/selection authority criteria guidance and recommendations related to maintenance, supply, and repair sources.

11.36.8.4. Designate a focal point within the applicable Program Office for the MAJCOM and end users to contact regarding AFREP recommendations and OSS&E issues.

11.36.8.5. Establish a process to identify candidate items for submission to Program Office for consideration.

11.36.8.5.1. At a minimum, process will ensure base AFREP certifies the candidate item is beyond repair from all applicable on-base organic maintenance work centers/back shops. Certification must be documented (email, logbook). Parts coded direct NRTS are exempt from this requirement. **(T-2)**

11.36.8.6. Establish and maintain an AFREP Program Office submission and status tracking website.

11.36.8.7. Compile annual program cost benefit analysis information and forward to AF/A4L.

11.36.8.8. Provide Program Office repair recommendations for evaluation and track their status (**Part I** identification, initiation date, submittal date, closure date).

11.36.8.9. Maintain, update, and distribute a list of Wing/Unit AFREP POCs to include representatives from other agencies (such as, DLA, ALCs, MAJCOMs).

11.36.8.10. Review/Validate Wing/Unit SMR/ERCC requests IAW TO 00-25-195 and TO 00-20-3 prior to submission to the applicable Program Office for evaluation/approval.

11.36.8.11. Validate items are approved for contract repair for strategic sourcing opportunities.

11.36.8.12. Initiate the opportunity assessment of strategic sourcing candidates when deemed appropriate or when requested by the Program Office.

11.36.8.13. Provide quarterly MAJCOM cross-tell of AFREP repairs to Base/Center AFREP managers. The minimum data will include nomenclature, total cost, and total amount saved for each item across the MAJCOM.

11.36.9. Wing/Unit Responsibilities:

11.36.9.1. Participate in AFREP when approved by the MAJCOM AFREP Manager. **(T-2)**

11.36.9.1.1. DELETED.

11.36.9.1.2. MXG SEL will ensure AFREP Manning Positions are categorized as an additional duty and not listed as positions on the MXG UMD. **(T-2)**

11.36.10. Wing/Unit AFREP Manager Responsibilities:

11.36.10.1. Submit SMR/ERRC change recommendations to the MAJCOM AFREP Manager for Program Office coordination. See TO 00-25-195, and this DAFI. **(T-2) Note:** Field-level TOs do not give authorization for local contract repair of any item, only on-base repair to the extent specified by the SMR code for a given item. AFREP or any other field level personnel will not perform repairs not authorized by technical data. **(T-2)**

11.36.10.1.1. Workcenters participating in AFREP repairs will submit Critical Application Items (CAI) and Critical Safety Items (CSI) repair recommendations to the MAJCOM AFREP Manager for screening to determine appropriate PM for submission. **(T-2) Note:** CAIs, CSIs, or elements of a system which the PM has designated as a CAI system, or a CSI system are prohibited from consideration under the AFREP program unless otherwise approved by an authorized engineering authority.

11.36.10.1.1.1. All Electronic Warfare (EW) Systems are CAI-designated systems. Verify CAI and CSI items on the Joint Services Critical Item Data Viewer, located at: **https://remote3.amrdec.army.mil/csiviewer/**. See **Attachment 2**, CAI & CSI for additional information.

11.36.10.1.2. Contractor repairs of any item are not allowed without prior written authorization from the PM and approval by the MAJCOM AFREP Manager. **(T-2) Note:** AFREP work centers are prohibited from entering into repair source contractual/obligation relationships with contractors. DoD regulations exist to assign such actions (finding and qualifying repair sources) to the authorized engineering authority.

11.36.10.1.2.1. If contract repairs are authorized, contracts will be established IAW local contracting procedures. **(T-2)**

11.36.10.1.3. The Wing/Unit AFREP Manager will ensure the SOW includes, as a minimum, the following items for contracted repairs:

11.36.10.1.3.1. Requirement for the contractor to perform/document receiving inspections. **(T-2)**

11.36.10.1.3.2. Requirement for the contractor to inspect/test the item following repair. **(T-2)**

11.36.10.1.3.3. Requirement for the contractor to provide a record of the repair and test results to the AFREP office and made available for the Government Inspector (such as, Defense Contract Management Agency (DCMA)). **(T-2)**

11.36.10.1.3.4. Contract will specify expected shipping, transportation, and repair-estimate completion dates. **(T-2)**

11.36.10.1.3.5. Repair items IAW Technical Data. **(T-2) Note:** Restricted use of systems will result from use of components which have been repaired as described immediately above, without prior written authorization from the program manager.

11.36.10.1.3.6. Enter data into the AFREP Recommendation Submittal site:

AFREP - Home (dps.mil) The minimum data consists of a roll up AFREP repair total cost and will include:

11.36.10.1.3.6.1. Time expended coordinating PM approval for AFREP repair authorization. **(T-2)**

11.36.10.1.3.6.2. Man-hours to complete repair "labor hours". **(T-2)**

11.36.10.1.3.6.3. Nomenclature/Stock Number of part being repaired. **(T-2)**

11.36.10.1.3.6.4. Total cost of item if sourced from the supply chain. **(T-2)**

11.36.10.1.3.6.5. Total cost of tangible resources expended to complete AFREP repair (such as, wiring/consumables). **(T-2)**

11.36.10.1.3.7. Assist technicians by interfacing with engineering, Equipment Specialists (ES), QA, Air Force Engineering Technical Services, and other field-level agencies. **(T-2)**

11.36.10.1.3.8. Accumulate and forward data requested by MAJCOMs concerning AFREP. **(T-2)**

11.36.10.1.3.9. Provides repair authorizations to the MXG QA PIM IAW DAFI 21- 101.

11.36.10.1.3.10. Ensure individuals assigned AFREP extra duties are trained, qualified and maintains a minimum five-skill level in their AFSC IAW DAFMAN 36-2689.

11.36.10.1.3.11. Submit and monitors DR for deficiencies discovered during a Wing/Unit AFREP initiative, IAW TO 00-35D-54 or equivalent PM approved DR process.

11.36.10.1.3.12. Review daily Awaiting Parts (AWP) and MICAP lists from maintenance activities to determine if the AFREP office can recommend to the appropriate PO, items from those lists. **(T-2)**

11.36.10.1.3.13. Provided quarterly AFREP repair updates to MXG/CC. The repair updates at a minimum will include nomenclature, total cost, and total amount saved for each item. **(T-2)**

11.36.10.1.3.14. Establish collection points within unit supply sections for consumable/expendable items coded with ERRC XB3 to determine reparability of assets prior to permanent disposal.

11.37. Calibration Limitation Approval Certification Program.

11.37.1. General. A limited TMDE calibration could seriously impact mission capability of weapon systems. All units will have a comprehensive training program to ensure authorized personnel can interpret TMDE calibration limitations to the specified requirement of the applicable weapon system. **(T-2)** Personnel will be certified IAW criteria established in **Table 11.1**. **(T-2)** MXG/CCs may designate contractors in writing to authorize calibration limitations.

11.37.2. Responsibilities and Management. The MT or TD will be responsible for management and development of the calibration limitation approval training program. **(T-2)**

11.37.2.1. As a minimum, the course will include when to consider a limited calibration, impact of using improperly calibrated equipment, and how to apply calibration specifications to weapon system requirements. **(T-2)**

11.37.2.2. Prior to placement on the SCR, the calibration limitation approval training (MT or TD course) will be mandatory. **(T-2)**

11.37.3. - 11.37.3.2. DELETED.

11.37.4. Certification Criteria. Certifying officials will be selected IAW criteria established in **Table 11.1**. **(T-2)**

11.38. Oil Analysis Program (OAP).

11.38.1. Program. Oil Analysis is the process of analyzing oil and other fluids used to lubricate or operate mechanical equipment, evaluating the condition of the fluid or the equipment from which the fluid originated, and recommending maintenance actions to the equipment operating activity. An OAP ensures timely and accurate oil analysis support through the strategic location of oil analysis laboratories and the standardization of procedures, data elements, analytical instrumentation, and diagnostic techniques. The Joint Oil Analysis Program (JOAP) is a combined effort of the Army, Navy and AF to set-up and maintain a standard program. Oil analysis requires a centrally managed program and the integration of AF OAP and JOAP plans.

11.38.2. Objectives. The overall objective of the AF OAP is to detect oil-wetted air and space equipment failures before serious malfunction or secondary damage occurs. The specific objectives of the AF OAP and JOAP programs are as follows:

11.38.2.1. Improve the operational safety, readiness, and economy of military equipment through the use of on-board and off-board oil analysis, a condition-monitoring concept that relies on the detection and measurement of wear-metals in the fluid.

11.38.2.2. Collect and analyze oil analysis data in order to increase the effectiveness of oil analysis techniques in the diagnosis of potential equipment failures and lubricant condition; to provide wear metal and lubricant physical property data to the various weapons system managers and others, as required.

11.38.2.3. Ensure oil analysis plans and operations are integrated (where practical) to provide:

11.38.2.3.1. Standard laboratory techniques, procedures, data, calibration standards, and analytical instruments.

11.38.2.3.2. Inter-service oil analysis support to all military departments.

11.38.2.3.3. The most cost–effective means of determining the condition of lubricants, fluids, and mechanical system through the use of various analytical techniques.

11.38.3. Guidance. The OAP helps aircraft technicians and supervisors to make informed, condition-based, preventive maintenance decisions, and can reduce equipment costs, increase equipment availability, and reduce in-flight risk. This is primarily achieved by monitoring the concentration of wear metals in fluids used to lubricate or power mechanical systems.

11.38.3.1. To monitor engine health, the OAP uses a variety of testing mechanisms. These include:

11.38.3.1.1. Atomic Emission spectrometric wear metal analysis.

11.38.3.1.2. Magnetic Chip Detectors/Magnetic Chip Detectors with on-board sensors.

11.38.3.1.3. Scanning Electron Microscope/Energy Dispersive X-ray system technology.

11.38.3.2. To the extent deemed cost effective, EOT will be used as the standard time interval between oil analysis sampling when in-service engines are equipped with an Engine Monitoring System or other operating time recorders.

11.38.3.2.1. For engines without Engine Monitoring System or other operating time recorders, oil analysis trending intervals will be standardized based upon Engine Flying Hours.

11.38.3.3. Analyze oil samples from transient aircraft IAW applicable technical data and owning activity requirements.

11.38.3.3.1. For transient aircraft with an EMS, at bases without the capability to download EOT data, Engine Flight Hours will be used to continue oil analysis trending.

11.38.3.4. Responsible activities must ensure the resultant data is accurate and given promptly to all customers so they can effectively monitor the condition of their equipment.

11.38.3.4.1. AF OAP laboratories will evaluate response times to optimize support of the customer. **(T-2)** Evaluation frequency is established by MAJCOM supplemental guidance.

11.38.3.5. Laboratory operation.

11.38.3.5.1. Each OAP laboratory must be certified IAW TOs 33-1-37-1/-2.

11.38.3.5.2. Seek to maximize inter-service use of existing laboratories through laboratory consolidation, workload sharing, and use of standardized instrumentation, techniques, and procedures. **(T-2)**

11.38.3.5.3. AF OAP laboratories must provide oil analysis services at no charge for all US Government, North Atlantic Treaty Organization (NATO) and friendly Foreign Military Sales aircraft. These services include analyzing oil samples from transient aircraft IAW applicable technical data within the AF OAP laboratory capabilities. **(T-2)**

11.38.4. Roles and Responsibilities

11.38.4.1. AF/A4L is the chief Air Staff agency with policy responsibility for the maintenance of air and space equipment.

11.38.4.1.1. Guidance. Prepares, publishes, and reviews AF-level policy and guidance for the AF OAP.

11.38.4.1.1.1. Coordinates with MAJCOMs to review and resolve guidance-related issues.

11.38.4.1.2. Management. Designates a POC for AF OAP. The representative will manage this publication while closely coordinating with functional experts.

11.38.4.1.2.1. Works with AF representative to the JOAP-Coordinating Group

(CG) on policy issues.

11.38.4.2. Major Command. Each MAJCOM establishes a headquarters POC for complying with MAJCOM OAP responsibilities.

11.38.4.2.1. Establishes or relocates OAP laboratories to support MAJCOM mission. Coordinates establishment or relocation with the AF OAP Manager.

11.38.4.2.2. Ensures quality deficiency reports are submitted to the unit Product Improvement Manager IAW TO 00-35D-54. DRs must be submitted to engine program offices on all equipment requiring tear down or overhaul due to an OAP laboratory maintenance recommendation and on all oil-wetted component failures where no OAP laboratory maintenance recommendation was made.

11.38.4.2.3. Ensures laboratories provide the depot a computer-generated printout/record, for each engine undergoing scheduled maintenance or overhaul.

11.38.4.2.4. Ensures laboratories process and evaluate samples IAW TO 33-1-371/- 2.

11.38.4.2.5. Ensures proper training of AF OAP laboratory technicians. This includes identifying training requirements to the AETC.

11.38.4.2.6. Ensures assigned shop instrumentation and equipment is not modified or used for non-OAP applications without AF OAP Office approval.

11.38.4.2.7. Provides guidance necessary to execute the AF OAP and ensures all subordinate organizations understand and properly execute AF OAP and JOAP responsibilities. MAJCOMs/ANG may provide additional guidance in their supplements or addendums to this DAFI as required.

11.38.4.2.8. Ensures AF OAP and JOAP requirements are included in planning, programming, and budgeting process. This includes providing needed funds, personnel, facilities, and other resources to maintain an effective program.

11.38.4.2.9. Supports equipment evaluations and field surveys for the AF OAP Office.

11.38.4.3. Air Force Materiel Command (AFMC). AFMC is the lead MAJCOM for the AF OAP and AF participation in the JOAP. AFMC is also responsible for oil analysis Research, Development, Test and Evaluation (RDT&E). The Directorate of Logistics, Civil Engineering, Force Protection, and Nuclear Integration (AFMC/A4/10) is the headquarters office of primary responsibility for AF OAP guidance coordination and implementation within AFMC.

11.38.4.3.1. Propulsion Directorate.

11.38.4.3.1.1. Sustainment Chief Engineer represents the AF on the JOAP-Executive Committee.

11.38.4.3.1.1.1. Establishes, funds, staffs, and directs the AF OAP Office.

11.38.4.3.1.2. The Development Program Manager ensures specification guidance for oil analysis sampling provisions or other appropriate measures to detect oil-wetted failures, where applicable, are included during the design phase.

11.38.4.3.1.3. AF OAP Office, AFLCMC/LP. The AF OAP Office manages the

AF OAP, and in coordination with the MAJCOMs and propulsion community, leads AF participation in the JOAP.

11.38.4.3.1.3.1. Certifies/decertifies AF OAP laboratories for participation in the JOAP.

11.38.4.3.1.3.2. Maintains a list of AF OAP laboratories, equipment, and customers.

11.38.4.3.1.3.3. Assists MAJCOM/Center managers in program execution. This includes recommending the establishment, location, and relocation of AF OAP laboratories.

11.38.4.3.1.3.3.1. Communicates AF OAP objectives, policies and procedures to the Director of Propulsion, Engine OAP Managers, equipment specialists and program managers.

11.38.4.3.1.3.3.2. Evaluates the need for and performs special studies, as requested by the MAJCOMs or depots.

11.38.4.3.1.3.3.3. The AF OAP Office should periodically conduct laboratory assistance/assessments to determine adequacy and effectiveness of the AF OAP. Identifies problems and recommends solutions.

11.38.4.3.1.3.4. Establishes and manages a data system, meeting tri-service requirements, to evaluate AF OAP participation and effectiveness and to provide engine program offices with historical data on oil sample analysis results.

11.38.4.3.1.3.5. Coordinates and consolidates AF/MAJCOM requirements with Army/Navy to ensure, where practical, the procurement of common OAP equipment.

11.38.4.3.1.3.6. Represents the AF on the JOAP-CG.

11.38.4.3.1.3.7. Develops a comprehensive OAP laboratory certification and quality control program.

11.38.4.3.1.3.8. Maintains and provides AF inputs to TOs 33-1-37-1/-2/-3/-4, *JOAP Manual*.

11.38.4.3.1.3.9. Reviews and evaluates the JOAP school curriculum.

11.38.4.3.1.3.10. Assists the Engine OAP Manager and serves as an advisor for the engine Maintenance Planning Working Group (MPWG) for OAP issues.

11.38.4.3.2. Director of Propulsion (DOP). The DOP AFLCMC/LP in conjunction with Engine Single Managers at AFLCMC/LPS, AFLCMC/LPA and the AF OAP Office assess existing/potential oil analysis technologies. The DOP also ensures wear metal debris and oil analysis is an integral part of the Engine Health Management Program. The DOP appoints Engine OAP Managers for each AF managed engines.

11.38.4.3.2.1. Engine OAP Managers. The Engine OAP Manager is the engineer in charge of a particular engine and is solely responsible for the OAP related issues on that particular engine.

11.38.4.3.2.1.1. Serves as the focal point for the engine MPWG for OAP issues, provides the guidance necessary to accomplish engine-specific oil analysis.

11.38.4.3.2.1.2. Ensures expeditious handling of equipment returned for tear down or overhaul because of an OAP laboratory maintenance recommendation or where oil analysis results indicated a potential problem.

11.38.4.3.2.1.3. Provides guidance necessary to accomplish engine specific oil analysis. Provides updates for TOs 33-1-37-1/-2/-3/-4 to the OAP Office.

11.38.4.3.2.1.4. Provides accurate and timely feedback to the MPWG and field units on OAP-monitored equipment. This includes maintenance findings on equipment in for tear down or overhaul as a result of an OAP laboratory maintenance recommendation. It also includes failure reports and related wear metal and oil analysis data on oil-wetted components where no OAP laboratory maintenance recommendation was made.

11.38.4.3.2.1.5. Works with the MPWG to establish and maintain wear metal limits, diagnostic criteria, and other oil analysis parameters. This is based on a review of data from equipment tear-down and overhaul findings.

11.38.4.3.2.1.6. Maintains metrics on hits, misses, and escapes. Once oil analysis data is included in the Engine Health Management AF Enterprise Center with software capability to perform metric monitoring, the AF OAP will concurrently monitor metrics with the Engine OAP managers.

11.38.4.3.2.1.7. Works with the MPWG, MAJCOM customers and the AF OAP Office to establish engine-specific technical and performance requirements for all wear metal debris and oil analysis equipment.

11.38.4.3.2.1.8. Utilizes the Component Improvement Program as needed to evaluate the cost effectiveness of existing and potential wear metal debris and oil analysis applications, establish test programs, and implement the most cost-effective method(s).

11.38.4.3.2.1.9. Sends updates of specific oil sampling intervals and wear metal limits (evaluate for new engines during the design phase; reconsider for existing engines when oil-wetted parts undergo any materiel or strength changes) to the MPWG.

11.38.4.3.3. SE and Vehicles Division (AFLCMC/WNZ) procures oil analysis equipment at the request of the AF OAP Office.

11.38.4.3.3.1. Maintains a contract for procurement of JOAP AE spectrometers used by the Army, Navy, and AF laboratories.

11.38.4.3.3.2. Provides technical order provisioning and support.

11.38.4.3.3.3. Establishes inter-service logistics support. This includes spare parts support, instrument repair and overhaul, procurement of common JOAP laboratory equipment and supplies, item management and equipment specialist activities, and funding status of existing contracts.

11.38.4.3.4. Air Force Research Laboratory. The Air Force Research Laboratory accomplishes RDT&E to improve wear metal and oil analysis instruments, materials, and techniques. **(T-2)**

11.38.4.3.4.1. Supports the AF OAP charter to conduct test and evaluation for the oil analysis programs, including the JOAP and the AF OAP, as applicable. **(T-2)**

11.38.4.3.4.2. Coordinates RDT&E activities with the MAJCOMs, DOP, and AF OAP Office as applicable. **(T-2)**

11.38.4.4. AETC. Provides initial oil analysis training for AFSC 2A7X2 through the Nondestructive Inspection course. The AF OAP Management Office and MAJCOMs may request additional training, as required.

11.38.4.4.1. Coordinates course materiel changes with the AF OAP Office and the MAJCOM POCs.

11.38.5. Reporting and Measurement. All MAJCOMs and laboratories must collect and report metrics to the AF OAP Manager IAW TOs 33-1-37-1/-2/-3/-4.

11.38.5.1. All laboratories must collect, and report hits, misses, and escapes as a minimum. **(T-2)**

11.39. Air Force Engineering and Technical Services (AFETS).

11.39.1. General. The AF must maintain its weapons systems and equipment to meet worldwide mission requirements and operational needs at a reasonable cost. To accomplish this, units need the capability to quickly resolve complex or unusual technical problems and provide enhanced system-specific technical training to AF technicians, contractors, and operators. Engineering and Technical Services (ETS) provides this expeditionary resource and is prepared to deploy AFETS and CETS as needed.

11.39.1.1. AFETS personnel are the primary source of Engineering and Technical Services support in the AF. AFETS field engineers are Emergency Essential DoD civilian employees, highly experienced and thoroughly trained technical specialists.

11.39.1.2. CETS can be an important element in developing an independent AF capability on new systems; however, units must develop their own organic capability and/or request AFETS support. **(T-2)** Organizations should normally terminate CETS within 12 months after obtaining self-sufficiency.

11.39.2. AFETS are DoD civilians who provide advantages of long-term continuity and decreased retraining costs provided by a civilian work force. AFETS field technicians will be used and retrained as necessary to meet technical needs and changing mission requirements. **(T-2)**

11.39.2.1. AFETS can design special test equipment, develop special maintenance procedures, develop, and conduct technical training for unit maintainers and operators, and recommend changes to maintenance processes.

11.39.2.2. AFETS also serve as the unit technical liaison and work with MAJCOM functional managers, depot technicians, engineers, item managers, and equipment manufacturers to resolve complex equipment problems.

11.39.2.3. AFETS will certify tasks IAW AFI 36-2650 and DAFMAN 36-2689 in USAF personnel training records when training is provided to the go/no-go level. **(T-2)**

11.39.3. AFETS personnel should be functionally aligned under the local ETS OPR (typically the MXG/CC or equivalent commander) and reside within the assigned organizations maintenance complex.

11.39.3.1. AFETS will not be authorized to overcome manning shortfalls or to perform duties considered organic to the unit's manning. **(T-2)**

11.39.3.2. When AFETS and contracted engineering support (example, CETS, Field Service Engineer or FSR) are assigned to a unit every effort will be made to co-locate these resources to maximize effectiveness of technical support within the organization. **(T-2)**

11.39.4. The AF may utilize CETS to provide on-site proficiency training, technical advice, and technical assistance for initial system bed-down or major modifications when AFETS are unavailable. Units desiring services of strategically assigned CETS will direct their requests to their MAJCOM OPR. **(T-2)**

11.39.4.1. When CETS and AFETS are assigned to the same unit, CETS will support and train AFETS personnel as required. **(T-2)**

11.39.4.2. CETS will certify tasks IAW DAFMAN 36-2689, and AFI 36-2650, in USAF personnel training records when training is provided to the go/no-go level. **(T-2)**

11.39.5. Exclusions. ETS covered in this DAFI excludes:

11.39.5.1. Engineering review and resolution of service-revealed deficiencies reported through normal maintenance information systems.

11.39.5.2. Materiel DR covered in TO 00-35D-54.

11.39.5.3. The engineering determination of materiel integrity.

11.39.5.4. The engineering or technical services used in 61-series instructions.

11.39.6. Limits: CETS are restricted to the duties and responsibilities outlined in this DAFI and specific tasks listed in the Task Work Specification. MAJCOM OPRs (with approval by the applicable MAJCOM Directorate) may grant exceptions to these limits only on a case-by-case basis based on mission need. Do not use CETS to avoid manpower ceilings or other personnel rules and regulations.

11.39.6.1. CETS will not:

11.39.6.1.1. Perform non-ETS duties or normal unit duties. **(T-3)**

11.39.6.1.2. Make policy or represent the using activity at meetings or conferences. **(T-3)**

11.39.6.1.3. Supervise or control AF personnel or personnel of other contractors. **(T-3)**

11.39.6.1.4. Hold engineering decision-making positions. **(T-3)**

11.39.6.1.5. Perform direct maintenance except in emergency situations. **(T-3)**

11.39.7. MAJCOM Responsibilities. MAJCOMs will:

11.39.7.1. Supplement this document as necessary to ensure standardization among subordinate units.

11.39.7.2. Designate a Lead ETS Program Office in a single MAJCOM to administer the activities of the member MAJCOMs merged by MOA/MOU.

11.39.7.3. Designate an ETS OPR in the appropriate Headquarters Directorate or Field Operating Unit (FOA) to serve as the MAJCOM ETS OPR for member MAJCOMs merged by MOA/MOU.

11.39.7.4. Ensure all applicable requirements of this DAFI are met by units authorized to decentralize management of their ETS programs to the using activities.

11.39.7.5. Program and defend MAJCOM ETS funds and manpower requirements over the Future Years Defense Program (FYDP) consistent with AF mission requirements.

11.39.7.6. Budget and fund AFETS PCS, TDY, and Developmental Training costs to support their MAJCOM requirements and submit Program Objective Memorandum (POM) for all ETS requirements.

11.39.7.7. Identify and ensure mobility statements are in AFETS Standard Core Personnel Document and designate positions as Emergency-Essential. Refer to DAFI 36-153, *Civilian Mobility*.

11.39.7.8. Ensure general personnel management records are maintained at the unit of assignment on all ETS personnel to assure proper management and administration of ETS resources.

11.39.7.9. Ensure training for AFETS receive proper priority in AF training plans.

11.39.7.10. Redistribute ETS resources between major activities when mission changes dictate such realignment. All redistribution efforts will be coordinated with losing and gaining organizations.

11.39.7.11. Provide government property support to CETS IAW Federal Acquisition Regulation (FAR), Subpart 45.3, Authorizing the Use and Rental of Government Property.

11.39.7.12. Coordinate CETS contract questions with the AFLCMC/Enterprise Acquisition Division (PZIEB) who performs all central acquisition contracting functions for CETS.

11.39.8. Lead ETS Program Office/Decentralized Management Activities Responsibilities (as applicable). Lead ETS Program Office/Decentralized Management Activities will:

11.39.8.1. Develop Task Work Specification and initiate procurement packages for each approved CETS requirement using appropriate Advisory & Assistance Service policies and procedures IAW FAR Subpart 37.2, *Advisory and Assistance Services*.

11.39.8.2. Oversee Contract Officer Representative (COR) activities.

11.39.8.3. Establish procedures to notify subordinate activities of CETS termination.

11.39.8.4. Develop and utilize assessment criteria to effectively manage, administer, and control ETS activities.

11.39.8.5. Conduct annual assessments of ETS Team performance at each field unit.

11.39.8.6. Validate manpower requirements at least every 24 months. Validation should be accomplished with inputs and recommendations from unit leadership and MAJCOM ETS OPR.

11.39.8.7. Realign AFETS manpower as needed when the mission, system, or equipment changes dictate.

11.39.8.8. Coordinate AFETS placement and Standard Core Personnel Documents with manpower and civilian personnel offices.

11.39.8.9. Maintain the knowledge, training abilities and skills of the AFETS workforce.

11.39.8.10. Update/train AFETS on new weapon systems, equipment conversions and major system modifications.

11.39.8.11. Coordinate with weapon system and equipment managers to program AETC Type I Training and other types of training for AFETS on a priority basis for current and new systems.

11.39.8.12. Provide AFETS instructor training.

11.39.8.13. Verify need for CETS personnel security clearances and take action to maintain access at the minimum level required IAW DoDMAN5200.02_AFMAN 16-1405, *Air Force Personnel Security Program*.

11.39.8.14. Include Personnel Reliability Program guidance in the Task Work Specification of contractors whose duties involve nuclear weapons.

11.39.8.15. Consolidate subordinate units' requirements and establish a validation process through the MAJCOM, FOA, or Direct Reporting Unit (DRU) ETS OPR (as applicable).

11.39.8.16. Establish, maintain, and manage MAJCOM ETS TDY and training budget to include planning and execution of funds.

11.39.9. Using Activity will:

11.39.9.1. Employ ETS resources effectively and efficiently to enhance mission capability IAW AF and MAJCOM guidance. **(T-2)**

11.39.9.2. Provide specific direction and guidance on maintenance activities requiring focused AFETS attention and/or technical support. **(T-2)**

11.39.9.3. Ensure AFETS personnel attend and participate in Group, Squadron, and unit maintenance meetings, as required. **(T-2)**

11.39.9.4. Ensure AFETS personnel are providing desired coverage on all shifts, as required, with a focus on shifts where the significant maintenance and repair activities are ongoing. **(T-3)**

11.39.9.5. Provide local access and oversight of Time and Attendance actions for assigned AFETS personnel.

11.39.9.6. AFETS assigned as tenants will be afforded command/base support by the host commensurate with other assigned DoD civilians to include eligibility for local awards, security clearance processing, annual physicals, passport/visa processing. **(T-2)**

11.39.9.7. Fund AFETS to attend conferences, Technical Interchange Meetings (TIM), and deployments as required. **(T-3)** In addition, fund training requirements to ensure AFETS remain current on assigned and emerging systems. **(T-3)**

11.39.9.8. Provide office supplies, special Information Technology (IT) equipment as necessary to support the unit's mission. **(T-3)**

11.39.9.9. Adhere to AF and ETS TDY/Deployment Policies and regulations. **(T-2)** Units are authorized and encouraged to deploy AFETS to support mission requirements worldwide. AFETS employees must be assigned UTC positions in mobility tasked units on the Deployment Manning Document (DMD) as required. **(T-2)** CETS representatives are typically not deployed but may be deployed on specific approval of the MAJCOM OPR if AFETS personnel are not available, subject to contract provisions and funding availability.

11.39.9.10. UDM/deployment functions/processes are the responsibility of assigned unit for AFETS personnel.

11.39.9.11. Adhere to Adverse Action, Appeal and Grievance Procedures. **(T-2)** Refer to DAFI 36-148, *Discipline and Adverse Actions of Civilian Employees*, issue based 36-Series AFIs, and Negotiated Labor Management (Union) Agreement as applicable, before proceeding.

11.39.9.12. Provide support through the local security manager to process AFETS personnel security periodic reviews and updates.

11.39.9.13. Provide AF Certifying Officer Support. **(T-2)** The using activity OPR will serve as or designate AF Certifying Officers for CETS personnel and provide the name, office symbol, signature, and telephone number of the Air Force Certifying Officer to the Administrative Contracting Officer, with a copy to the MAJCOM OPR, no later than 30 days after the CETS assignment or within five workdays of any AF Certifying Officer change. **(T-2)**

11.39.9.13.1. The CETS contract line items assigned to each certifying officer will be clearly identified in this designation.

11.39.9.13.2. The AF Certifying Officer is responsible for certifying the monthly Certificate of Service. It is recommended that the using activity delegate the AF Certifying Officer responsibilities to the Director of Operations of the squadron primarily using the individual CETS employee's services.

11.39.9.13.2.1. The designated certifying officer will be a commissioned officer. **(T-2)** When it is impractical to designate a commissioned officer or one is not available, requests for approval to appoint a senior NCO or AF civilian (GS-11 or above) as AF Certifying Officer will be submitted by the using activity OPR in writing to the MAJCOM OPR. Each request will be evaluated on an individual basis.

11.39.10. AFETS Responsibilities. AFETS personnel will:

11.39.10.1. Provide field service engineering, technical advice; and assistance to resolve system anomalies and equipment failures. **(T-2)**

11.39.10.2. Develop and teach specific technical training for maintaining and operating unit equipment and assigned weapons systems. **(T-2)**

11.39.10.3. Investigate equipment failures and mishaps and train personnel to help prevent recurrence. **(T-2)**

11.39.10.4. Develop contacts with contractor, depot, and AFLCMC engineers, technicians, and item managers to resolve maintenance problems, design deficiencies, and supply problems. **(T-2)**

11.39.10.5. Develop special test equipment and maintenance procedures to resolve complex system problems. **(T-2)**

11.39.10.6. Perform emergency maintenance (direct assistance) on equipment when temporary skill or manning shortages prevent accomplishment by other assigned personnel. **(T-2)**

11.39.10.7. Advise the ETS OPR on the best utilization and management of CETS. **(T-2)**

11.39.10.8. Document technical activates and provide stakeholders a written account of maintenance activities by the end of each month. **(T-2)**

11.39.10.9. Maintain mobility readiness and accomplish unit required ancillary training. Training must be kept current. **(T-2)**

11.39.11. CETS Contractor Responsibilities. CETS contractor will:

11.39.11.1. Provide ETS through CETS employees to perform the duties described in the Task Work Specification. **(T-2)**

11.39.11.2. Select, supervise, and exercise sole and autonomous control and direction over CETS employees. **(T-2)**

11.39.11.3. Comply with the administrative and security regulations of the using activities. **(T-2)**

11.39.11.4. Provide copies of the Task Work Specification to CETS employees. **(T-2)**

11.39.11.5. Provide CETS security clearance certification to the unit security office. **(T-2)**

11.40. Senior Leader Mission Generation (SLMG) Course.

11.40.1. The Senior Leader Mission Generation (SLMG) Course was developed in 2013 and focused on wing leadership teaming between maintenance, operations, and logistics support to achieve safe and effective mission generation. SLMG objectives are to 1) comprehend the organizational dynamics and responsibilities of operational, maintenance, logistics support, and medical functions for aircraft mission generation; 2) comprehend the necessary integration and teamwork between operational, maintenance, logistics support, and medical functions for aircraft mission generation.

11.40.2. Only Wing CCs/CVs, Operations Group Commander (OG/CCs), MXG/CCs, Mission Support Group (MSG/CCs), MDG/CCs and their equivalent to be stationed at wings with a flying or nuclear mission are required for attendance. **(T-2) Note:** MAJCOM/CV is the waiver authority for attendance. Officers in Space, Cyber, Intel, Air Base Wings or other "non-traditional" wings are not mandated to attend; however, officers desiring to attend from non-

mandated wings can contact their Senior Leader Management office and be added to the course. Registration for SLMG will be accomplished during registration for Pre-Command Training. **Note:** The SLMG course is a unit funded TDY.

11.41. Condition Based Maintenance Plus (CBM+). CBM+ is the application and integration of appropriate processes, technologies, and knowledge-based capabilities to improve the reliability and maintenance effectiveness of USAF systems and components. CBM+ is maintenance performed based on evidence of need provided by RCM analysis and other enabling processes and technologies. The CBM+ Process has four distinct phases, including Component Selection, Enhanced Reliability Centered Maintenance (eRCM), Sensor-Based Algorithms (SBA), and CBM+ Deployment.

11.41.1. PREDICTIVE MAINTENANCE ALERT LOOP (PMAL). A six-step collaborative process that allows stakeholders to receive and act upon the results of eRCM analyses and/or sensor-based algorithms/modules. PMAL transforms eRCM forecasts and sensor-based algorithm alerts into Mx and supply chain actions and is a critical component in the integration of a successful USAF Predictive Mx culture.

11.41.2. GOVERANCE. A CBM+ Team is assigned per weapon system and includes representatives from AFLCMC/RO, the Program Office, the MAJCOM (including direct CBM+ support, WSMs/WSTs and field unit contacts), AFSC/LZRB, and 420 SCMS. For platforms managing many MOBs, a field representative may also serve as an optional member of the CBM+ Team to provide feedback on the execution of Mx. The CBM+ Team oversees the execution of the PMAL. The CBM+ Team meets on an as-needed basis to discuss the most recently published forecast, the locations of affected aircraft, and the availability of supply to make informed, collaborative decisions and recommendations.

11.41.3. PLAN AND SCHEDULE MAINTENANCE. The PS&D Section will be the focal point for CBM+ management, including ordering parts, ensuring that CBM+ parts desired to be changed are scheduled on the weekly operations and maintenance schedule, and that all documentation is complied with IAW **Chapter 14** of this instruction. Refer to the respective MAJCOM guidance on how and when to schedule maintenance for assigned locations. When supply is limited or aircraft are deployed or preparing for mission deployment, the MAJCOM may prioritize Mx requirements or coordination with applicable supporting organizations.

Chapter 12

MAINTAINING COMMERCIAL DERIVATIVE AIRCRAFT (CDA).

12.1. Background Information, Objective and Roles and Responsibilities. The USAF procures CDA for various missions. These aircraft are originally type certificated to Federal Aviation Administration (FAA) regulations/orders and have FAA-approved aircraft maintenance manuals. If the aircraft are civil registered (N number displayed) in lieu of military registration and military tail number, it may carry an FAA standard airworthiness certificate if operated and maintained in full compliance with civil regulations.

12.1.1. Civil registered aircraft owned and operated by the USAF IAW Title 10 U.S. Code are public use aircraft. When these aircraft are engaged in civil aircraft operations, such operations must be conducted IAW FAA and civil. When these aircraft are engaged in public aircraft operations, they are exempt from civil regulations and FAA oversight. Civil registered aircraft owned and operated by the USAF may be declared public use at any time and are then exempt from civil regulations and FAA oversight. If the aircraft are civil registered but do not have a civil airworthiness certificate or are operated by the USAF under a military registration and tail number, the aircraft are for public use and operate entirely under the authority of the USAF military technical airworthiness authority.

12.1.2. The FAA defines a Commercial Derivative Aircraft (CDA) as a commercial aircraft with an FAA type certificate (TC) and produced under an FAA Production Certificate (PC). Air Force Policy Directive (AFPD) 62-6, *USAF Airworthiness*, establishes policies for CDA to ensure that any USAF operated aircraft are airworthy over their entire life cycle and maintain high levels of safety. The directive also instructs the USAF to Meet the Intent (MTI) of applicable FAA regulations to the maximum extent practical.

12.1.3. All USAF-managed aircraft, and associated modifications, must meet the requirements of DAFI 62-601, *Airworthiness*, and AFI 63-101/20-101. **(T-2)** PMs are ultimately responsible for maintaining configuration control and ensuring flight safety of systems within their portfolio. When a military mission is compatible with a certified civil usage, the USAF will utilize FAA-type certified CDA to the maximum extent practicable. **(T-2)** To ensure safety and support, all modifications performed on CDA type certificated components or systems will be FAA certified (example, supplemental type certificate). Modifications to CDA military type certificated components or systems require approval of AF chief engineer, or delegated authority.

12.1.4. For maintenance and operations of CDA the AF will use AF-managed TOs or FAA-approved aircraft and component maintenance manuals and FAA regulations called out in Title 14 Code of Federal Regulation Parts **43**, **91**, **121,** and **145** as a guide. **(T-0)** FAA Advisory Circulars, Notices to Airmen, and other FAA information sources may also be used to satisfy all requirements of Title 14 Code of Federal Regulations Parts **43**, **91**, **121,** and **145.**

12.2. AF/A4L will:

12.2.1. Coordinate relevant policies and procedures with SAF/AQ and the FAA.

12.3. The Program Manager (PM) will:

12.3.1. Be responsible for all elements of life cycle management IAW AFI 63-101/20-101. **(T-2)**

12.3.1.1. Evaluate acquisition and sustainment strategies and determine requirements for Contractor Logistics Support (CLS) structure, Organically Managed support structure, and/or hybrid support structure.

12.3.2. When FAA manuals are used, issue technical data for configuration items and inspection requirements that are not approved by the FAA or supplied by the Original Equipment Manufacturer. **(T-2)**

12.3.3. Review evaluations from the Lead Commands concerning Airworthiness Directives (AD), Service Bulletins (SB), Customer Bulletins (CB), All Operator Letters, and Aircraft Service Changes (ASC) and will determine extensions for each, if required. **(T-2)**

12.3.4. For CDA which maintain an FAA Type Certified, ensure that the MAJCOM performs overhauls, rebuilding, major repairs, major alterations, minor repairs, and minor alterations in FAA-authorized repair facilities with appropriate ratings and authorizations or an AF-approved AFSC Military Repair Station depot facility, as directed by the PM. **(T-2)**

12.3.5. Establish a maintenance plan and Service Action Review process with the Lead Command for aircraft originally Type Certified by the FAA. **(T-2)**

12.3.6. Follow AFI 63-101/20-101 for modification requests and approvals. **(T-2)**

12.3.7. Obtain airworthiness approvals IAW DAFI 62-601. **(T-2)**

12.3.8. Coordinate with the FAA Military Certification Office for approval of modifications that affect commercial derivative aircraft configuration IAW USDOT/FAA Order 8110.101, *Type Certification Procedures for Military Commercial Derivative Aircraft*. **(T-0)**

12.3.9. Ensure FAA ADs and SBs are utilized in place of TCTOs, and commercial maintenance manuals are utilized in lieu of AF TOs to the greatest extent possible. **(T-2)**

12.3.10. For units possessing CDA that strictly utilize commercial manuals, may issue original FAA SBs, ADs or other FAA-approved modifications in-place of TCTOs. **(T-2)**

12.3.11. For units possessing CDA that strictly utilize USAF managed TOs, in order to implement ADs, SBs or other FAA-approved modifications, issue TCTOs IAW TO 00-5-1 and TO 00-5-15. Reference one of the following in each TCTO:

12.3.11.1. The AD and/or SB involved.

12.3.11.2. The Supplemental Type Certificate number.

12.3.11.3. Other FAA approval.

12.3.12. Develop a Maintenance Management Program Plan and ensure maintenance planning data is supplied to MAJCOMs, units, and/or contractors in order to operate and maintain airworthiness for the weapon system lifecycle. The program plan meets the intent of the guidance in FAA Advisory Circular 120-16, *Continuous Airworthiness Maintenance Program (CAMP)*.

12.3.12.1. The Maintenance Management Program Plan will outline the requirements to maintain the lifecycle of continued airworthiness of a weapon system in compliance with the intent of Title 14 Code of Federal Regulations (CFR) Parts 43, 65, 121 and 145 throughout its post-production, post-modification DD Form 250, *Material Inspection and Receiving Report* in-service lifecycle. The Maintenance Management Program Plan should include as a minimum:

12.3.12.1.1. Airworthiness Responsibility

12.3.12.1.2. Air Carrier Maintenance Manual

12.3.12.1.3. Maintenance Organization Structure and Function

12.3.12.1.4. Accomplishment and Approval of Maintenance and Alterations

12.3.12.1.5. Maintenance Schedule

12.3.12.1.6. Required Inspection Items

12.3.12.1.7. Maintenance Record Keeping

12.3.12.1.8. Contract Maintenance

12.3.12.1.9. Personnel Training

12.3.12.1.10. Maintenance Program Development

12.3.12.1.11. Configuration Management and Tracking

12.3.12.1.12. Engineering Services

12.3.12.1.13. Continuing Analysis and Surveillance System (CASS)

12.3.12.1.14. Depot Support Plan (if required)

12.4. Lead Commands will:

12.4.1. Ensure any new or modified configurations or maintenance conditions are coordinated with, and approved by, the designated Lead Command IAW AFPD 10-9 and the PM or equivalent responsible for the reliability, maintainability and availability of the systems and end-items prior to implementation. **(T-2)**

12.4.2. Assist ALC in determining additional inspection and component time-change requirements, intervals, documentation and publication update requirements. **(T-2)**

12.4.3. Review evaluations from their field units on ADs, SBs, CBs, All Operator Letters, or ASCs and make recommendations to the aircraft's PM. **(T-2)**

12.4.4. Ensure depot and contractor maintenance providers are furnished with lead command maintenance program and they meet AF approved FAA equivalent requirements or are a FAA approved repair station, as applicable. **(T-2)**

12.5. Units will:

12.5.1. Participate in the Service Action review process established by the PM. **(T-2)**

12.5.2. Assist Lead Commands and the PM to determine additional inspection intervals and requirements. **(T-2)**

12.5.3. Comply with FAA ADs as directed by the Chief Engineer or delegated authority. **(T-2)**

12.6. Maintenance Personnel Requirements. For AF-managed aircraft that maintain an FAA TC and airworthiness, maintenance personnel will meet the Lead Command and PM established requirements and procedures to maintain airworthiness. **(T-2)** AF maintenance technicians performing organic depot maintenance follow Air Force Sustainment Center Instruction (AFSCI) 62-603, Military Repair Station Program, Air Force Sustainment Center Manual (AFSCMAN) 62-602, Military Repair Station Manual.

12.6.1. For CDA that do and do not maintain a civil airworthiness certificate, maintenance is not required to be completed by an FAA-certificated mechanic. However, a Maintenance Management Program Plan detailing the maintenance personnel requirements will be established between the PM and the Lead Command. **(T-2)**

12.6.1.1. The plan will address as a minimum the training requirements, the level of effort allowed (such as, specific maintenance tasks as identified in the Original Equipment Manufacturer maintenance manuals), and tasks that will be performed by FAA-certified mechanics, repair stations, AFSC Military Repair Stations, or the Original Equipment Manufacturer. **(T-2)**

12.6.1.1.1. CDA Training courseware, as applicable, for unique CDA platform requirements, such as but not limited to; Extended Operations (ETOPS and Polar Operations), Materiel Management, Continuing Analysis Surveillance System (CASS), Maintenance Provider Program, Required Inspection Item (RII), Major/Minor Repair) will be addressed in lead command program training development and remain standardized across the entire weapon system. Individual Main Operating Base (MOB) units and depots may augment training as required.

12.6.1.2. The maintenance plan will be approved by the PM with coordination by the FAA Military Certification Office or Military Repair Station/Flight Standards Management Office as appropriate. **(T-2)**

12.7. Deviations/Changes to Inspection Requirements, Time Change Intervals, and Component/Aircraft Overhaul. Commercial derivative aircraft inspection requirements, time change, component and aircraft overhaul intervals are established and controlled by the Original Equipment Manufacturer and approved by the FAA. When deviation from the Original Equipment Manufacturer established maintenance standards/configuration is needed to meet AF mission requirements, units will send proposed changes to the PM through MAJCOM and for evaluation. **(T-2)**

12.8. Air Force Modifications to CDA and Components. AF modifications to CDA and components are developed following procedures outlined in AFI 63-101/20-101. All AF modification requests require coordination with the Chief Engineer or delegated authority who will provide assistance in determining applicable requirements, forms and coordination necessary to correctly disposition aircraft and component modification requests. **(T-2)**

12.9. Certification Basis for CDA. Elements of the certification basis for any CDA which are not met via FAA certification are satisfied by compliance with approved military airworthiness requirements derived from MIL-HDBK-516C, *DoD Handbook, Airworthiness Certification Criteria*. CDA whose primary mission is the transport of passengers are FAA Type Certified; FAA certification of these CDA passenger carrying aircraft is maintained for the life of the air system.

Chapter 13

CENTRALIZED REPAIR FACILITIES (CRF).

13.1. Introduction. CRFs consolidate off-equipment intermediate-level, and in some instances, depot-level tasks for commodities such as aircraft engines, electronic warfare pods, avionics line replaceable units, wheel and tire assemblies, and other aircraft components. CRFs focus on efficiently providing maintenance, repair, and/or overhaul capabilities, support RN efficiencies and will be fully integrated into the AF Supply Chain. CRFs are considered part of the repair network and exist to ensure responsiveness to MGN requirements to sustain operations both at home station and/or when deployed. Management and control procedures are outlined in AFI 20-117.

13.2. Organization. CRFs will be established within existing maintenance organizations (EMS, CMS, MXS), minimizing requirements for overhead and support. **(T-2)** Production oversight and monitoring of repair operations is the responsibility of the owning maintenance organization in which the CRF is established. Commanders with CRFs will manage the personnel, facilities, and processes for the CRF following the policies and procedures in this DAFI and DAFI 20-117. **(T-2)**

13.3. CRF Production Requirements. Maintenance Squadron (EMS, CMS, MXS) Director of Operations/MX SUPT will:

13.3.1. Ensure the Node Manager (NM) executes enterprise production duties as outlined in AFI 20-117. **(T-2)**

13.3.2. Ensure the NM identifies and up-channels repair constraints that affect CRF repair/RN CAP2 to the MFM and RNM as prescribed in DAFI 20-117.

13.3.3. Ensure the NM utilizes information management systems and participates in RNM collaboration calls to provide timely status reports, resolve repair constraints, and receive revised repair requirements/RN changes. **(T-2)**

13.3.4. Identify systemic distribution, transportation, and supply difficulties and coordinate with base LRS leadership and/or up-channel concerns to the RNM and MFM for resolution. **(T-2)**

13.3.5. Follow established procedures to ensure the rapid movement of retrograde and sustainment assets to support enterprise requirements.

13.4. MGN Support. Units supported by CRFs will maintain the level of intermediate-level repair capability necessary to sustain MGN operations. MAJCOMs must identify intermediate-level tasks and resources required to perform MGN maintenance tasks for assigned weapon systems (for example, repair of XF3 assets, hose/tube testing, functional checks, NRTS screening).

13.4.1. Rotable Pools. Customer Wait Time and transportation constraints may drive the establishment of a Centralized Rotable Pool for Class VII end items such as engines and pods to meet established weapons system availability goals. Use of a Centralized Rotable Pool can enhance mission capability by placing serviceable assets closer to the user when the repair capability is off installation. Centralized Rotable Pool size, compared to support unit spare levels, will be determined during deliberate planning between the appropriate RNM and MAJCOMs.

13.4.2. Cannibalization at supported units. When commodity LRU local retail stocks fall below mission requirements, retention of CRF-repaired end items as "CANN assets" may be necessary. However, this will be by exception and must be approved by the appropriate RNM in coordination with the supporting MAJCOM CRF Manager. **(T-2)** CRFs will document their cannibalization process and notify supporting unit of approval to retain CANN assets. **(T-2)**

13.4.3. Provide CRF node performance, CAP2, and commodity status reports and metrics as defined in DAFI 20-117. **(T-2)**

13.4.4. Ensure the NM utilizes information management systems to provide timely status reports and receive workload requirements/ changes for commodity group repairs supported by the CRF IAW with AFI 20-117. **(T-2)**

13.5. CRF Enterprise Information Management. Managers require accurate, timely, and enterprise repair data to make CRF command and control and production decisions. To facilitate this requirement, NMs will utilize systems, processes, and business rules prescribed by AFI 20-117 to provide repair data and ensure enterprise visibility. **(T-2)**

13.6. Documentation. The CRF and supported units will maintain all required status, inventory, and historical record documentation on CRF-repaired assets, IAW TO 00-20-1 and DAFI 21-103.

13.7. Metrics. CRFs will report performance against metrics IAW DAFI 20-117.

Chapter 14

MAINTENANCE PLANS, SCHEDULING AND DOCUMENTATION (PS&D).

14.1. Responsibilities:

14.1.1. and 14.1.1.1. DELETED.

14.1.2. MAJCOMs will:

14.1.2.1. Supplement this instruction to establish minimum requirements for the following:

14.1.2.1.1. TCTO folders and monthly/weekly utilization and maintenance schedules.

14.1.2.1.2. Publish MAJCOM procedures for verification of configuration items.

14.1.2.1.3. Determine whether to ship removed engines to depot or induct into CRF repair.

14.1.2.1.4. Determine routing and approval for AF Form 2407.

14.1.3. PS&D will:

14.1.3.1. Maintain historical documents and maintenance data essential for the development of wing plans, schedules, and analysis of historical maintenance events. **(T-2)**

14.1.3.2. Maintain historical maintenance data within the MIS. **(T-2)**

14.1.3.3. Develop wing maintenance plans using MIS aircraft/system historical data input by all maintenance personnel. **(T-2)**

14.1.4. The PS&D Section NCOIC/Chief (or equivalent) will:

14.1.4.1. DELETED.

14.1.4.2. Establish and coordinate plans for rotating 2R1XX personnel through various duty positions to increase field knowledge and experience every 24 months, not to exceed 36 months. **(T-2)**

14.1.4.2.1. This rotation plan applies to TSgts and below as well as 3- or 5-skill level personnel of any rank. **(T-3)**

14.1.4.3. Evaluate quarterly the performance of workcenters performing scheduling functions to include TCTO, SI, and Job Standard Master Listing (JML) management (such as, AGE, Armament, Egress, Fuels, MXO, PS&D). **(T-2)**

14.1.4.3.1. During the visit, ensure historical documents are properly maintained and review and discuss the 2R1X1 training and rotation plan with each section NCOIC that have 2R1s assigned. **(T-2)**

14.1.4.3.2. Provide formal written reports of deficiencies found during the visits to the MXO DO/SUPT and applicable section NCOIC. **(T-2)**

14.1.4.3.2.1. Deficiencies will not be closed until validated by the MXO DO/SUPT. **(T-2)**

14.1.4.4. - 14.1.4.4.2. DELETED.

14.1.4.5. Provide SME on all maintenance scheduling issues and equipment historical document AFTO Form 95 management to QA during inspection/evaluations. **(T-2)**

14.1.4.6. Designate the MSM administrator from within PS&D (for units utilizing IMDS only). **(T-2)**

14.1.5. The Wing AVDO will:

14.1.5.1. Complete AVDO duties IAW DAFI 21-103 and maintain the inventory and utilization portion of the MIS Inventory, status, and utilization subsystem. **(T-2)**

14.1.5.2. Maintain a PDM schedule by tail/serial number for all assigned aircraft and equipment in support of AFMC and Lead Command plans and requirements. **(T-2)**

14.1.6. Unit Dedicated Scheduler will:

14.1.6.1. Provide dedicated support to AMXS/AMU. **(T-2)**

14.1.6.2. Attend and actively participate in daily, weekly, and monthly scheduling, and quarterly and yearly planning programs and meetings. **(T-2)**

14.1.6.2.1. Inform Unit supervision of maintenance capabilities or limiting factors that could affect maintenance production. **(T-2)**

14.1.6.3. Coordinate with Unit supervision and Operational Squadron (OS) operations schedulers when scheduling Unit aircraft to meet flying requirements. **(T-2)**

14.1.6.4. Provide a listing of JCNs for following week's scheduled maintenance. **(T-2)**

14.1.6.4.1. This list will be used to track Maintenance Scheduling Effectiveness (MSE). **(T-2)**

14.1.6.4.2. PS&D will determine causes of missed maintenance for reporting MSE. **(T-2)**

14.1.6.5. Manage TCTOs, TCIs, and Sis (including installed engine inspections) for aircraft assigned to their appointed AMXS/AMU. **(T-2)**

14.1.6.6. Generate AFTO Form 103, *Aircraft/Missile Condition Data*, to record certified maintenance needs for aircraft requiring depot maintenance IAW TO 00-25-4, *Depot Maintenance of Aerospace Vehicles and Training Equipment*, coordinate it with PS&D, QA, and AMXS maintenance supervision. **(T-2)**

14.2. Data Documentation.

14.2.1. Maintenance Historical Documentation.

14.2.1.1. Maintenance historical documentation will be accomplished IAW TO 00-20-1 which outlines the requirements to capture and record the significant maintenance actions on aerospace vehicles and equipment. **(T-2)**

14.2.1.2. Historical documentation will be entered and tracked in the authorized MDS MIS. **(T-2)** When the MIS is not available, historical documentation will be documented and tracked on the AFTO Form 95, or equivalent. **(T-2)**

14.2.1.3. MAJCOMs should develop supplements to this instruction to identify aerospace vehicle and support equipment historical file content and retention requirements needed beyond the minimum requirements outlined in this instruction and TO 00-20-1.

14.2.2. Aircraft jacket files. Units will develop and maintain a standardized master aircraft jacket file for use throughout the wing following the requirements listed in this instruction, TO 00-20-1 and AFI 33-322.

14.2.2.1. MAJCOMs will standardize MDS-specific requirements not captured in this instruction in supplements and addendums to this instruction.

14.2.2.2. Aircraft jacket files will be maintained in PS&D and standardized IAW the master aircraft historical file developed by the PS&D NCOIC. **(T-2)**

14.2.2.2.1. Off-equipment maintenance documents may be decentralized to sections maintaining installed-on equipment assets (examples include fuel cell records at fuel systems section, landing gear strut records at hydraulics section).

14.2.2.2.1.1. Decentralized records are filed by and are the responsibility of the owning work center.

14.2.2.2.2. PS&D will list all historical records, in their file plan or office of record. **(T-2)**

14.2.2.2.2.1. The DD Form 2861, *Cross-Reference*, will be used to cross-reference documents decentralized from PS&D to other sections and will be filed to cross reference AFTO Form 95 records that are maintained in the MIS. **(T-2)**

14.2.2.2.3. Wing-assigned aircraft jacket files may be maintained electronically; however, they must mirror the standardized master aircraft jacket file in organization and appearance. **(T-2) Note:** Slight variations in composition are allowed between different MDS weapons systems located within the same wing.

14.2.2.3. MXG/CC may identify additional local items for inclusion in aircraft jacket files. Aircraft jacket files as a minimum will include:

14.2.2.3.1. Packages for one complete inspection cycle. **(T-2)** Units may download paperless inspections to automated storage media from MIS for filing in aircraft jacket files.

14.2.2.3.2. Last FCF documentation (such as, FCF certification letter/FCF checklist). **(T-2)**

14.2.2.3.3. Last depot package. **(T-2)**

14.2.2.3.4. Transfer packages. **(T-2)**

14.2.2.3.5. Applicable weapon system -6 TO AFTO Form 95s. **(T-2)**

14.2.2.3.6. W&B records. **(T-2)**

14.2.2.3.7. Engine Records. **(T-2)**

14.2.2.3.8. Document review records/checklists. **(T-2)**

14.2.2.3.9. NDI records. **(T-2)**

14.2.2.3.10. AF Form 2411, Inspection Document (or equivalent). **(T-2)**

14.2.2.3.11. Annual aircraft jacket file review checklist. **(T-2)**

14.2.2.3.12. Authorized TO variances. **(T-2)**

14.2.2.3.13. Requests for assistance meeting the requirements for retention as historical records IAW TO 00-25-107, or equivalent/like MDS specific requirements for retention of documents as historical records. **(T-2) Note:** Contact the Lead Command as identified in AFPD 10-9 for guidance for meeting retention as historical records requirements outside the scope of TO 00-25-107.

14.2.2.3.14. Pulled AFTO Form 781-series aircraft forms. **(T-2)**

14.2.2.3.14.1. Pulled paper forms retained as part of the jacket file will be destroyed after 3 months if they do not contain historical information IAW AFRIMS. **(T-2)**

14.2.2.3.14.2. Fusing fully automated forms will maintain the last 7 copies of the pulled aircraft forms and destroy the earliest record when the 8th report is received IAW AFRIMS. **(T-2)**

14.2.2.3.14.3. Units not required to use a MIS will use aircraft forms and maintain the current and the last 3 months' worth of pulled aircraft forms. **(T-2)**

14.2.2.3.14.4. Pulled 781 forms will be filed in order by sets identified by the "From and To" date at the top of each 781-series form (see TO 00-20-1). **(T-2)**

14.2.2.3.14.5. Sets of forms may or may not include an AFTO Form 781J, *Aerospace Vehicle – Engine Flight Document* and AFTO Form 781K, *Aerospace Vehicle Inspection, Engine Data, Calendar Inspection and Delayed Discrepancy Document*. AFTO Forms 781J and K will be included in the set of forms they were pulled with and retained for the same period of time. **(T-2)**

14.2.2.3.14.6. When PS&D discovers the AFTO Form 781-series missing during a jacket file inspection, a missing-forms letter will be sent to the appropriate Maintenance Supervision of the maintenance unit responsible for pulling the forms with a 5 duty-day suspense. **(T-2)**

14.2.2.3.14.6.1. If a response is not returned within 5 duty days, notify the applicable maintenance unit supervision. **(T-2)**

14.2.2.3.14.6.2. If the forms cannot be located, file the missing forms letter, endorsed by the Maintenance Supervision in place of the missing forms. **(T-2)** See TO 00-20-1 for missing form procedures and AFI 33-322 for records management and disposition instructions.

14.2.2.4. Annual jacket file review. Review aircraft jacket files annually using a locally-developed PS&D checklist. **(T-2)**

14.2.2.4.1. The last completed checklist will be kept on file in each aircraft jacket file. **(T-2)**

14.2.3. Aircraft Document Reviews (ADR). ADRs validate and correct any errors on airframe and engine operating times and cycles, TCTO documentation, TCI component operating times,

time remaining to the next inspection, backordered supply document numbers and open deferred discrepancies. The aircraft AFTO Form 781-series for possessed aircraft are reviewed by aircraft crew chiefs, flightline maintenance functions, PS&D, Engine Management (EM) and LRS personnel to ensure the accuracy and validity of entries.

14.2.3.1. MAJCOMs will standardize the MIS/on-line products used to perform ADR on like-MDS weapons systems.

14.2.3.1.1. Units using MDS-specific laptop forms (for example Integrated Maintenance Information System (IMIS), Autonomic Logistics Information System (ALIS)) must develop procedures to ensure intent of ADRs is implemented. **(T-2)**

14.2.3.2. An ADR will be accomplished at least every 60 days for units using the fully automated AFTO Form 781-series (AFTO Form 781A, AFTO Form 781J, *Aerospace Vehicle – Engine Flight Document*, AFTO Form 781K, *Aerospace Vehicle Inspection, Engine Data, Calendar Inspection, and Delayed Discrepancy Document*. **(T-2)**

14.2.3.2.1. Units without access to a MIS and authorized to use manual AFTO Form 781-series, must accomplish an ADR at least every 30 days. **(T-2)**

14.2.3.2.2. ADRs will also be accomplished when an aircraft is transferred, before and after scheduled inspections (PH or ISO), before and after storage and after fatigue tests. **(T-2)**

14.2.3.2.3. For CANN aircraft, conduct ADRs at least every 30 days. **(T-2)**

14.2.3.3. Units will develop and publish an ADR checklist for use by home station and deployed units. **(T-2)**

14.2.3.3.1. This checklist will identify who initiates the ADR, reviewing agencies (to include the OAP lab), AFTO Form 781-series entry requirements, agency responsible for completing the AFTO Form 781-series/MIS entry, and outline any configuration verification requirements. **(T-2)**

14.2.3.4. ADR Procedures.

14.2.3.4.1. PS&D will create a JST for ADRs on a red dash symbol and ensure it is loaded against all assigned aircraft. **(T-3)**

14.2.3.4.2. ADRs will be scheduled and added to the appropriate maintenance plan. **(T-2)** An ADR is a scheduled maintenance action and will be included in MSE computations. **(T-2)**

14.2.3.4.3. PS&D and EM will validate applicable inspection, TCI, TCTO data for correct due dates/time or expiration dates, airframe, and engine operating times (or flight times if applicable) and appropriate symbol entry IAW TO 00-20-1. **(T-2)**

14.2.3.4.4. Units will coordinate with /LRS to run a tail number inquiry to validate backorders and correct any discrepancies discovered. **(T-2)**

14.2.3.4.5. Maintenance personnel will correct all discrepancies discovered during the ADR, prior to signing off the ADR JCN. **(T-2)**

14.2.3.4.5.1. If an ADR discrepancy cannot be corrected immediately, document the ADR discrepancy in the AFTO Form 781A with a JCN and applicable symbol

and retain it in the AFTO Form 781-series forms until corrected and signed off. **(T-2)** Once all the uncorrected discrepancies are documented in the AFTO Form 781- series the ADR can be signed off as complete.

14.2.4. Pre-Dock Meetings. PS&D personnel will:

14.2.4.1. Review planned aircraft inspection schedules and initiate an AF Form 2410, *Inspection/TCTO Planning Checklist*, or locally developed product for each aircraft prior to the pre-inspection meeting. **(T-2)**

14.2.4.1.1. MAJCOMs may determine if the pre/post dock requirement for inspections with less than a 200-hourly or 200-calendar day cycle is required. If it is determined that a pre/post dock meeting is not required, initiation of an AF Form 2410 is not necessary.

14.2.4.2. Host meetings and notify the appropriate Maintenance Supervision and flight supervisors of any recurring problems with attendance. **(T-2)** Prior to the pre-dock meeting, PS&D will:

14.2.4.2.1. Determine pre-dock meeting attendees. **(T-2)**

14.2.4.2.1.1. The following personnel will attend the meeting as a minimum: PS&D, Pro Super, Inspection Dock NCOIC, aircraft crew chief, DMS/Supply representative, and EM representative. **(T-2)**

14.2.4.2.1.2. Include other agencies as required for performance of the work package.

14.2.4.2.2. Review and list all known aircraft and equipment TCTOs, TCIs, SIs, and other major requirements to be accomplished during the inspection on the AF Form 2410, or locally developed product. **(T-2)**

14.2.4.2.3. Identify requirements for kits or parts. **(T-2)**

14.2.4.2.4. List all Delayed Discrepancies to be accomplished during the inspection on the AF Form 2410 keeping the original JCN. **(T-2)**

14.2.4.2.5. Incorporate all requirements against the aircraft into a work package. **(T-2)**

14.2.4.2.6. List specialist tasks required in addition to normal inspection needs. **(T-2)**

14.2.4.2.7. Develop a list of items identified as out-of-configuration for verification/correction during the inspection. **(T-2)**

14.2.4.2.7.1. For non-configuration tracked aircraft, compile a list of missing serially controlled items and coordinate/forward them to Inspection Dock NCOIC for verification. **(T-2)**

14.2.4.3. At the pre-dock meeting, PS&D will brief representatives of the inspection schedule and scope, including TCTOs, TCIs, SIs, DDs, and special requirements to be accomplished. **(T-2)**

14.2.4.3.1. Agency representatives will inform PS&D of limiting factors that might affect the schedule. **(T-2)**

14.2.4.3.2. PS&D will discuss aircraft configuration during all aircraft pre-dock meetings. **(T-2)**

14.2.4.3.3. Wings will use the AF Form 2410, or locally developed product to record additional information discussed during the pre-dock meeting. **(T-2)**

14.2.4.3.3.1. Maintain the original AF Form 2410, or locally developed product on file in the aircraft jacket file for use as a guide when conducting the post-dock meeting. **(T-2)**

14.2.4.3.3.2. Provide a copy to the Inspection Dock NCOIC or equivalent for use during the post-dock meeting. **(T-2)**

14.2.4.3.4. PS&D will provide a copy of the applicable "out of configuration" MIS products (such as, IMDS screen 810 and 990; FMxC2, screen 8110; serial number checklists) to Inspection Dock NCOIC in pre-dock package for verification/correction. **(T-2)**

14.2.4.3.4.1. The responsible work center will correct verified erroneous data and "out of configurations" in the MIS prior to post-dock. **(T-2)**

14.2.4.3.5. As a minimum, the following will also be discussed at the pre-dock meeting:

14.2.4.3.5.1. The type and number (if applicable) of the inspection to be performed. **(T-2)**

14.2.4.3.5.2. Validation of current aircraft and engine operating times. **(T-2)**

14.2.4.3.5.3. Parts in the TNB that require aircraft installation. **(T-2)**

14.2.4.3.5.4. Any known post inspection fuel cell work required. **(T-2)**

14.2.4.3.5.5. Date the aircraft is to be ready for the flightline to accept back. **(T-2)**

14.2.4.3.5.6. All known engines requiring replacement. **(T-2)**

14.2.4.3.5.7. Review of the aircraft forms open discrepancies including Delayed Discrepancies and develop a joint plan to work as many discrepancies as feasible/applicable. **(T-2)**

14.2.4.3.5.8. Any inspections that will require maintenance personnel to stop work (such as, NDI shop requirements) and when the maintenance dock needs to be clear of personnel to perform the inspections. **(T-2)**

14.2.4.3.5.9. All meeting attendees will sign the AF Form 2410. **(T-2)**

14.2.5. Post-Dock Meetings. Units will hold a post-dock meeting as soon as possible after the inspection but no later than before the FCF or first flight. **(T-2)** PS&D will:

14.2.5.1. Lead a post-dock meeting for all inspections that required a pre-dock meeting. **(T-2)** As a minimum, discuss and validate the following information at the post-dock meeting:

14.2.5.1.1. PS&D, Pro Super, Inspection Dock NCOIC, Aircraft Section representative/crew chief and other locally determined attendees will discuss open

discrepancies, review any significant inspection events, and identify any problems that may adversely affect future scheduling. **(T-2)**

14.2.5.1.2. The Inspection Dock NCOIC will provide the completed inspection work package to PS&D for filing until it is replaced by the next similar inspection work package. **(T-2)** For example, an HPO1 will be replaced by the next HPO1 and the HPO2 will be replaced with the next HPO2.

14.2.5.1.3. The Inspection Dock NCOIC will return the completed serial number verification sheet to the PS&D representative. **(T-2**

14.2.5.1.4. The Inspection Dock NCOIC or designated representative and the aircraft crew chief or equivalent will perform an aircraft documents review. **(T-2)**

14.2.5.1.5. PS&D personnel will validate TCTOs, TCIs, and SIs scheduled during the inspection were completed and signed off in the MIS prior to the post dock meeting. **(T-2)**

14.2.4.1.5.1. DELETED.

14.2.5.1.5.2. Validate that any TCTO/TCI/SI not complied with will not ground the aircraft before releasing the aircraft back to flightline maintenance personnel. **(T-2)**

14.2.5.1.6. Verify all parts placed on order during the inspection but not received have valid document numbers.

14.2.5.1.7. If maintenance actions previously identified for completion at the pre-dock meeting were not accomplished, establish agreements as to how these inspection requirements will be completed and documented on the AF Form 2410 or locally developed product with the reason why it was not performed. **(T-2)**

14.2.5.1.7.1. The Inspection Dock NCOIC and flightline maintenance supervisor (Pro Super or above) agree that all inspection requirements are completed and the flightline supervisor agrees to accept or "buy back" the aircraft. **(T-2)**

14.2.5.1.8. PS&D will file the completed AF Form 2410, or locally developed product, and completed/verified copies of the output products in the aircraft jacket file (PS&D retains completed package until the next scheduled PH/ISO inspection for that aircraft). **(T-2)** Electronic versions may be saved to digital media.

14.2.6. MIS (FMxC2/IMDS) extended downtime (more than 48 hours).

14.2.6.1. If the MIS is not available for more than 48 hours, maintenance organizations will use the most current data contained in MSM for IMDS units and "Global Reach" system products for FMxC2 units. The MSM database will be refreshed with new MIS products daily. **(T-2)**

14.2.6.1.1. MSM usage may continue in a digital format as long as updates can be made and retained.

14.2.6.2. Units will develop guidance to establish procedures to accurately manage Time Change Items, Special Inspections, and Time Compliance Technical Orders during

Maintenance Information System (MIS) extended downtime, outage, or intermittent operability. These procedures are to ensure health of fleet and aircraft safety of flight. **(T-2)**

14.2.6.2.1. For PS&D and workcenters performing maintenance scheduling functions local guidance will address procedures to validate operating times (i.e., hours, cycles, starts, landings, rounds, due dates...etc.) affecting the accurate management of Time Change Items, Special Inspections, and Time Compliance Technical Orders weekly during extended or intermittent MIS outage or faulty operability. **(T-2)** Document completion on AF Form 2411, *Inspection Documentation*. **(T-2)**

14.2.6.2.2. MSM, Global Reach system products, or local tracking products may be used until the MIS is restored and backlog data has been loaded and verified in the system. If debriefed sorties are unable to be loaded into the MIS, the debrief section will provide a cumulative breakdown of sorties and hours completed daily to PS&D and MMA to ensure operating times reflect accordingly on locally tracked products and use to forecast scheduled maintenance actions. **(T-2)**

14.2.6.2.3. Munitions, Engine Management, AGE, and workcenters performing scheduling functions will provide operating times (i.e., hours, cycles, starts, rounds, due dates...etc.) as required by PS&D. **(T-2)**

14.2.6.3. If data cannot be retained by MSM or Global Reach, the use of AFTO Form 349, *Maintenance Data Collection Record*, or local developed form, will be initiated for use in data collection/completion. **(T-2)**

14.2.6.3.1. The most current paper or electronic version of MIS products will be used once AFTO Form 349 or electronic equivalent usage is initiated. **(T-2)**

14.2.6.3.2. The AFTO Form 349 or electronic equivalent, will be used to update applicable MIS products once brought back online. **(T-2)**

14.2.6.3.3. The AFTO Form 349 or electronic equivalent, will be maintained until the data listed on it has been verified as captured/loaded in the MIS. **(T-2)**

14.2.6.3.4. After all changes have been verified in the MIS, destroy the AFTO Form 349 or electronic equivalent.

14.2.6.4. If an aircraft is temporarily moved to an operating location away from the unit of assignment and connectivity to the MIS is unavailable, units will send only those documents necessary to ensure safety of flight and current aircraft status. **(T-2)**

14.2.7. Aerospace Vehicle and Equipment Mishap Response Procedures:

14.2.7.1. PS&D will coordinate with MMA or equivalent to ensure MIS lock out procedures to prevent further manipulation of data concerning the aerospace vehicle and/or equipment used during maintenance prior to the mishap event are completed IAW **Chapter 5**. **(T-2)**

14.2.7.2. At a minimum, produce, consolidate, and impound the following products: aircraft jacket file, aircraft AFTO Form 95s, TCTO history, debriefing records, pulled AFTO Form 781-series forms, SI/TCI data, maintenance history, automated records check. **(T-2)** Include any additional significant historical data, and other decentralized records. **(T-2)**

14.2.7.3. EM will download and impound engine records from the applicable MIS and CEMS. **(T-2)**

14.3. Configuration, TCTO, SI and TCI Management.

14.3.1. Responsibilities. MAJCOMs will establish PS&D requirements and responsibilities to support work centers whose duties require scheduling functions for the equipment they maintain (such as, Egress, Armament, Aerospace Ground Equipment, and Fuels) in a supplement to this instruction.

14.3.1.1. PS&D will provide work centers whose duties require scheduling functions (such as, Egress, Armament, and Aerospace Ground Equipment, Fuels) SME training support and oversight of scheduling products necessary to ensure configuration data integrity is maintained. **(T-2)** PS&D will:

14.3.1.1.1. Outline procedures for ordering hazardous materials for TCIs and TCTOs (such as, batteries). **(T-2)**

14.3.1.1.2. Units using a MIS will not delegate suspense validation processing for TCIs installed on aircraft to the performing work center unless the written procedures include the following: a list of work centers and specific technicians authorized to process suspenses; a list of the specific suspenses authorized to be cleared; and the method for notifying PS&D of the work completed (an audit trail) (IMDS units only). **(T-2)**

14.3.1.1.2.1. Ensure EM processes all IMDS suspense validations for engines and engine components. **(T-2)**

14.3.1.1.3. Validate that data errors are corrected with appropriate personnel and updated in the MIS weekly. **(T-2)**

14.3.1.1.4. Submit MSM trouble tickets at **https://midtier.gunter.af.mil/**, call the Field Assistance Branch at DSN 596-5771, or e-mail **team4@gunter.af.mil** to correct program deficiencies. **(T-2)**

14.3.2. Configuration Management. Configuration management provides unit managers the capability to determine the actual versus approved configuration of an aircraft or equipment. The intent of configuration management is to ensure selected serially controlled and/or TCIs are properly loaded to the MIS database with accurate, approved part numbers, Quantity per Assembly and Next Higher Assembly items by WUC/LCN. PS&D has overall responsibility for the Equipment Configuration Management or Aircraft Configuration Management subsystem of the MIS and will provide assistance to maintenance personnel. **(T-2)** The performing work center supervisor and PS&D will validate configuration change, TCTO, SI and TCI events using MIS on-line capabilities. **(T-2)** Individual work centers accomplishing TCIs are responsible for changing configuration information in MIS. Unless otherwise specified in local procedures, schedulers will process all removal, installation, TCI, SI and TCTO compliance updates for aircraft and equipment in the applicable MIS and EM will process engines and engine components in applicable engine information system. **(T-2)**

14.3.2.1. Lead Commands will ensure procedures exist and are executed to provide system configuration tables which are updated, validated, and provided to field maintenance personnel as configurations change. **(T-2)**

14.3.2.1.1. Items not accessed or visible during field-level maintenance will be identified to Lead Command and AFSC managers for disposition. **(T-2)**

14.3.2.2. Maintenance personnel discovering an item with a missing data plate, or one which does not have a serial number, will contact PS&D who will coordinate with the Lead Command system functional manager and/or AFSC item manager for disposition. **(T-2)**

14.3.2.3. For those aircraft that do not currently have an established configuration table, the Lead Command will develop procedures to identify, track and validate installed configuration managed items against the data in the MIS.

14.3.2.4. PS&D will coordinate the daily resolution of IMDS configuration management notices with the appropriate maintenance section utilizing the applicable MIS screen. **(T-2)**

14.3.2.4.1. Uncorrected discrepancies will be briefed weekly at the daily production/scheduling meeting and forwarded to the appropriate maintenance supervision for corrective action. **(T-2)**

14.3.2.5. When out of configuration items or mismatched serially tracked items are discovered, establish a single DD for the "out-of-configuration" condition. **(T-2)**

14.3.2.5.1. Additionally, add a MIS WCE for each WUC/LCN and part/serial number item requiring verification to the single DD. **(T-2)**

14.3.3. TCTO Management. TCTOs are AF, MAJCOM/Lead Command or Numbered Air Force (NAF) directed modifications and inspections that provide units with instructions for doing a one-time change, modification, or inspection of equipment, (includes applicable FAA Airworthiness Directives, original equipment manufacturer service bulletins and service instructions, after concurrence by Lead Command). Lead Command, NAF and local inspections are considered OTIs. Use the MIS to process Lead Command and NAF OTIs or modifications in the same manner as TCTOs with compliance periods, remove from service dates and rescission dates IAW TO 00-5-15. TCTOs, with the exception of immediate and urgent action, are considered scheduled maintenance and integrated into maintenance planning cycles. **(T-2)** Consider concurrent accomplishment of TCTO work with other unscheduled or scheduled maintenance (such as, PH, ISO, HSC, HPO). Manage TCTOs using the MIS, TO 00-5-15 and specific MAJCOM instructions. **Note:** Communication of a grounding, or potential grounding event (TCTO, OTI, PM event) to weapon systems operating in a deployed environment and/or under the authority of an operational command must follow the grounding procedures outlined in DAFMAN 11-401 and 63-101/20-101. Units must not directly communicate home station requirements to its deployed forces but provide communication through their respective MAJCOM. **(T-2)**

14.3.3.1. PS&D is responsible for managing all assigned weapon system TCTO programs and will monitor/provide oversight of all AF owned aircraft, weapon system, AGE, and commodity TCTOs to ensure all compliance requirements are met. **(T-2)**

14.3.3.1.1. Munitions-related TCTOs will be managed by the munition's scheduler (if assigned) and engine-related TCTOs will be managed by EM schedulers. **(T-2)**

14.3.3.1.2. PMEL TCTOs will be managed by the owning agency with PS&D oversight. **(T-2)**

14.3.3.1.3. The parent technical training center manages and schedules all TCTOs for training equipment assigned to a TD or Mobile Training Team.

14.3.3.2. PS&D will review MIS products weekly to ensure proper documentation and management by owning and managing TCTO agencies. **(T-2)**

14.3.3.2.1. When an error is detected, PS&D will inform affected work centers and provide assistance to correct the discrepancy IAW TO 00-20-2.

14.3.3.2.2. Units will complete an annual TCTO status review between MIS and REMIS or equivalent systems. **(T-2)**

14.3.3.2.2.1. Units will reconcile rescinded TCTOs using a REMIS Master TCTO report or equivalent annually (NLT 30 Sep) and before deleting/retiring TCTO records from the appropriate MIS. **(T-2)**

14.3.3.2.2.2. If REMIS or equivalent access is not available, request a REMIS Master TCTO report or equivalent from the MAJCOM MDS Weapon Systems Team/Program Office identified in the subject TCTO. If TCTO status conflicts are identified, units will contact the applicable Lead Command to establish the process for resolving conflicts and facilitating status correction in REMIS or equivalent system. **(T-2)**

14.3.3.2.2.3. Once all status errors are corrected, and reconciliation is complete and verified, IMDS units can delete the TCTO from the MIS. FMxC2 automatically retires TCTOs 60 days after rescission, and all equipment shows as complete.

14.3.3.2.2.3.1. Document completion on AF Form 2411. **(T-2)**

14.3.3.2.3. PS&D will brief the MXG/CC (or equivalent) weekly on unaccomplished TCTOs that are within 60 days of grounding. **(T-2)**

14.3.3.2.3.1. Significant problems or potential delays in TCTO accomplishment will be brought to the immediate attention of the MXO DO/SUPT and MXG/CC (or equivalent). **(T-2)**

14.3.3.2.4. PS&D will chair a TCTO review meeting attended by all TCTO owning and managing agencies after the monthly supply TCTO reconciliation meeting. **(T-2)** These meetings may be combined.

14.3.3.2.4.1. PS&D will discuss the supply reconciliation, supply status, scheduling factors, current TCTO status and anticipated problems for all active TCTOs. **(T-2)**

14.3.3.2.4.2. PS&D will produce meeting minutes on the AF Form 2410 and distribute to all affected agencies. **(T-3)**

14.3.3.2.5. Depot-level TCTOs, excluding commodities, will be loaded, and tracked in the MIS for auditing compliance and applicability. **(T-2)**

14.3.3.2.5.1. Depot-level engine TCTOs will be loaded in CEMS only. **(T-2)**

14.3.3.2.5.2. Units will ensure dual reporting of completed depot-level TCTOs is prevented. **(T-2)**

14.3.3.2.5.3. All field-level companion TCTOs for commodities must be loaded in the MIS. **(T-2)**

14.3.3.2.6. PS&D will monitor, track, and administer all applicable CPINS as commodity TCTOs for configuration management purposes IAW TO 00-5-15 and TO 00-5-16.

14.3.3.2.6.1. PS&D will coordinate reprogramming of all passive/active aircraft internal and external electronic warfare systems and equipment with the wing Electronic Warfare Officer or equivalent before implementing any CPIN changes. **(T-2)**

14.3.3.2.6.2. PS&D will coordinate with EM before issuing NSS/ETS CPINS. **(T-2)**

14.3.3.2.7. When TCTOs are directed for items without serial numbers, assign permanent serial numbers IAW TO 00-20-2 and AFI 23-101. **(T-2)**

14.3.3.2.7.1. For serial numbers that cannot be created IAW TO 00-20-2 or AFI 23-101, use the associated equipment serial number the item is assigned to (for example, an aircraft chock serial number would be 0000AXXXC1).

14.3.3.2.8. Control and Transfer of TCTO Kits. Units will transfer aircraft or equipment, with any TCTOs still pending completion, with their applicable TCTO kits. **(T-2)**

14.3.3.2.8.1. Retain engine TCTO kits for engines installed on aircraft at depot locations if the aircraft is returning to that unit for TCTO compliance. **(T-2)**

14.3.3.2.8.2. Transfer TCTO kits IAW AFI 23-101, TO 00-5-15 and TO 00-5-1.

14.3.3.3. Specific TCTO Responsibilities.

14.3.3.3.1. QA personnel will:

14.3.3.3.1.1. Review all new and revised technical data and TCTO's for completeness, accuracy, and applicability. **(T-2)** Inform applicable work centers of changes and up channel any problems discovered during this review. **(T-2)**

14.3.3.3.1.2. Determine if the TCTO impacts W&B. **(T-2)**

14.3.3.3.1.3. Distribute copies of TCTOs to the managing agency, performing work centers, and LRS. **(T-2)**

14.3.3.3.1.4. Provide a supply cover letter requesting the number of items in supply (including WRM) affected by the TCTO. **(T-2)**

14.3.3.3.1.5. Report all deficiencies in technical instructions and kit-proofing to the appropriate TCTO Manager IAW TOs 00-5-1 and 00-5-15. **(T-2)**

14.3.3.3.1.6. Attend TCTO planning meetings. **(T-2)**

14.3.3.3.1.7. Provide technical support to performing work centers. **(T-3)**

14.3.3.3.2. PS&D personnel will:

14.3.3.3.2.1. Determine the total number of end items applicable to the TCTO.

(T-2)

14.3.3.3.2.1.1. Items that are assigned with the same Mission Design Series, WUC, Part Number, but are not applicable to the TCTO will be loaded in "22" status. **(T-2)** This ensures accurate accountability that all equipment has been verified as being affected or not applicable to TCTO.

14.3.3.3.2.2. Chair a TCTO planning meeting with attendees from QA, owning and performing work centers and Flight Service Center/LRS IAW AFI 23-101, **Chapter 4**. **(T-2)**

14.3.3.3.2.2.1. Record meeting minutes on AF Form 2410, or locally developed product and provide an overall plan to implement the TCTO. **(T-2)**

14.3.3.3.2.2.2. Minutes will include TCTO applicability by ID number (or applicable part number or serial number for commodity TCTOs), purpose of the inspection/modification and clearly identify and document the performing work centers, training requirements, scheduling parameters, remove from service date, a review of the TCTO procedures, form entries and supply requirements prior to scheduling the TCTO for completion. **(T-2)**

14.3.3.3.2.2.3. All attendees sign the AF Form 2410, or locally developed product, at the conclusion of the planning meeting indicating agreement with the conditions. **(T-2)**

14.3.3.3.2.3. Establish and maintain a TCTO folder for each active TCTO. **(T-2)**

14.3.3.3.2.3.1. TCTO folders will be standardized and include the basic TCTO and any supplements, completed AF Form 2410, or locally developed product, AF Form 2001, *Notification of TCTO Kit Requirements* (if required), messages and the supply cover letter from QA (if required). **(T-2)**

14.3.3.3.2.3.2. Once the TCTO has reached its rescission date, print a MIS product showing the current status of equipment and place it in the TCTO folder. **(T-2)**

14.3.3.3.2.3.2.1. Move the folder to an inactive TCTO file. **(T-2)**

14.3.3.3.2.3.2.2. The TCTO managing agency will maintain the folder until the TCTO is rescinded in the applicable MIS IAW TO 00-5-15. MIS TCTO records will be deleted (scheduled to retire for FMxC2 users) at that time. **(T- 2)**

14.3.3.3.2.3.3. TCTOs will not be deleted from the MIS prior to the rescission date. **(T-2)**

14.3.3.3.2.3.4. Validate in REMIS that no additional requirements have been submitted or extensions applied. **(T-2)**

14.3.3.3.2.4. If an initial TCTO load is not received from REMIS or equivalent, notify the single manager and/or equipment specialist IAW TO 00-5-15. **(T-2)**

14.3.3.3.2.5. Use the ILS-S to order required kits/parts/tools IAW MIS manuals. **(T-2)** Kits, parts, tools, and software will be ordered within 24 hours of the TCTO

meeting and document numbers input on the AF Form 2001. **(T-2)** Locally manufactured and obtained parts will be documented on the AF 2001. **(T-2)**

14.3.3.3.2.5.1. When ILS-S is not available, initiate three copies of the AF Form 2001 and forward two copies of the Form with a copy of the TCTO to the supply TCTO monitor. **(T-2)**

14.3.3.3.2.5.2. For locally obtained parts, prepare an AF Form 2001 listing each item by NSN, noun and quantity required. **(T-2)**

14.3.3.3.2.6. Assign ID numbers to kits as they are received. **(T-2)**

14.3.3.3.2.6.1. Use **Part II** of the AF Form 2001 to manage kit/part assignment and track individual end items, date issued, document numbers and the number of kits remaining. **(T-2)**

14.3.3.3.2.6.2. The LRS/Flight Service Center TCTO monitor will ensure kits and/or parts are assembled prior to release. **(T-2)**

14.3.3.3.2.7. Control and release TCTO kits from LRS. **(T-2)**

14.3.3.3.2.8. Notify appropriate MAJCOM, by message, when local managers anticipate a problem with TCTO compliance within prescribed time limits. **(T-2)**

14.3.3.3.2.8.1. The message should include the TCTO number and narrative, total units affected, total units complete, kits on hand, kits on order, estimated delivery date, requisition number and a narrative of the problem.

14.3.3.3.2.8.2. The message will be endorsed by MXG/CC (or equivalent) prior to submission to MAJCOM. **(T-2)**

14.3.3.3.2.9. Report status of TCTOs that cannot be reported under "HOW MAL" codes 793, 797, 798, 801, 802, or 911 IAW the MIS, and 00-20 series TOs. **(T-2)**

14.3.3.3.2.10. Schedule, track and monitor TCTO accomplishment. **(T-2)**

14.3.3.3.2.10.1. Prepare a work order in the MIS for each affected end-item, including spares. Agencies owning installed on-equipment TCTOs will coordinate with PS&D prior to scheduling on-aircraft TCTOs. **(T-3)**

14.3.3.3.2.11. Review suspense validation or equivalent inputs prior to processing TCTO suspenses and updating the MIS. **(T-2)**

14.3.3.3.2.12. Annotate back-up MIS products as changes occur. **(T-2)**

14.3.3.3.2.13. Ensure TCTOs are scheduled for completion prior to expiration or grounding date whichever comes first. **(T-2)**

14.3.3.3.2.14. Schedule all workable TCTOs for accomplishment prior to permanent equipment transfer or storage input. **(T-2)**

14.3.3.3.2.15. For TCTOs with compliance periods calculated in operating time (hours, cycles, starts, landings, or rounds) create a local JST and load the JST to the equipment, schedule for completion prior to expiration of the compliance period operating time. **(T-2) Note:** Once compliance period operating time has been reached remove equipment from service until the TCTO has been completed. **(T-2)**

14.3.3.3.2.15.1. Document the JST number in the TCTO notes.

14.3.4. SI and TCI Management:

14.3.4.1. Job Standard Master Listing (JML) Management.

14.3.4.1.1. PS&D will maintain (load, change, and delete) the JML for all inspections and time changes listed in the applicable aircraft/system -6 TO and commodity TOs. **(T-2)**

14.3.4.2. Develop a matrix/chart depicting the total number of SIs and TCIs to be loaded in the MIS for each assigned aircraft/system. **(T-2)**

14.3.4.2.1. Maintain JMLs for off-equipment items in the OWC. PS&D will provide written guidance and training for JML management of off-equipment JSTs when PS&D authorizes OWCs to maintain it. **(T-3)**

14.3.4.2.2. For units using FMxC2, Lead Commands must maintain master inspection and time change requirements.

14.3.4.2.3. Once Master Job Standard Numbers are fielded for a weapon system, local PS&D will review TO 00-20-2 for Master Job Standard Numbers procedures. **(T-2)**

14.3.4.2.4. PS&D will load, change, and delete JSTs in the MIS as soon as possible after receipt of any -6 TOs, or other TO, TCI or inspection change and will promptly notify all affected PS&D sections for action. **(T-2)** PS&D will:

14.3.4.2.4.1. Load separate JSTs for all aircraft/systems -6 TOs special/scheduled inspections with frequencies greater than 30 days or 50 hours in the MIS. **(T-2)**

14.3.4.2.4.1.1. Load PE, PH, engine changes and other event type inspections (such as, hard landing) as a JST in the MIS as they occur. **(T-2)**

14.3.4.2.4.1.2. Provide training for maintaining JSTs as necessary. **(T-2)**

14.3.4.2.4.2. Perform a semi-annual review of the JML and all JSTs for accuracy and currency to include off-equipment and decentralized activities. **(T-2)**

14.3.4.2.4.2.1. Review matrix/chart depicting the total number of SIs and TCI requirements to be loaded in the MIS for each assigned aircraft/system. **(T-2)**

14.3.4.2.4.2.2. Reconcile TCI and SI JSTs with the aircraft/systems -6 TOs and applicable commodity TOs and document the semi-annual review on AF Form 2411. **(T-2)**

14.3.4.2.4.2.3. Units may create JSTs in the MIS to automate required documentation of repetitive or complex tasks (such as engine change, tire change, phase inspection, flight control maintenance).

14.3.4.2.4.3. Monitor the inspection and time change subsystems in the MIS. **(T-2)**

14.3.4.2.4.3.1. Perform a monthly review of all inspections, SIs, and TCI JSTs for each assigned aircraft. **(T-2)**

14.3.4.2.4.3.2. Look for missing and/or excess inspections and TCIs loaded to the aircraft and ensure the accuracy of all due dates/times for TCIs and verify the Date of Manufacture (DOM) and Date of Installation (DOI). **(T-2)**

14.3.4.2.4.3.2.1. TCIs will be loaded in the MIS with a part number and serial number. **(T-2)**

14.3.4.2.4.3.3. Document the review and ensure corrections are made to the MIS. **(T-2)**

14.3.4.2.4.3.4. Maintain the report on file with corrective actions until the next review. **(T-2)** The use of automated verification tools is encouraged provided MIS data is the source for verification.

14.3.4.3. PS&D will manage the assigned weapon systems TCI program. **(T-2)** PS&D Personnel will:

14.3.4.3.1. At least annually, meet with Egress and Aircrew Flight Equipment activities to verify each aircraft's egress data. **(T-2) Note:** MAJCOM/Units may direct more frequent verification of Egress and Aircrew Flight Equipment as required to maintain system integrity.

14.3.4.3.1.1. Document all verification of aircraft's egress data on the AF Form 2411 maintained in the aircraft jacket file. **(T-2)**

14.3.4.3.2. Identify, monitor, forecast and schedule only those selected items specifically identified in TO 00-20-9, *Forecasting Replacement Requirements for Selected Calendar and Hourly Time Change Items*; applicable commodity TOs; the aircraft -6 TO, DAFMAN 21-201 or identified as Federal Supply Group 13 and Materiel Management Code AQ Items. **(T-2)**

14.3.4.3.2.1. TCIs will be loaded in the MIS with a part number and serial number. **(T-2)**

14.3.4.3.3. Establish a JST for both the DOM and DOI for Cartridge-Actuated Devices (CAD), Propellant Actuated Devices (PAD), life sustaining, and other TCI items listed in the aircraft -6 TO and applicable commodity TOs. **(T-2)**

14.3.4.3.3.1. Load only the DOI or DOM JST that comes due first, in the MIS against a specific part or serial number. **(T-2)**

14.3.4.3.3.2. As a minimum, when the DOI and DOM frequencies are identical, maintain the JST for the DOM. **(T-2)** (N/A for FMxC2 units).

14.3.4.3.3.3. Ensure component background information is provided by Egress to include a list of all components having multiple part numbers with a different service life. **(T-2)**

14.3.4.3.3.3.1. Forecasting of CAD/PAD items for long-term CAD/PAD spare requirements will be accomplished by Ogden Air Logistics Complex through use of the Requirements Determination Module to extract installation and due dates from REMIS. **(T-2)**

14.3.4.3.3.3.2. When CAD/PAD items or forecast requirements are not visible within the maintenance data system (for example, Contract Logistics Support managed components), units will forecast for TCIs IAW TO 00-20-9 and DAFMAN 21-201.

14.3.4.3.3.3.3. Validate and consolidate TCI forecasts for items listed in TO 00-20-9, commodity TOs, and aircraft specific -6 TOs. **(T-2)**

14.3.4.3.3.3.4. Submit consolidated forecasts to the appropriate Lead Command representative with an info copy to munitions operations. **(T-2)**

14.3.4.3.3.3.5. Forward any quarterly updated forecasts to munitions operations. **(T-2)**

14.3.4.3.4. Initiate, validate, and submit TCI extension requests to the Air Force Sustainment Center item manager with an info copy to munitions operations. **(T-2)**

14.3.4.3.4.1. Ensure a copy of approved extension are placed in the affected aircraft's forms and removed when no longer required. **(T-2)**

14.3.4.3.4.2. Maintain and monitor a suspense copy of the extension request and follow up prior to the grounding date of the TCI. **(T-2)**

14.3.4.3.4.3. Refer to TO 00-20-1 and 00-20-9 for additional guidance on TCI extensions and maintain a copy of the Air Force Sustainment Center/System Program Director approved message until the item is replaced. **(T-2)**

14.3.4.3.4.4. EM will generate engine TCI extension requests and coordinate through the Command Engine Manager to the appropriate Engine Program Office in AFLCMC. **(T-2)**

14.3.4.3.5. Perform monthly reconciliation of all TCIs with LRS. **(T-2)**

14.3.4.3.5.1. The reconciliation will consist of 100 percent validation of existing due outs. **(T-2)**

14.3.4.3.5.2. Inform FSC of any "mark for" changes or items no longer required. **(T-2)**

14.3.4.3.6. Monitor and requisition TCI requirements based on projected equipment utilization. **(T-2)**

14.3.4.3.6.1. Order parts using MIS or coordinate with LRS/DMS to order parts using AF Form 2005, unless otherwise specified in -11, -14 and -6 TOs. **(T-2)**

14.3.4.3.6.2. Schedule TCIs for replacement to minimize aircraft downtime at the next applicable inspection IAW TO 00-20-1 (i.e., schedule a TCI at the next inspection interval, HPO, PH, PE, HSC, 60-month, letter check). **(T-2) Note:** Life sustaining, or CAD/PAD TCIs cannot exceed replacement interval in applicable -6 and commodity TOs without an approved extension/waiver from the Program Office/appropriate item manager.

14.3.4.3.6.3. Notify the Munitions Flight of the need to order munitions items IAW TO 00-20-9 and DAFMAN 21-201. **(T-2)**

14.3.4.3.6.3.1. Serviceable CAD/PAD TCIs components will not be turned into munitions operations until the remaining service life reaches 9-months or less. **(T-2)** Serviceable CAD/PAD TCIs components with less than 9-months service life remaining will not be reissued. **(T-2)**

14.3.4.3.6.3.2. Maintenance plans must reflect replacement dates to coincide within the 9-month parameter. **(T-2)**

14.3.4.3.6.4. Order non-CAD/PAD or engine TCIs IAW AFI 23-101.

14.3.4.3.7. Schedule the time change in the MIS and incorporate it in the monthly/weekly/ quarterly maintenance schedule. **(T-2)**

14.3.4.3.8. Review the data (DOM, DOI, LOT number, JST, and Due Date) entered by the performing work center. Ensure the suspense validation is updated in the MIS when the time change is completed (Suspense validation N/A for FMxC2). **(T-2)**

14.3.4.3.9. Coordinate management of respective TCIs with applicable maintenance and operation work centers. **(T-2)**

14.3.4.3.10. Schedule drogue chute TCIs, except chute harnesses, for replacement during the drogue chute repack before the expiration of the component service or shelf life. **(T-2)**

14.3.4.3.10.1. These components will not be over flown without an approved extension from the appropriate item manager. **(T-2)**

14.3.4.3.10.1.1. A copy of approved extensions must be maintained in the affected aircraft's forms and removed when no longer required. **(T-2)**

14.3.4.3.11. Prepare TCI forecasts IAW TO 00-20-9.

14.3.4.3.11.1. Provide squadron Maintenance Supervision a forecast for non-munitions items for their supply section. **(T-2)**

14.3.4.3.12. To facilitate quarterly requisitioning, P&S will submit the quarterly validated time-change AFTO Form 223, Spreadsheet, or IMDS/FMxC2 generated forecast to the Munitions Accountable System Officer. **(T-2)** This must be submitted between 45 and 60 calendar days Continental United States (CONUS) or between 90 and 120 calendar days Outside Continental United States (OCONUS) before the next calendar year quarter IAW DAFMAN 21-201 **Table 7.3**, OCONUS and CONUS Time Change Requisitioning Schedule. **(T-2)** If aircraft is scheduled to be in depot when time change will be required, home station P&S will coordinate with depot P&S to facilitate requisition of required assets by the depot munition's function IAW DAFMAN 21-201 **Table 7.3** time frames. **(T-2)**

14.3.4.3.12.1. Validate current requirements against the annual forecast and make corrections based on aircraft utilization. **(T-2)**

14.3.5. Major Maintenance Work Processing. PS&D will:

14.3.5.1. Coordinate on all TO 00-25-107 requests for DAFI 21-103 reporting. **(T-2)**

14.3.5.1.1. The work center discovering the discrepancy is responsible for drafting the TO 00-25-107 request and forwarding the request to QA for coordination and release.

14.3.5.1.2. PS&D will make the appropriate PIC changes in the MIS when the 00-25-107 request has been submitted and/or received. **(T-2)**

14.3.5.1.3. Depot-level assistance provided by contractor support will be accomplished IAW contract specifications. **(T-2)**

14.3.5.2. Develop procedures in conjunction with QA for routing all major maintenance requests to ensure all affected parties are informed. **(T-2)**

14.3.5.3. Conduct an initial meeting upon arrival of a DFT to validate maintenance support requirements are in place. **(T-2)**

14.3.5.3.1. The meeting will be documented on an AF Form 2410, or locally-developed product. **(T-2)**

14.3.5.3.2. PS&D will initiate/accomplish all PIC changes in the MIS. **(T-2)**

14.3.5.3.3. Once work is completed, PS&D will ensure appropriate PIC are changed and a completed copy of the work package is placed in the aircraft jacket file. **(T-2)**

14.3.5.3.3.1. PS&D will document significant historical data on the appropriate AFTO Form 95 IAW 00-20 series TOs. **(T-2)**

14.3.6. Transfer Inspections.

14.3.6.1. Units will perform gaining/losing transfer inspections IAW TO 00-20-1, MAJCOM guidance and this instruction. **(T-2)**

14.3.6.1.1. In conjunction with QA, develop a local JST for both gaining and losing aircraft and equipment transfer. **(T-2)**

14.3.6.1.1.1. This JST must meet all TO 00-20-1, 2J-1-18, *Preparation for Shipment and Storage of Gas Turbine Engines*, applicable aircraft -6 and -21 TOs, as well as DAFI 21-103 and MAJCOM specific transfer requirements. **(T-2)**

14.3.6.1.1.2. Include all historical records (example, NDI records, Egress records, W&B records, OAP records, strut records) and other applicable items. **(T-2)**

14.3.6.1.2. Losing PS&D ensures all actions are completed in the MIS prior to permanently transferring an aircraft to another unit. **(T-2)**

14.3.6.1.3. Losing PS&D conducts a transfer pre-dock meeting one duty day prior to start of the aircraft transfer inspection. **(T-2)**

14.3.6.1.4. All items to be accomplished during the transfer inspection will be documented on an AF Form 2410, or locally developed product, and scheduled in the MIS. **(T-2)**

14.3.6.2. Losing PS&D will complete a total verification of all TCIs installed on the transferring aircraft. **(T-2)**

14.3.6.2.1. Verify the correct computation of all due dates/hour/cycles based on DOM, DOI, installed times, or equivalent factors. **(T-2)**

14.3.6.2.2. For IMDS units only:

14.3.6.2.2.1. Ensure the IMDS-REMIS synchronization programs are processed, and errors are corrected prior to transfer. **(T-2)**

14.3.6.2.2.2. Ensure an up-to-date Transfer of Equipment report and an AFTO

Form 95 with current engine trend and performance data are placed in the aircraft jacket file. **(T-2)**

14.3.6.2.2.3. Ensure a backup copy is maintained until receipt is verified by the gaining unit. **(T-2)**

14.3.6.3. Losing PS&D will ensure an ADR is performed and conduct a transfer post dock meeting to ensure all required actions have been completed, all forms are current/accurate, and the MXG/CC (or equivalent) has certified each aircraft ready to transfer aircraft IAW TO 00-20-1, AFI 16-402, and DAFI 21-103.

14.3.7. Acceptance Inspections. Units perform acceptance inspections IAW TO 00-20-1, MAJCOM guidance and this instruction.

14.4. ENGINE MANAGEMENT (EM).

14.4.1. Engine Management (EM). EM manages unit efforts to maintain adequate engine support for mission requirements. EM monitors engine removals and replacements, component tracking, engine TCTOs and TCIs, engine records in the MIS and CEMS and performs engine manager duties.

14.4.1.1. - 14.4.1.1.2. DELETED.

14.4.1.2. EM will:

14.4.1.2.1. Manage the MIS and CEMS by referencing applicable information in this instruction, AFI 23-101, TO 00-25-254-1, TO 00-20-5-1-3, *Instructions for Jet Engine Parts Tracking of OC-ALC/LPA Managed Engines*. Reference AFCSM 21-558, *Comprehensive Engine Management System* and applicable aircraft -6 TOs.

14.4.1.2.2. Coordinate with Propulsion Flight CC/SUPT and organization leadership to support WRE requirements. **(T-2)**

14.4.1.2.3. Ensure plans, schedules, and maintenance actions are documented on assigned engines. **(T-2)**

14.4.1.2.4. Perform quarterly inventory IAW TO 00-25-254-1. Coordinate with the PS&D AVDO or equivalent to ensure accurate aircraft accountability in support of engine quarterly inventory completion.

14.4.1.2.5. Review Engine Managers Data List and reconcile after review IAW 00-25-254-1.

14.4.1.2.6. Ensure IMDS suspense validations/FMxC2 Engine Managers Data List transactions are accomplished no later than the close of business of the next business day following the date/time of occurrence. All transactions must be reported and entered in the order of occurrence. **(T-2)** Note**:** **Paragraph 14.4.1.3.4.2** provides unit level procedures requirements to support EM execution of duties for **Paragraph 14.4.1.2.6**.

14.4.1.2.7. Perform a monthly reconciliation of total assigned assets between the local MIS and CEMS, document the completed reconciliation on AF Form 2411 and develop a file plan for historical purposes. (**T-2)** At a minimum the reconciliation will include

SRAN location, total engines assigned (to include serial numbers), engine condition/status, installed engines, uninstalled engines.

14.4.1.2.7.1. Engine managers will take immediate action to correct all reporting errors along with the competed AF Form 2411. **(T-2)** Contact MAJCOM engine manager or CEMS PMO Help Desk, **cems.pmo.helpdesk@us.af.mil** to solve reporting problems requiring clarification for completion of monthly reconciliation

14.4.1.2.7.2. **Command e** ngine managers will develop a standard procedure to extract monthly reconciliation data from engines located at a contractor repair facility whom contractors' sites do not have access to CEMS or the MIS. **(T-2)** At a minimum, reconciliation data must include SRAN location, total engines assigned (to include serial numbers), engine condition/status, installed engines, and uninstalled engines.

14.4.1.2.8. Provide TCI information (cycles remaining, EOT) on serially controlled items to the Propulsion Flight and AMXS/AMU for engine and engine component CANN actions. **(T-2)**

14.4.1.2.9. Ensure all engine SIs are loaded in MIS against the engine, not against the aircraft. **(T-2)**

14.4.1.2.10. Ensure all engine/module inspections/TCIs tracked by EOT, Calculated Cycles (CCY), Total Accumulated Cycles (TAC), are loaded/tracked in the MIS and CEMS databases. **(T-2)**

14.4.1.2.11. Ensure serial numbers erroneously input into CEMS are followed by a Possessor Change (6D) Transaction Condition Code (TCC). **(T-2)**

14.4.1.2.11.1. After the TCC has successfully processed, notify the CEMS Program Management Office help desk stipulating the serial number was erroneously input and will be deleted from CEMS, **cems.pmo.helpdesk@us.af.mil**. **(T-2)**

14.4.1.2.11.2. Create a JCN for engine, module or component data plate changes, modifications, re-identifications and new etchings and document changes in CEMS automated history. **(T-2)**

14.4.1.2.11.3. A matrix by engine type will be developed to depict specific inspection and TCI quantities for each TMS. Inspections tracked by flight hours must be loaded in the MIS. **(T-2)**

14.4.1.2.12. Items that are assigned with the same TMS, WUC, Part Number, but are not applicable to the TCTO will be loaded in "22" status (refer to TO 00-20-2). **(T-2)** This ensures accurate accountability that all equipment has been verified as being affected or not applicable to TCTO.

14.4.1.2.12.1. Comply with TCTO duties and responsibilities for engine items IAW this **Chapter**. **(T-2)**

14.4.1.2.13. Manage TCTOs on all assigned engines and engine components, installed and uninstalled, as well as manage TCTOs for support equipment to include engine trailers. **(T-2)**

14.4.1.2.14. Accomplish quarterly TCTO status reviews and reconciliations IAW TO 00-25-254-1. **(T-2)**

14.4.1.2.15. Maintain records on TCTO kits and status for all engines installed on aircraft sent to depot. **(T-2)**

14.4.1.2.16. Manage time changes on all engines and engine components. **(T-2)**

14.4.1.2.16.1. EM will forecast parts requests and ensure requests are submitted to LRS up to 60 days (but not less than 10 days) prior to the need date of the scheduled time change or JEIM/CRF induction (see sections 14.2. and 14.3.). **(T-2)**

14.4.1.2.17. Reconcile all TCIs during the monthly TCI meeting with PS&D and LRS. **(T-2)**

14.4.1.2.17.1. Reconciliation will consist of 100 percent validation of existing due-outs and a complete physical inventory of all issued TCIs. **(T-2)**

14.4.1.2.17.2. Inform FSC of any "mark for" changes or items no longer required. **(T-2)**

14.4.1.2.18. Maintain and update historical documents for all assigned engines, modules, and major assemblies that are not managed by a Performance Based Logistics or contractually by a Contract Logistics Support contract. **(T-2)**

14.4.1.2.19. Check life-limited components forecast for additional component changes, TCTOs and SIs on all removed engines. **(T-2)**

14.4.1.2.20. Coordinate with the propulsion Flight CC/SUPT to develop a detailed 6-month engine and module TCI removal forecast and publish the forecast in the monthly flying and maintenance schedule. **(T-2)**

14.4.1.2.20.1. This 6-month forecast must be accomplished monthly using CEMS product E373/MIS products and the projected unscheduled removals based on the Unscheduled Removal Rate. **(T-2)**

14.4.1.2.20.2. Removal rate formula (total number of unscheduled removals divided by flying hours, multiplied by 1000). Provide a copy of the forecast to maintenance leaders, PS&D, unit, and the MAJCOM engine manager. **(T-2)**

14.4.1.2.21. Publish scheduled engine changes in the weekly and monthly maintenance schedule. **(T-2)**

14.4.1.2.22. Verify engine total time versus aircraft total time, flying hours and manual cycles with PS&D during aircraft document reviews. **(T-2)**

14.4.1.2.23. Maintain the portion of the JML for engine inspections and time changes. **(T-2)**

14.4.1.2.23.1. Maintain (load, delete, and change) and conduct a semi-annual review of the JML for engine inspections and time changes listed in the aircraft -6 TO. **(T-2)**

14.4.1.2.24. Establish a CEMS and MIS contingency plan for when either or both systems are down for more than 48 hours. **(T-2)**

14.4.1.2.24.1. The plan will include procedures for retaining data in date-time order for input when MIS/CEMS operation resumes. **(T-2)** The plan will also address both home station and deployed procedures. **(T-2)**

14.4.1.2.25. Develop local engine tracking procedures and documentation methods to be used at deployed locations. **(T-2)**

14.4.1.2.25.1. Procedures must include the method of communication (message, e-mail or FAX), documentation and shipping responsibilities with SRAN addresses, and reporting procedures for CANNs and engine removals. **(T-2)**

14.4.1.2.25.2. Procedures will ensure units take immediate action to correct all reporting errors between the base MIS and CEMS using the engine manager's data list. **(T-2)**

14.4.1.2.26. Update CEMS to reflect the four letter GEOLOC for uninstalled engines in a deployed location and the Organization Code is showing "1" per TO 00-25-254-1.

14.4.1.2.27. Accomplish UEM duties IAW, AFI 23-101, AFPAM 63-129, TOs 00-25-254-1, 00-20-5-1-3, AFCSM 21-558, applicable aircraft -6 TOs and this instruction.

14.4.1.2.27.1. Act as liaison to the SRAN engine manager when part of a tenant unit is supported by the host base engine manager. **(T-2)**

14.4.1.2.27.2. Provide the primary SRAN engine manager all quarterly reporting information required for submission to higher headquarters. **(T-2)**

14.4.1.3. The SRAN engine manager will:

14.4.1.3.1. Be selected from AFSC 2A or 2R, minimum 7-skill level (or civilian equivalent). **(T-2)**

14.4.1.3.1.1. The assistant will be a minimum 5-skill level from the same AFSCs or civilian equivalent. **(T-2)**

14.4.1.3.1.2. Both individuals will be aligned under EM. **(T-2)**

14.4.1.3.2. Advise CMS or MXS/CC and MXG/CC (or equivalent), on administration of the base EM Program, engine maintenance concepts, principles, policies, procedures, and techniques. **(T-2)**

14.4.1.3.3. Act as the single point of contact between the unit, MAJCOM, and MMA for EM questions. **(T-2)**

14.4.1.3.4. Establish written procedures to support EM responsibilities IAW TO 00-25-254-1 and this instruction. Unit procedures must:

14.4.1.3.4.1. Specify responsibilities of affected work centers for accurate and timely MIS/CEMS reporting of TCTO, SI, TCI, and other documentation requirements (such as, borescope inspections, blade blending, CANN actions). **(T-2)**

14.4.1.3.4.2. Ensure engine, module, and component operation and maintenance data is reported to EM no later than close of business the first duty day after the event (for example, part removal, installation, time update, TCTO status change,

and EMS operational/performance data where applicable). **(T-2)**

14.4.1.3.4.2.1. Ensure Engine Monitoring System (EMS) operational/performance data is transferred to CEMS where applicable. **(T-2)**

14.4.1.3.4.3. Address tenant, transportation, maintenance, aircraft distribution, supply, and support personnel requirements and be coordinated with the MAJCOM EM prior to publication. **(T-2)**

14.4.1.3.5. Request Initialization Decks (I-Deck) for engines and major modules (cores, High Pressure Turbine (HPT), Low Pressure Turbine (LPT), fans), to include embedded parts, part number, serial number, EOT, inspections, active TCTOs and TCIs, from CEMS Central Database (CDB) and ensure data in the MIS matches the CEMS CDB. **(T-2)**

14.4.1.3.6. Ensure deployed engine monitors are identified and trained to perform duties while deployed. **(T-2)**

14.4.1.3.6.1. Designated engine monitors will ensure all deployed spare engines have a copy (paper or electronic) of CEMS product E407, option 1 and 4, included in the deployment package. **(T-2)**

14.4.1.3.7. Perform engine manager duties for shipment and receipt of all assigned engines. **(T-2)**

14.4.1.3.8. Perform periodic quality audits to monitor accuracy and timeliness of reporting. **(T-2)**

14.4.1.3.9. Perform annual EM training for all affected personnel (back shop, test cell, flightline, aircraft maintenance scheduler) who report engine status or are responsible for engine documentation and scheduling IAW AFCSM 21-558, TOs 00-25-254-1 and 00-20-1/-2.

14.4.1.3.10. Maintain a jacket file of engine shipping documents and receipts. **(T-2)**

14.4.1.3.10.1. Obtain MAJCOM EM approval prior to returning engines to CRF/depot. **(T-2)**

14.4.1.3.11. Perform duties and requirements for engine shipments IAW TOs 00-25-254-1, 00-85-20, 2J-1-18, and 2-1-18.

14.4.1.3.11.1. Engines requiring off-base shipment must be delivered to transportation within 24 hours of notification/decision to ship the engine and/or the engine change is complete. **(T-2)** Notify MAJCOM EM and the owning SRAN EM if this time frame cannot be met.

14.4.1.3.12. The work folder will transfer with the engine. **(T-2)**

14.4.1.3.12.1. A copy will be maintained by the losing organization until verification of receipt by gaining unit. **(T-2)**

14.4.1.3.12.2. Gaining units will maintain the work folders and ship the documents with the engine to depot when appropriate. **(T-2)**

14.4.1.3.12.2.1. Gaining units will retrieve a copy of the previous EAWP from

the Data Repository Center or equivalent data in the applicable MIS upon receipt of the engine. **(T-2)**

14.4.1.3.12.2.2. EAWP users are required to send completed EAWP files to the Data Repository Center or MIS equivalent within 3 duty days of EAWP close-out. **(T-2)**

14.4.1.3.13. The SRAN EM will report the following in CEMS:

14.4.1.3.13.1. Receipt transactions for engines as of the date and time engines are delivered from the transportation hold area and accepted at the JEIM facility. **(T-2)**

14.4.1.3.13.2. Shipment transactions with the "as of" date and time the engine(s) physically leave the base. **(T-2)**

14.4.1.3.13.2.1. Once engine is received at gaining unit, ensure trailer and adapter are transferred in MIS. **(T-2)**

14.4.1.3.13.3. All engine and tracked item removals, installations, and engine status changes. **(T-2)**

14.4.1.3.13.4. All engine status transaction removals, installations, gains, Engine-Not-Mission Capable for Supply (ENMCS), work completed, test cell rejects, work stopped, work started, change in level of maintenance, awaiting disposition, intra-AF receipt and intra-AF shipments, transfer, and HOW MAL codes IAW TO 00-25-254-1.

14.4.1.3.14. Verify all update transactions (such as, times, TCTO, part removal and installations) are input before reporting an engine removal or installation. **(T-2)**

14.5. Maintenance and FHP Planning Cycle.

14.5.1. Responsibilities. MAJCOMs will develop procedures to ensure the intent of the maintenance and FHP planning cycle is met. The objective of the planning cycle is to execute the wing FHP consistent with operational requirements and maintenance capabilities. The maintenance and FHP planning cycle begins with the annual allocation of flying hours. Maintenance and operations schedulers propose an annual flying plan that balances both operational requirements and maintenance capabilities. Units should commit the fewest number of aircraft possible to meet programmed Utilization (UTE) rate standards and goals.

14.5.1.1. If applicable, MAJCOMs will develop scheduling procedures for units involved in Operational Test and Evaluation, Developmental Test and Evaluation, or Initial Operational Test and Evaluation to ensure the intent of the maintenance and FHP planning cycle is met.

14.5.1.2. AMC units tasked by the 618th Air and Space Operations Center will adhere to Commander, Air Force Forces (COMAFFOR) Apportionment and Allocation Process (CAAP) policies and procedures.

14.5.1.3. The annual plan, detailed by month, will evaluate the capability of maintenance to support the annual FHP.

14.5.1.4. When developing the annual plan, units will utilize the MDS specific sortie production model, or equivalent, if available.

14.5.1.5. Maintenance PS&D. PS&D builds, coordinates, publishes, and distributes an integrated aircraft/system annual and quarterly plan & monthly and weekly schedule to support maintenance and operational requirements.

14.5.1.5.1. Plans will be developed, coordinated, and consolidated jointly by the OSS's Current Operations Flight Scheduling, and PS&D. **(T-2)**

14.5.1.5.2. The printed wing plan will include an assessment of the wing's ability to execute the FHP and will be coordinated with the OG/CC and MXG/CC. **(T-2)**

14.5.1.5.3. Plans and schedules may be published via electronic means (such as, web pages, SharePoint®, or e-mail) provided operations security is not compromised. **Note:** TORQUE will be used as it becomes available.

14.5.1.5.4. Normal daily operations and training schedules are For Official Use Only (FOUO) and will not be restricted to classified systems. **(T-2)**

14.5.2. First Look Requirements. The First Look report is an internal wing document intended to highlight potential maintenance-capacity and operational-requirement disconnects in the upcoming year. Every year, NLT 15 March, PS&D will coordinate with MMA, flightline and backshop maintenance work centers to provide PS&D with historical attrition and projected manning production. **(T-2)** This assessment will take into account personnel, facilities, and airfield infrastructure for each aircraft maintenance organization.

14.5.2.1. In wings operating aircraft supported by a sortie production model, PS&D will coordinate with the Unit Maintenance Supervision to establish local requirements, responsibilities and procedures for utilizing the model to develop, sustain or reflow FHP/contingency requirements. **(T-2)**

14.5.2.2. The assessment will be provided to PS&D NLT the last workday of March. **(T- 2)** **Note:** AMC units tasked by the 618th Air and Space Operations Center will adhere to the CAAP policies and procedures.

14.5.2.3. PS&D will provide copies of the capability assessment to each OS scheduling section and maintenance supervision. **(T-2)**

14.5.2.3.1. The assessment will provide first look maintenance capability projections in a monthly format IAW MAJCOM guidance. **(T-2)**

14.5.2.3.2. The assessment will include operational requirements taking into consideration historical data that determines the average number of aircrews not available per month (DNIF, PME attendance, Leave, TDY, deployments), an assessment of maintenance ability to support the monthly requirement and an overall assessment of the unit's maintenance capability to meet the annual FHP (N/A for AMC units). **(T-2)**

14.5.2.4. OS and maintenance responses are sent to PS&D and OSS's Current Operations Flight Scheduling and will be consolidated into a comprehensive package that includes a breakdown of the following items by OS:

14.5.2.4.1. Sortie UTE Rates (N/A to AMC units). **(T-2)** Compute UTE rates by month for the entire FY for contracted (required) sorties and scheduled sorties using the

formula: (number of sorties per month) divided by (number of Primary Aerospace Vehicle (Aircraft) Inventory (PAI) aircraft).

14.5.2.4.2. Sorties contracted/scheduled per day (N/A to AMC units). **(T-2)** Compute the number of sorties required per operations and maintenance (O&M) day to meet the operational requirement using the following formula: (Number of Sorties Required) divided by (Number of O&M days in a Given Month). Sorties per day need to be computed by month for the entire FY.

14.5.2.4.3. Monthly scheduled sorties (N/A to AMC units). **(T-2)** Compute monthly scheduled sortie requirements using the following formula: (Number of Sorties or Hours Required) divided by (1 Minus the Attrition Factor). For example, (1,000 sorties or hours required) divided by (1 minus 0.15) equals 1,177 sorties or hours to schedule. Round any part to the next whole sortie or hour.

14.5.2.4.4. Inspection dock capability. **(T-2)**

14.5.2.4.4.1. Compute the number of major inspections (i.e., PH/ISO) to be accomplished for each maintenance unit, by month, for the entire FY in order to meet operational requirements.

14.5.2.4.4.2. Compute dock capability using the following formula: (Number of O&M Days) divided by (Number of PH/ISO Days) multiplied by (Inspection Cycle) = Inspection Dock Capability. Inspection dock capability is provided at the wing level and provided by the squadron performing inspections.

14.5.2.5. Once compiled, first look packages will be presented to the OG and MXG/CCs before being presented to the WG/CC. **(T-2)**

14.5.3. Annual Maintenance Planning Cycle.

14.5.3.1. MAJCOMs will develop procedures to ensure the objectives of the annual maintenance planning cycle are met.

14.5.3.1.1. At a minimum, MAJCOM procedures will produce an annual flying and maintenance plan that allocates sorties and hours into quarters, is approved by the WG/CC, and published prior to the beginning of the FY.

14.5.3.1.2. Due to the unpredictable nature of most future AMC mission requirements, units tasked by 618th Air and Space Operations Center will prepare flying and maintenance plans with focus on supporting local operational training requirements based on historical data as well as all known future maintenance and operational requirements.

14.5.3.2. Flying Hour Allocation. Using the MAJCOM Baseline Allocation message, PS&D, the OS, and OSS's Operations Scheduling will provide affected work centers the following planning factors NLT 20 August each year, or within 10 working days after receipt of the flying hour allocations:

14.5.3.2.1. PS&D will provide updated capabilities which are computed by MMA and the PDM schedule. **(T-2)**

14.5.3.2.2. OSS will provide the:

14.5.3.2.2.1. Required flying hours and estimated sorties and missions in monthly increments. **(T-2)**

14.5.3.2.2.2. Flying days in each month. **(T-2)**

14.5.3.2.2.3. Aircraft and aircrew alert requirements. **(T-2)**

14.5.3.2.2.4. Known and projected TDYs and special mission requirements. **(T-2)**

14.5.3.2.2.5. Configuration and munitions requirements. **(T-2)**

14.5.3.3. NLT 1 September, or within 10 working days after receipt of the planning factors, maintenance supervision will provide PS&D, SQ/CCs, and OSS's Operations Scheduling the following planning factors:

14.5.3.3.1. Estimated number of aircraft available by month, taking into consideration aircraft required for training. **(T-2)**

14.5.3.3.2. A projected airframe capability statement. **(T-2)**

14.5.3.3.3. Forecasted personnel capability, taking into consideration required training for maintenance personnel. **(T-2)** (N/A to contract maintenance organizations).

14.5.3.3.4. The number of supportable sorties for each month. **(T-2)**

14.5.3.3.5. An estimated monthly attrition factor provided by MMA. **(T-2)**

14.5.3.3.5.1. The factor combines operations, weather, and materiel (maintenance and supply) factors.

14.5.3.3.5.2. Maintenance is responsible for adding the attrition factor to operational requirements.

14.5.3.3.6. A recommended block scheduling pattern. **(T-2)**

14.5.3.3.7. A statement of limitations. **(T-2)**

14.5.4. Quarterly Maintenance and FHP Planning. Quarterly planning starts with the operational requirement for flying hours, UTE rate, airframe availability, alert, and other related scheduling data.

14.5.4.1. MAJCOMs will develop procedures to ensure the objectives of the Quarterly Planning cycle are met.

14.5.4.2. The OS Director of Operations will provide these requirements to maintenance supervision and PS&D NLT 25 days before the beginning of the quarter. **(T-2)**

14.5.4.3. Maintenance supervision and the OS Director of Operations will discuss these requirements at the scheduling meeting before the quarter being planned. **(T-2)**

14.5.4.4. Schedulers will ensure quarterly plans are as detailed and accurate as possible. **(T-2)**

14.5.4.4.1. Plans should include known special missions, PDM schedules, HHQ commitments and lateral command support requirements.

14.5.4.4.2. All maintenance requirements will be consolidated into a single, quarterly plan using AF Form 2401, Equipment Utilization and Maintenance Schedule, or computer-generated form. **(T-2)**

14.5.4.4.2.1. Specific locally developed codes will be used to identify inspections, SI, TCI, and TCTO on the AF Form 2401. **(T-2)**

14.5.4.4.3. As a minimum, the quarterly plan will show the next 3 months planned sorties and known maintenance requirements. **(T-2)**

14.5.4.4.3.1. Known maintenance requirements include all maintenance events that impact aircraft availability and require management attention to ensure proper Time Distributed Index flow.

14.5.4.4.3.2. Consolidate as many scheduled maintenance events as practical, to reduce individual aircraft downtime, increase Aircraft availability, and minimize the number of times per month an aircraft is removed from the schedule due to scheduled maintenance requirements.

14.5.4.4.3.2.1. The intent is to reduce the number of times per month an aircraft is removed from the schedule for scheduled maintenance, thus increasing aircraft availability.

14.5.4.4.3.2.2. Unit/Wing/MAJCOM requests to change the frequency of -6 TO requirements to increase bundling opportunities will be submitted through the applicable Lead Command for consideration and/or resolution. **(T-2)**

14.5.4.4.3.3. To prevent operational utilization for that day(s) flying schedule, the quarterly plans will include, at a minimum, calendar inspections that hold an aircraft down, calendar TCIs, TCTOs in workable status, PDM schedules, training aircraft, cannibalization aircraft and aircraft ISO/PE/PH inspections. **(T-2)**

14.5.4.4.3.4. Other maintenance requirements, such as engine changes, hourly requirements, acceptance/transfer inspections, training aircraft and cannibalization aircraft will be posted as they become known or planned. **(T-2)**

14.5.4.4.3.5. Add AME inspections to the quarterly plan if the aircraft is scheduled to stay in that configuration to ensure the inspections are included in the monthly and weekly schedules. **(T-2)**

14.5.4.4.4. Revise weekly schedule and monthly plan to meet the quarterly plan objectives while staying within the maintenance capability. **(T-2)**

14.5.4.4.5. Use the following priority to determine which objectives to support if a lack of resources prevents meeting requirements:

14.5.4.4.5.1. Alert commitments. **(T-2)**

14.5.4.4.5.2. HHQ directed missions. **(T-2)**

14.5.4.4.5.3. Training. **(T-2)**

14.5.4.4.5.4. OSS's Current Operations Flight Scheduling will compile, coordinate, and brief the unit's quarterly plan and include operational requirements, support capability and any difficulties expected. **(T-2)**

14.5.4.4.5.5. Once an approved quarterly plan is established, OSS's Current Operations Flight, Scheduling will forward a copy to the OS, AMXS, OG/CC and MXG/CC along with all scheduling agencies. **(T-2)**

14.5.4.4.5.6. The plan will be posted so it may be viewed by both maintenance and operations. **(T-2)**

14.5.4.5. - 14.5.4.5.3. DELETED.

14.5.5. Monthly Maintenance and FHP Planning.

14.5.5.1. Wings will develop procedures to ensure the objectives of the monthly planning cycle are met. **(T-2)**

14.5.5.1.1. Include predictable maintenance factors based on historical data along with other inputs, such as flow times for maintenance, turnaround times and parts replacement schedules.

14.5.5.1.2. MAJCOMs will develop maintenance scheduling effectiveness guidance in their supplements to this DAFI. **(T-2)**

14.5.5.2. The monthly flying and maintenance plan schedule refines the quarterly plan by combining all aspects of aircraft utilization and will include:

14.5.5.2.1. A detailed monthly operations utilization calendar that specifies total aircraft flying hours, total sorties and missions, alert requirements, scheduled sortie or mission requirements and daily turn plans for each MDS by squadron, group, or wing. **(T-2)**

14.5.5.2.1.1. Do not assign attrition sorties to a specific aircrew/mission for the monthly planning process. **(T-2)**

14.5.5.2.2. Monthly maintenance requirements (as required). **(T-2)**

14.5.5.2.3. Transient work schedule, if applicable. **(T-2)**

14.5.5.2.4. Scheduled inspections, TCTOs, engine changes, time changes, DDs, contract or depot maintenance, washes, corrosion control, training aircraft and all other known maintenance requirements. **(T-2)**

14.5.5.2.5. SE scheduled inspections, contract, or depot maintenance, TCTOs, time changes, DDs, washes, and corrosion control. **(T-2)**

14.5.5.2.6. Avionics and other off-equipment maintenance scheduled inspections, TCTOs, assembly or repair operations. **(T-2)**

14.5.5.2.7. Engine/module 6-month removal forecast and in-shop inspection requirements. **(T-2)**

14.5.5.2.8. Munitions, ECM, and other mission loading or configuration requirements, including ammunition changes. **(T-2)**

14.5.5.2.9. Total ordnance requirements for aircraft support. **(T-2)**

14.5.5.2.10. Tanks, Racks, Adapters and Pylons and WRM scheduled inspections, TCTOs, assembly or repair operations. **(T-2)**

14.5.5.2.11. Monthly training schedules, if not published separately. **(T-2)**

14.5.5.2.12. Detailed support requirements (such as, Petroleum, Oil, and Lubricants servicing, supply, food service, fire department, security, civil engineer, and airfield operations requirements). **(T-2)**

14.5.5.2.13. All known operational events (such as, exercises, deployments, surges) to determine maintenance capability to meet operational needs. **(T-2)**

14.5.5.3. Monthly planning cycle requirements.

14.5.5.3.1. NLT the first weekly scheduling meeting of the month, the OS Director of Operations will provide maintenance supervision and PS&D with the estimated operational needs for the following month in as much detail as possible. **(T-2)**

14.5.5.3.1.1. To optimize aircraft and munitions support, CMS, EMS, MUNS, MXS, AMXS, and OS will ensure the number of aircraft, and/or munitions configurations, are minimized and standardized. **(T-2)**

14.5.5.3.1.2. Include known takeoff times, landing times and flying hour windows. **(T-2) Note:** Landing times are not required if the unit has an established and constant average sortie duration.

14.5.5.3.2. The OS Director of Operations and maintenance supervision will review their applicable portion of the monthly maintenance plan and weekly schedule prior to submission to PS&D. **(T-2)**

14.5.5.3.3. NLT the second weekly scheduling meeting of the month, AMXS maintenance supervision will notify the OS Director of Operations whether requirements can be met or limitations exist and collectively make necessary adjustments to the proposed schedule to satisfy maintenance and operational requirements. **(T-2)**

14.5.5.3.4. MXG/CC and OG/CC will formalize the next month's flying and maintenance plan prior to presenting it to the WG/CC for approval NLT the third scheduling meeting of the preceding month. **(T-2)**

14.5.5.4. WG/CC's monthly scheduling meeting.

14.5.5.4.1. OS scheduling will outline past accomplishments, status of flying goals, problems encountered and detailed needs for the next month. **(T-2)**

14.5.5.4.2. PS&D will outline projected maintenance capability and aircraft/equipment availability. **(T-2)**

14.5.5.4.3. DELETED.

14.5.5.5. When the WG/CC approves/signs the proposed monthly flying plan, PS&D will include it as a portion of the monthly flying and maintenance plan. **(T-2)** Monthly plans may be published electronically provided local security requirements are met.

14.5.6. Weekly Scheduling. The weekly schedule is the final refinement to the monthly plan and results in the weekly flying and maintenance schedule.

14.5.6.1. Wings will develop procedures to ensure the objectives of the weekly scheduling process are met. **(T-2)**

14.5.6.1.1. PS&D will review matrix/chart depicting the total number of SI and TCI requirements to be loaded in the MIS for each assigned aircraft/system and verify against the MIS totals weekly. **(T-2)** Overdue and uncorrected discrepancies will be briefed weekly during a daily production/scheduling meeting chaired by the MXG/CD (or equivalent). **(T-2)**

14.5.6.2. NLT 2 workdays before the weekly scheduling meeting, the OS Director of Operations will provide maintenance supervision the following information (as required for missile units):

14.5.6.2.1. Aircraft takeoff and landing times. **(T-2)**

14.5.6.2.2. Configuration requirements. **(T-2)**

14.5.6.2.3. Munitions requirements. **(T-2)**

14.5.6.2.4. Fuel loads. **(T-2)**

14.5.6.2.5. Special or peculiar mission support requirements. **(T-2)**

14.5.6.2.6. Alert requirements. **(T-2)**

14.5.6.2.7. Exercise vulnerability. **(T-2)**

14.5.6.2.8. Deployments. **(T-2)**

14.5.6.2.9. Off-base sorties. **(T-2)**

14.5.6.2.10. On-equipment training requirements. **(T-2)**

14.5.6.2.11. Other special requirements. **(T-2)**

14.5.6.2.12. All mission unique requirements are annotated by OS Director of Operations on the weekly and daily flying schedule. **(T-2)**

14.5.6.3. Home and deployed units will publish a weekly schedule. **(T-2)** Include the following in the weekly flying and maintenance schedule:

14.5.6.3.1. Sortie sequence numbers, aircraft tail numbers (primary and spares), scheduled takeoff and landing times, aircraft or equipment scheduled use times, configurations, fuel loads, and special equipment requirements. **(T-2)** Units that fly a published and constant average sortie duration need not publish land times.

14.5.6.3.2. Spare aircraft requirements. **(T-2)** Spare requirements are printed by day for each maintenance unit. Generate only the absolute minimum of spare aircraft.

14.5.6.3.3. Scheduled maintenance actions, by aircraft and equipment serial number, to include inspections, TCTOs, time changes, contract and depot inputs, engine changes, washes or corrosion control, document reviews and DDs. **(T-2)**

14.5.6.3.4. Required pre-inspection and other maintenance/scheduling meetings. **(T-2)**

14.5.6.3.5. Wash rack use. **(T-2)**

14.5.6.3.6. On-equipment training requirements. **(T-2)**

14.5.6.3.7. AGE inspections or maintenance schedule by type and ID number. **(T-2)**

14.5.6.3.8. MAJCOMs will develop standardized procedures to record and coordinate changes to the weekly schedule using an AF Form 2407 or electronic equivalent. Include minimum approval levels for approving changes to the weekly schedule.

14.5.6.3.9. Any change to the printed schedule will require an AF Form 2407 with the following exceptions: a change to the original printed takeoff or landing time of 15 minutes or less; a change of aircrew names, ranges, or airspace; or a change arising after the first crew ready time for the squadron's current day's scheduled flying window. **(T-2)**

14.5.6.3.9.1. Changes made during the daily scheduling meeting also require an AF Form 2407. **(T-2)**

14.5.6.3.9.2. The agency requesting the change initiates the AF Form 2407 and coordinates it IAW MAJCOM procedures. **(T-2)**

14.5.6.4. The OS Director of Operations and Maintenance Supervision will review and coordinate on the proposed weekly flying and maintenance schedule with OS, AMXS, MXS, CMS, and EMS prior to presenting it to the OG/CC and MXG/CC (or equivalent). **(T-2)**

14.5.6.5. The approved schedule will be submitted to PS&D for compilation and a complete copy provided to the WG/CC. **(T-3)**

14.5.6.6. At the weekly scheduling meeting wings will evaluate the past week's accomplishments (to include flying and MSE) and negotiate/approve refinements to the coming week's schedule. **(T-2)**

14.5.6.6.1. The AF Form 2402, *Weekly Equipment Utilization and Maintenance Schedule*, or locally developed product, will be used to summarize the upcoming week's schedule. **(T-2)**

14.5.6.6.2. The AF Form 2403, *Weekly Aircraft Utilization/Maintenance Schedule*, or locally developed equivalent product that contains all requirements and creates a finite depiction of aircraft utilization and maintenance. **(T-2)**

14.5.6.7. Once the weekly schedule is reviewed and signed by the OG/CC, MXG/CC (or equivalent), and WG/CC it becomes the final planning guide for both operations and maintenance and the basis for deviation reporting. **(T-2)**

14.5.6.7.1. The schedule will be followed as printed or as amended by coordinated changes. **(T-2)**

14.5.6.7.2. Coordinated changes do not negate reporting deviations IAW MAJCOM guidance.

14.5.6.8. PS&D will distribute the schedule to each appropriate activity and work center NLT time determined in MAJCOM supplements to this DAFI. **(T-2)**

14.5.6.8.1. Weekly schedules may be published electronically provided local security requirements are met.

14.6. Contingency and Expeditionary Responsibilities.

14.6.1. Responsibilities of Contingency/Expeditionary (Cont/Exp) units, for example, maintaining non-assigned aircraft. **Note:** This does not include AMC-established enroute stations.

14.6.1.1. Most planning and scheduling is the responsibility of units with assigned aircraft and is provided through reach back support to home stations. Contingency units have fewer responsibilities as described below. Commanders of expeditionary units will ensure the intent of the guidance is met when the dynamic nature of a Cont/Exp organization make strict adherence impossible. **(T-2)**

14.6.1.2. Cont/Exp PS&D will conduct the following programs as outlined below:

14.6.1.2.1. ADR, pre- and post-dock meetings, acceptance inspections (from DFT/CFTs) and the major work program. **(T-2)**

14.6.1.2.1.1. Cont/Exp PS&D will use the procedures developed by the aircraft-owning organizations. **(T-2)**

14.6.1.2.1.2. If aircraft from multiple bases/units are supported, procedures do not have to be standardized.

14.6.1.3. Ensure discrepancies noted by the aircraft-owning PS&D for the Aircraft Configuration Management, TCI and SI programs are corrected. **(T-2)** Cont/Exp PS&D will not develop programs independent of the aircraft-owning organization. **(T-2)**

14.6.1.4. Develop local coordination procedures for contingency aircraft affected by Immediate and Urgent Action (I/UA) TCTOs. **(T-2)**

14.6.1.5. When notified by the aircraft-owning organization of an I/UA TCTO, the Cont/Exp PS&D will host a TCTO meeting. **(T-2)**

14.6.1.5.1. The purpose of the meeting is to determine if the Cont/Exp unit has the maintenance capability to perform the TCTO.

14.6.1.5.1.1. Invite AMU, QA and affected work centers. Cont/Exp will notify the Commander of the unit's capability to perform the TCTO. **(T-2)**

14.6.1.5.1.2. Develop and implement local tracking methodology to track TCTO completion. **(T-2)**

14.6.1.5.1.3. Update MIS when the aircraft owning Cont/Exp PS&D loads the requisite JST/JCNS. **(T-2)**

14.6.1.5.1.4. If the Cont/Exp unit does not have the maintenance capability to perform the TCTO, Cont/Exp PS&D will notify the owning organization of that inability. **(T-2)**

14.6.1.5.2. Cont/Exp PS&D will only maintain aircraft I/UA TCTO files while active. **(T-2)**

14.6.1.5.2.1. Once TCTOs are completed and loaded in MIS, records will be sent to home station for filing. **(T-2)**

14.6.1.5.2.2. A TCTO meeting is not necessary for Routine Action aircraft TCTOs.

14.6.1.5.3. A full TCTO program IAW this **Chapter** is required for AGE and other special equipment which is assigned to the contingency unit. **(T-2)** This is intended to cover equipment that does not rotate with aviation packages.

14.6.1.5.4. Monthly and weekly maintenance planning. Cont/Exp PS&D will produce maintenance plans detailing all known maintenance requirements for the upcoming month/week. **(T-2)**

14.6.1.5.4.1. This plan will detail by tail number, due date, JST and a description of the scheduled maintenance required for the time period. **(T-2)**

14.6.1.5.4.1.1. Use of the AF Form 2401 is not required.

14.6.1.5.4.1.2. The list will be published 2-days prior to the covered time period, coordinated through maintenance supervision, and approved by the Commander. **(T-3)**

14.6.1.5.4.2. The weekly schedule will additionally identify those actions which will be deferred. **(T-2)**

14.6.1.5.4.2.1. It will specifically identify if the action is deferred for mission requirements or due to a lack of capability. **(T-2)**

14.6.1.5.4.2.2. Actions which are not identified as “pre-deferred” are expected to be accomplished during the upcoming week.

14.6.1.5.4.3. MSE will not be calculated for Cont/Exp units. **(T-2)** It is anticipated that Cont/Exp units require a great deal of flexibility to meet mission requirements.

14.6.1.6. Cont/Exp organizations are not responsible for Aircraft Generation Planning, Transfer Inspections, Flying/Maintenance Planning Cycle, First Look, Annual/Quarterly Mx Planning, AVDO and 2R1 functional management responsibilities.

14.6.1.7. Cont/Exp PS&D will develop procedures with home station AVDOs to communicate and ensure AVDO responsibilities are performed. **(T-2)**

Chapter 15

AIRCRAFT SUNSHADE MANAGEMENT

15.1. Purpose: This **Chapter** outlines overall management responsibilities for aircraft sunshades, crew shelters and portable/inflatable shelters. Additionally, it provides guidance and a standardized approach to procure and sustain these equipment items.

15.2. Scope: Applies to all AF units possessing or procuring these equipment items to support logistics operations and flight line or maintenance areas. This includes conventional force logistics units; nuclear and nuclear support units; cyber and space; special operations; wholesale-level procurement, sustainment, and maintenance; aerial port squadrons; logistics readiness squadrons; research, test, and development units. It does not include medical logistics, civil engineering logistics, security forces units and communications units.

15.2.1. Aircraft sunshades and other shelter types as defined below and addressed in this **Chapter** are considered equipment items for accountability purposes and will be tracked and accounted for IAW DAFI 23-101 and DAFMAN 23-122.

15.2.1.1. These assets are not listed on unit authorized equipment tables of allowance because authorizations are ***not required*** support equipment for weapons systems. These assets are the responsibility of the owning organization.

15.2.1.2. Commanders will ensure all other applicable organizations with appropriate subject matter expertise are involved in the procurement, installation, repair, sustainment, and replacement of these assets. **(T-2)**

15.2.1.3. Aircraft sunshades are not considered as temporary or relocatable facilities associated with Military Construction (MILCON) projects. Procedures for temporary or relocatable facilities associated with MILCON projects are contained in DAFI 32-1020, *Planning and Programming Built Infrastructure Projects*. Relocatable buildings are designed to be readily erected, disassembled, stored, moved, and reused to meet a short-term requirement for facilities due to either transitory peak requirements or urgent requirements pending approval, such as construction of facilities via normal military construction programs. According to DAFI 32-1020, **Chapter 8**, Relocatable and Temporary Facilities, the terms temporary and relocatable are interchangeable. Furthermore, DAFI 32-1020 provides guidance on satisfying interim facility requirements using relocatable or temporary facilities. Aircraft sunshades are not incident or interim to a MILCON project, nor are they in place to meet a temporary requirement; therefore, the terms temporary or relocatable as used in DAFI 32-1020 do not apply to aircraft sunshades.

15.2.1.4. Aircraft sunshades are not intended to replace aircraft maintenance hangars and as such there is no requirement associated with aircraft specifications or square footage allowances contained in DAFMAN 32-1084.

15.3. Definitions.

15.3.1. Aircraft Sunshades: Structure with the sole purpose of providing minimal protection for personnel from the elements (sun, wind, rain, snow, excluding lightning) with a roof and a maximum of two sides.

15.3.2. Crew Shelters: Any portable or prefabricated structure placed inside, under or erected to support activities within an aircraft sunshade, hangar, hardened aircraft shelter or protective aircraft shelter. These should not be confused with other shelters that are designed for personnel protection only (such as, End-of-Runway shacks).

15.3.3. Portable/Inflatable shelters: A structure constructed using layers of membrane connected together using pressurized air to produce a structure which covers limited areas (such as, cargo aircraft engine, open fuel tanks) of an aircraft or equipment.

15.3.4. Allied support: Utilities (electrical, water, air, communications) provided up to a stub at each aircraft sunshade. Utilities are real property assets. Installation of new utility services carries a work classification of Construction. See **Paragraph 15.11**.

15.4. Headquarters Air Force.

15.4.1. AF/A4L will:

15.4.1.1. Develop, articulate, and clarify all AF aircraft sunshade policies.

15.4.2. The Directorate of Civil Engineers (AF/A4C) will:

15.4.2.1. Provide input for development and clarification of aircraft sunshade policies.

15.4.2.2. Determine appropriate A4C agencies responsible for procurement consultation to the field.

15.4.2.3. Develop allied support guidance in relation to aircraft sunshades.

15.5. MAJCOM A4s will:

15.5.1. Provide input to AF/A4L on AF aircraft sunshade policies.

15.5.2. Review all plans for procurement, installation, and sustainment of aircraft sunshades with assistance from MAJCOM/A3, A4, Safety, AF Installation and Mission Support Center (AFIMSC) or Primary Subordinate Unit (PSU) Air Force Civil Engineer Center (AFCEC) as outlined in Paragraphs **15.7.1.11** and **15.8**, prior to approving the procurement or installation.

15.5.3. Develop weather event baseline criteria if not previously developed so an organization can procure an acceptable aircraft sunshade suitable to its specific location. Consider annual days of sun, average wet bulb globe temperature, annual rainfall, and annual snowfall, UV index, snow load, snow removal capability, wind sustainment requirements and temperatures that may affect work-rest cycles and overall productivity.

15.5.4. DELETED.

15.5.5. Approve/disapprove submitted request(s) based on information contained under the owning organization responsibilities section of this **Chapter**.

15.5.6. Provide field operating and sustaining organizations direction on the specific types and sizes of aircraft sunshades to use for each application.

15.6. Owning Organization.

15.6.1. The owning organization is the group level or equivalent organization responsible for the planning, funding, procurement, installation, maintenance, and lifetime sustainment of the aircraft sunshade including any installed utilities (lighting, obstructions in front of lighting,

electrical, communications included in the project scope as defined in Paragraphs **15.3.4** and **15.8.8**. **(T-2)**

15.6.1.1. Owning organizations may install aircraft sunshades, upon MAJCOM/A4 concurrence, to provide protection from the sun or other weather events such as: rain, sleet, snow. **(T-2)**

15.6.2. Owning organizations are responsible for the aircraft sunshade grounding system beginning at the single point service ground. Owning organizations will test the aircraft sunshade grounding system IAW AFMAN 32-1065, *Grounding & Electrical Systems*, Chapter 10, *Testing and Inspecting Static and Lightning Protection Systems and Grounding*. **(T-2)** **Note:** These responsibilities can be contracted as outlined in **Paragraph 15.8.8**.

15.6.2.1. Owning organizations will ensure that Base Civil Engineer accepts the Lightning Protection Systems prior to accepting the facility, ensuring the lightning protection system is compliant and that the facility is immediately usable IAW AFMAN 32-1065. **(T-2)**

15.6.3. The owning organization is responsible for maintaining and storing manufacturer design drawings and specifications and providing ready access to installation agencies as necessary. **(T-2)**

15.6.4. For each procurement, and each aircraft sunshade related contracting effort (such as inspection and sustainment contracts) referenced in **Paragraph 15.10.3** of this publication, the owning organization will provide and appoint a Contracting Officer Representative (COR) who reports to the contracting officer on all aspects of implementation of the contract. **(T-2)**

15.6.4.1. The COR will coordinate agreement with local Civil Engineering organization request a Civil Engineering representative to advise on technical requirements of the procurement and sustainment. **(T-2)**

15.6.4.2. The CE advisor will assist the COR in:

15.6.4.2.1. Enforcing established engineering standards or inspection criteria as defined and incorporated in the procurement/sustainment contract in order to address safety and integrity of the structure. **(T-2)**

15.6.4.2.2. Providing quality oversight authority for any technical/serviceability inspections performed on the structure by the contractor. **(T-2)**

15.7. New Procurements. To minimize diversity of types of aircraft sunshades, the AF utilizes strategic sourcing to establish efficiencies in procurement and long-term sustainment. For additional guidance, contact the MAJCOM A4 on aircraft sunshade standardization.

15.7.1. The owning organization will:

15.7.1.1. Develop plans for purchase, installation, acceptance, and sustainment then submit information to the MAJCOM/A4 for concurrence. **(T-2)** If the owning organization intends to request allied support, the owning organization will include these costs in the forecast. If allied support is required, submit an AF Form 332, *Base Civil Engineer Work Request*, or service/work request to Civil Engineering Customer Service prior to solicitations, purchases, or procurements. **(T-2)**

15.7.1.2. Refer to AFI 65-601, Volume 1, *Budget Guidance and Procedures*, and AFI 65-601, Volume 2, *Budget Management for Operations* to determine correct appropriation for

procurement and installation of aircraft sunshades or crew shelters described in this publication. Plan and fund current equipment sustainment IAW **Paragraph 15.10**.

15.7.1.3. Use local contracting office for strategic sourcing, if available, to standardize and leverage buying power from an enterprise perspective. (T-2)

15.7.1.4. Ensure all facets of aircraft sunshade sustainment are considered; all applicable installation functional areas (CE community planner, Airfield Management, Comm, Safety, Medical) are involved in the siting and selection process and is approved by the installation's facility board prior to solicitation and procurement. **(T-2)**

15.7.1.4.1. If expertise is not available in the owning organization, contact the appropriate MAJCOM representative for further guidance. All new sunshades will be compliant with current applicable structural, environmental and safety standards. **(T-2)** Ensure compliance with criteria and design as outlined in **Paragraph 15.8**.

15.7.1.5. Submit planning materials to include drawings, dimensions, cost estimates and statements of work, as well as ramp work striping and support equipment requirements to their applicable MAJCOM/A4. **(T-2) Note:** This must be completed as early as possible in the planning phase to facilitate a smooth execution phase.

15.7.1.6. Ensure use of reflective markings on corner structural supports regardless of lighting used. **(T-2)**

15.7.1.7. Ensure use of retro reflective beads for all apron, taxiway, and taxi lane markings near aircraft sunshades. **(T-2)** Reference Engineering Technical Letter 04-2, *Standard Airfield Pavement Marking Schemes* and Unified Facilities Guide Specifications 32-17-23, *Pavement Markings* and AFMAN 32-1040, *Civil Engineering Airfield Infrastructure Systems.*

15.7.1.8. Perform an evaluation of all proposed sunshade installation plans to ensure requirements in Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design* are met. If waivers are required, those waivers must be approved prior to contract award of the sunshade. **(T-2)**

15.7.1.8.1. Ensure waiver authorities do not undermine contract requirements or federal regulations (example Federal Acquisition Regulation, Department of Defense Federal Acquisition Regulation Supplement). **(T-0)**

15.7.1.9. Ensure aircraft sunshades that penetrate an airfield imaginary surface defined in UFC 3-260-01 have obstruction lights installed IAW UFC 3-535-01, *Visual Air Navigation Facilities*, and conform to requirements contained in AFMAN 32-1040.

15.7.1.10. Ensure compliance with fuel servicing safety requirements IAW TO 00-25-172.

15.7.1.11. Address the following items below and those in **Paragraph 15.8** as a minimum in installation plans submitted to applicable MAJCOM/A4 for approval. **(T-2)**

15.7.1.11.1. Aircraft sunshade protection characteristics such as hail size, snow, ice, and water accumulation (weight and/or inches, consider water runoff, ice mitigation), maximum winds (sustained and gusts), aircraft tie down and lightning/grounding protection determined in conjunction with proper local authorities or AFIMSC/PSU AFCEC. **(T-2)**

15.7.1.11.2. Ensure sunshades are designed IAW UFC 3-301-01, *Structural Engineering*. **Note:** Consider jet blast potential in aircraft sunshade design and siting.

15.7.1.11.3. Number of spots to be covered. Consider ramp space capacity for both peacetime and contingency requirements (reception and bed down). **(T-2)**

15.7.1.11.4. Number of parking spaces lost due to aircraft sunshade placement. Consider ramp requirements, future mission changes, and impact on overall aircraft parking plan. **(T-2)**

15.7.1.11.5. Design life expectancy and warranty information. **(T-2)**

15.7.1.11.6. Expected costs including procurement, installation, and projected annual sustainment costs, to include inspection services. **Note:** Ensure adequate resources are established to maintain aircraft sunshade serviceability and mission accomplishment.

15.7.1.11.7. **Sustainment methodology (owning organization supported, manufacturer supported, supplemental contractor).** Ensure minimum requirements outlined in **Paragraph 15.10.3** are addressed. **(T-2)** Pre-posture sustainment through end-of-year.

15.7.1.11.7.1. DELETED.

15.7.1.11.8. Foreign Object Damage (FOD) mitigation and prevention. **(T-2)**

15.7.1.11.9. Planned storage of Aerospace Ground Equipment (AGE) and other related support equipment in aircraft sunshades within the maintenance area. **(T-2)**

15.7.1.11.10. Provisions for electrical power units or powered AGE placement and protection from equipment exhaust and aircraft jet blast while operating in/near aircraft sunshades. **(T-2)**

15.7.1.11.11. Environmental impacts and mitigation plans. Ensure the host Environmental Planning Function reviews proposals for installation of aircraft sunshades and associated utilities as early in the planning process as possible. The Environmental Planning Function is responsible for determining the level of environmental impact analysis required. Environmental impact analysis must be completed prior to contract award or implementation. **(T-0)**

15.7.1.11.12. Conduct and include a Risk Management (RM) assessment IAW AFPD 90-8, *Environment, Safety, and Occupational Health Management and Risk Management*, and AFI 90-802, to determine potential impact to personnel, environmental, safety, occupational health and airfield operations before procurement and installation activities begin. **(T-2)**

15.7.1.11.13. Mitigate any issues affecting control tower visibility or security to include security lighting and illumination and any issues affecting navigational aids. **(T-2)**

15.7.1.11.14. Mitigate obstructions to airspace and file FAA Form 7460-1, *Notice of Proposed Construction or Alteration*, with the FAA for new construction. **(T-0)**

15.7.1.11.15. Communications requirements. If communication (Local Area Network (LAN), wireless communications) is placed in aircraft sunshades, provide explanation

of how communications will be procured, installed, and sustained. Include in procurement, installation, and sustainment cost estimates. **(T-2)**

15.7.1.11.16. Mitigate any limitations on emergency and maintenance vehicle access to aircraft. **(T-2)**

15.7.1.11.17. Fall protection for personnel working above 4' off the ground IAW DAFMAN 91-203. **(T-2)**

15.8. Design Criteria/Standards of Aircraft Sunshades.

15.8.1. Current aircraft sunshades that don't meet these requirements of current design standardization are authorized for use until time of replacement. If repairs become significant or not cost effective, owning organizations should consider replacement to the new standard or removal of the aircraft sunshade.

15.8.1.1. Coordinate with Air Traffic Control, Base/Unit Terminal Instrument Procedures specialist (SEI 357), to evaluate plans for potential impacts on aircraft approach/departure procedures. **(T-2)**

15.8.1.2. **&**

15.8.1.3. DELETED.

15.8.2. **Type of materiel used.** Select materiel as appropriate for location, type of aircraft sunshade, and the mission being served. The aircraft sunshade and side materiel will be fabric, reinforced aramid fiber, carbon fiber, galvanized steel or shop/factory painted steel. The frame materiel should be galvanized steel or other suitable newly designed building materiel with strength and durability characteristics that replicate or exceed that of galvanized steel.

15.8.3. **Aircraft sunshade height and width.** Aircraft sunshades must meet minimum clearance requirements for interior aircraft movement, as well as entrances and exit points including taxi lanes or taxiways in close proximity to the exterior of the structure. Refer to UFC 3-260-01, **Chapters 6** and **8** for these dimensions. (**T-2)**

15.8.4. Consider AGE transport and maintenance/emergency vehicle height requirements. Also, consider exhaust blast from jet engines and auxiliary power units, and future mission changes that may impact aircraft sunshade height and width requirements.

15.8.5. Wing tip and tail height clearances will meet the requirements outlined in DAFMAN 91-203 and UFC 03-260-01.

15.8.6. Bird nesting/roosting mitigation. Ensure no bird roosting or nesting locations are present, all holes in support structure and beneath roof must be covered or screened. **(T-2)**

15.8.6.1. The metal structure should minimize potential nesting sites for birds.

15.8.6.2. Anti-perching devices will be installed to deter birds from perching on or under the structure. **(T-2)**

15.8.7. Airfield waivers. The owning organization will make every effort to prevent submission of new airfield waivers. **(T-2)**

15.8.8. Lighting requirements. If lighting is placed in or on the aircraft sun shades, provide explanation of how electricity will be provided to and within the aircraft sunshade. Ensure

lighting provides sufficient illumination for security but does not interfere with flightline visual references. The procurement of lighting, installation, maintenance, and sustainment will be included in aircraft sunshade cost estimates. **(T-2)**

15.8.8.1. Lighting designs and fixture specifications will be IAW UFC 3-530-01, *Interior and Exterior Lighting Systems*.

15.8.8.2. Light mounts will be designed to handle wind loads on the light fixtures without damaging the lights and without compromising the structural integrity of the aircraft sunshade. **(T-2)**

15.8.9. Electrical requirements. If electrical power is to be placed in aircraft sunshades, provide explanation of how electricity will be provided to and within the aircraft sunshade. Procurement, installation, maintenance, and sustainment of electrical requirements on the load side of the power supply point/stub will be included in aircraft sunshade cost estimates. **(T-2)**

15.8.9.1. Electrical power system design will be IAW AFMAN 32-1062, *Electric Systems, Power Plants and Generators*, AFMAN 32-1065. Reference UFC 3-501-01, *Electrical Engineering*, UFC 3-520-01, *Interior Electrical Systems*, UFC 3-530-01, and UFC 3-550-01, *Exterior Electrical Power Distribution*, UFC 3-600-01, *Fire Protection Engineering for Facilities*, and Engineering Technical Letter 02-15, F*ire Protection Engineering Criteria - New Aircraft Facilities*.

15.8.10. The cost of running power (such as, lighting, and electrical) from prime or temporary power sources to the sunshades will be included in the cost estimate and will be borne by the owning unit. **(T-2)**

15.8.11. In no case will the loss of parking spots resulting from the purchase or installation of aircraft sunshades be a primary factor used to propose or construct additional aircraft parking spots or upgrade existing pavements to support aircraft. Procedures on construction of additional parking spots or pavement upgrades will be IAW AFI 32-1020, *Planning and Programming Built Infrastructure Projects* and DAFI 32-1020.

15.8.11.1. Whenever possible, aircraft sunshades will be installed on existing pavement without driving a requirement to expand or upgrade the underlying features. When the addition of pavement is necessary to make the sunshade complete and usable, the cost of the structure must be included with the cost to installation of the pavement for a total sunshade construction project cost. **(T-2)**

15.8.12. Aircraft sunshades are airfield fixed-structure obstructions and will meet MIL-STD-3007, *Department of Defense Standard Practice for Unified Facilities Criteria and Unified Facilities Guide Specifications* and AF criteria included in referenced UFCs and AFIs, as well as, local and national fire, safety, and electrical standards and codes as applicable. **(T-2)**

15.8.13. Consider location specific design requirements (snow load, maximum wind ratings). In addition to the requirements in UFC 3-301-01, for adjacent sunshades which share bracing frames, each fourth frame will provide twice the required lateral bracing strength. **(T-2)**

15.8.13.1. Particular attention will be focused on the design of lateral bracing for wind and jet blast loads, fatigue strength of steel lateral bracing members, and the design and location of anchor bolts near joints in runway aprons. **(T-2)**

15.8.14. Aircraft sunshades must meet ventilation and exhaust air requirements referenced in the International Mechanical Code, UFC 1-200-01, *DoD Building Code*. **(T-0) Note:** Achieve minimum exhaust and/or ventilation air requirements utilizing either mechanical or natural systems.

15.9. Current Aircraft Sunshades.

15.9.1. To replace currently installed aircraft sunshades, select materiel as appropriate for location, type of aircraft sunshade, and the mission being served. The aircraft sunshade and side materiel will be fabric, reinforced aramid fiber, carbon fiber, galvanized steel or shop/factory painted steel. **(T-2)**

15.9.1.1. The frame materiel will be galvanized steel or other suitable newly designed building materiel with strength and durability characteristics that replicate or exceed that of galvanized steel. **(T-2)**

15.9.1.2. Current aircraft sunshades that don't meet these requirements of current design standardization are authorized for use until time of replacement. **(T-2)**

15.9.1.3. If repairs become significant or not cost effective, owning organizations will consider replacement to the new standard or removal of the aircraft sunshade. **(T-2)**

15.9.1.4. To minimize diversity of types of aircraft sunshades across the enterprise and to establish better efficiencies in procurement and long-term sustainment, use strategic sourcing, if available. **(T-2)**

15.9.1.5. If strategic sourcing is not available, seek guidance from higher headquarters on aircraft sunshade standardization. **(T-2)**

15.9.2. Owning organizations will sustain aircraft sunshades and other shelter types described in this publication IAW AFI 65-601, Volume 2, *Financial Management*, to ensure no degradation of safety to personnel or mission accomplishment occurs. **(T-2)**

15.9.3. Owning organizations will conduct a risk management assessment IAW AFI 90-802 in conjunction with proper local authorities on current aircraft sunshades for FOD mitigation, markings, bird roosting mitigation, sustainability, safety, structural integrity, wind-load capacity, snow-load capacity, and ability to withstand hail. **(T-2)**

15.9.3.1. The owning organization is responsible for repairing any deficient areas identified during the risk management assessment. **(T-2)**

15.9.4. There is no requirement to upgrade current aircraft sunshades to meet the full requirements outlined in Paragraphs **15.7.1** through **15.7.1.11.16** and **15.8.1** through **15.8.13** except where codes apply and are mandatory. However, any replacement or significant repair of current aircraft sunshades will meet requirements as outlined in Paragraphs **15.7.1** through **15.7.1.11.16** and **15.8.1** through **15.8.13** **(T-2)**

15.9.5. Alterations can significantly impact loading on the structure. Conduct a structural analysis certified by a licensed professional engineer or government structural engineer to ensure the alterations do not compromise the structural integrity of the sunshade structure. Sunshades will not be altered to have more than two total walls or bay(s).

15.10. Sustainment and Accountability. Owning organization Group Commander or equivalent will:

15.10.1. Appoint a primary and alternate aircraft sunshade managers.

15.10.2. Develop local procedures establishing management and maintenance of sunshades.

15.10.3. Ensure assets are tracked as equipment items on the appropriate documents IAW DAFI 23-101 and DAFMAN 23-122.

15.10.4. Ensure appropriate authorities (Maintenance Group (MXG), Contracting, Comm, CE, Safety, Airfield Management) at the installation level accept installation of aircraft sunshades and allied support IAW manufacturer specifications, contract specifications, and AFIs. **(T-2)**

15.10.5. Develop an organically supported or contractor supported replacement/sustainment plan that will be included in the 10-year facility plan IAW this DAFI. **(T-2) Note:** This statement does not limit the plan from exceeding the minimum 10-year requirement.

15.10.5.1. Sustainment plan at a minimum will address the following as appropriate:

15.10.5.1.1. Certification and acceptance of installation as needed. **(T-2)**

15.10.5.1.2. Routine maintenance/sustainment and inspection criteria/services which meet manufacturer or qualified engineering authority (such as, personnel officially trained to inspect or provide technical guidance on that specific Sunshade) guidance as needed and appropriate. **(T-2) Note:** Ensure manufacture warranty is not voided.

15.10.5.1.3. Periodic and recurring in-depth inspections with prescribed interval/frequency and items to be inspected to determine structural integrity as appropriately defined for each type of structure by the manufacturer or qualified engineering authority as needed and appropriate. **(T-2)**

15.10.5.1.4. Non-routine maintenance/sustainment and inspection services as needed and appropriate. **(T-2)**

15.10.6. Develop local guidance that establishes periodic inspection criteria as recommended by original manufacturer (interval not to exceed 6 months) approved by a qualified engineering authority for aircraft sunshades and document on AFTO Form 244, or equivalent. **(T-2)**

15.10.6.1. Required inspections will be tracked in MIS. **(T-2)**

15.10.6.2. As a minimum, the owning organization will ensure inspection of:

15.10.6.2.1. Structural Supports for signs of corrosion, excessive movement, cracking, or damage; lateral bracing for signs of corrosion, loosening, cracking, missing hardware, or fatigue damage, particularly at the connections; structural anchorage for signs of loosening and cracking around anchorage points on apron. **(T-2)**

15.10.6.2.2. Foreign Object, cleanliness, and serviceability of installed safety markings. **(T-2)**

15.10.6.2.3. Lighting (if installed) for security and serviceability. **(T-2)**

15.10.6.2.4. Electrical system equipment, including electrical panels, receptacles, lighting systems, solar panels, and conduit (if installed) for security and serviceability. **(T-2)**

15.10.6.2.5. Following extreme/unique weather events (i.e., microburst, flooding).

15.10.7. Any discrepancy identified during routine, non-routine maintenance or other visual inspection will be documented on the AFTO Form 244 or equivalent; appropriate condition symbol will be used IAW TO 00-20-1.

15.10.7.1. Additionally, all discrepancies will be annotated in the MIS. **(T-2)**

15.10.7.2. If a discrepancy is discovered which could affect safety or structural integrity this information will immediately be directed to the owning organization group commander or equivalent. **(T-2)**

15.10.7.3. The owning organization group commander or equivalent with advisement from the qualified engineering authority and safety personnel will decide whether the sunshade is in an acceptable condition to continue performing its intended purpose or whether the sunshade will be removed from service and all assets and personnel vacated from the sunshade until repair is completed. **(T-2)**

15.10.8. Establish an emergency evacuation plan to protect both personnel and equipment from inclement/severe weather that may compromise the integrity of the aircraft sunshade roof or support structure. **(T-2)**

15.10.8.1. During inclement/severe weather situations including but not limited to high winds, thunderstorms, lightning, hail, tornadoes, hurricanes or other adverse weather warning situation, personnel will be evacuated from the aircraft sunshade, not to the aircraft sunshade. **(T-2)**

15.10.8.1.1. The aircraft sunshade is not intended to be used as a protective shelter in these situations.

15.11. Allied Support (Electricity, Water, Communications, Lighting).

15.11.1. If elected, electrical power will be provided to a connection point at the aircraft sunshade IAW UFC 3-550-01, *Exterior Electrical Power Distribution* and will be installed and maintained by Civil Engineering as real property IAW DAFI 32-9005, *Real Property Accountability and Reporting*. **(T-2)**

15.11.1.1. Allied support funding requirements will be prioritized along with other facility and infrastructure requirements through the Facilities Board process or applicable installation facility project prioritization process. **(T-2)**

15.11.2. If elected, water lines can be installed to a stub at the aircraft sunshade site and will be installed and maintained by Civil Engineering as real property IAW DAFI 32-9005. Water stubs and/or connections must be appropriately protected from frost/freeze and other environmental conditions. **(T-2)**

15.11.2.1. These stubs and/or connections must be prominently marked to prevent hazards and accidents. **(T-2)**

15.11.2.2. Allied support funding requirements will be prioritized along with other facility and infrastructure requirements through the facilities board process or applicable installation facility project prioritization process. **(T-2)**

15.11.3. If elected, communications will be provided to the aircraft sunshade IAW UFC 3-580-01, *Telecommunications Interior Infrastructure Planning and Design*, and will be installed and maintained by qualified communications personnel.

15.11.3.1. Allied support funding requirements for the communication real property elements of a project (example, conduit, manholes, duct banks) will be prioritized along with other facility and infrastructure requirements through the facilities board process or applicable installation facility project prioritization process. **(T-2)**

15.11.4. Lighting installation will be considered during procurement and/or sustainment phases and will be purchased and maintained by the owning organization from the light to the power stub. **(T-2)**

15.11.4.1. If lighting is to be included in an aircraft sunshade, the owning organization will include this in the procurement, installation, and sustainment plan. **(T-2)**

15.11.4.2. Owning organizations will use criteria and consultation as outlined in Paragraphs **15.7** through **15.9**. Energy efficient lighting will be considered where allowable. **(T-2)**

15.11.5. Power receptacles will be considered during the procurement and/or sustainment phases and will be purchased and maintained by the owning organization from the power receptacles to the power stub. **(T-2)**

15.11.5.1. If power is to be included, the owning organization will include this in the procurement, installation, and sustainment plan. **(T-2)** Owning organizations will use criteria and consultation as outlined in Paragraphs **15.7** through **15.9**. **(T-2)**

15.12. Crew Shelters and Portable/Inflatable Shelters.

15.12.1. Owning organizations will address the following items as a minimum in installation plans submitted to applicable MAJCOM/A4 for approval:

15.12.1.1. Annual procurement and sustainment costs, including allied support infrastructure costs. See **Paragraph 15.11** for allied support procedures. **(T-2)**

15.12.1.2. Ensure shelter meets all standards and codes as applicable. Crew shelters and inflatable or fabric structures must comply with the minimum Antiterrorism Standard requirements of UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*. **(T-0)**

15.12.1.3. Ensure a FOD mitigation plan is implemented. **(T-2)**

15.12.1.4. Warranty information. **(T-2)**

15.12.1.5. Wing tip and tail height clearances will meet the requirements outlined in DAFMAN 91-203 and UFC 03-260-01. **(T-0)**

15.12.1.6. Appoint a shelter manager and establish a shelter user and operations plan. Ensure assets are tracked as equipment items on the appropriate documents on the CA/CRL IAW DAFMAN 23-122. **(T-2)**

15.12.2. Crew shelters will be configured to minimum ventilation standards referenced in the International Mechanical Code when occupied. **(T-0)**

TOM D. MILLER
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Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

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Prescribed Forms

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AF Form 861, *Base/Transient Job Control Number Register*

AF Form 864, *Daily Requirement and Dispatch Record*

AF Form 2001, *Notification of TCTO Kit Requirements*

AF Form 2400, *Functional Check Flight Log*

AF Form 2401, *Equipment Utilization and Maintenance Schedule*

AF Form 2402, *Weekly Equipment Utilization and Maintenance Schedule*

AF Form 2403, *Weekly Aircraft Utilization/Maintenance Schedule*

AF Form 2407, *Weekly/Daily Flying Schedule Coordination*

AF Form 2410, *Inspection/TCTO Planning Checklist*

AF Form 2411, *Inspection Document*

AF Form 2426, *Training Request and Completion*

AF Form 2408, *Generation Maintenance Plan*

AF Form 2409, *Generation Sequence Action Schedule*

Adopted Forms

AF Form 55, *Employee Safety and Health Record*

AF Form 332, *Base Civil Engineer Work Request*

AF Form 623, *Individual Training Record*

DAF Form 797, *Job Qualification Standard Continuation/Command JQS*

DAF Form 847, *Recommendation for Change of Publication*

AF Form 1067, *Modification Proposal*

DAF Form 1098, *Special Tasks Certification and Recurring Training*

AF Form 1297, *Temporary Issue Receipt*

AF Form 1492, *Warning Tag*

AF Form 2005, *Issue/Turn-In Request*

DAF Form 2096, *Classification/On the Job Training Action*

AF Form 3580, *USAF Museum Aerospace Vehicle Static Display Egress and Safety Certificate*

AFTO Form 20, *Caution and Inspection Record*

AFTO Form 66, *TMDE Bar Codes (Polyester Film)*

AFTO Form 82, *TCTO Verification Certificate*

AFTO Form 95, *Significant Historical Data*

AFTO Form 97, *Aerospace Vehicle Battle Damage Incident Debrief/Assessment/Repair Record*

AFTO Form 97B, *Aircraft Battle Damage Evaluator Checklist*

AFTO Form 103, *Aircraft/Missile Condition Data*

AFTO Form 242, *Nondestructive Inspection Data*

AFTO Form 244, *Industrial/Support Equipment Record*

AFTO Form 252, *Technical Order Publications Change Request*

AFTO Form 345, *Aerospace Vehicle Transfer Inspection Checklist and Certification*

AFTO Form 349, *Maintenance Data Collection Record*

AFTO Form 350, *Reparable Item Processing Tag*

AFTO Form 492, *Maintenance Warning Tag*

AFTO Form 726, *Transient Aircraft Service Record*

AFTO Form 781, *Arms Aircrew/Mission Flight Data Document*

AFTO Form 781A, *Maintenance Discrepancy and Work Document*

AFTO Form 781C, *Avionics Configuration and Load Status Document*

AFTO Form 781H, *Aerospace Vehicle Flight Status and Maintenance*

AFTO Form 781J, *Aerospace Vehicle - Engine Flight Document*

AFTO Form 781K, *Aerospace Vehicle Inspection, Engine Data, Calendar Inspection and Delayed Discrepancy Document*

DD Form 250, *Material Inspection and Receiving Report*

DD Form 1348-6, *DoD Single Line Item Requisition System Document*

DD Form 1610, *Request and Authorization for TDY Travel of DoD Personnel*

DD Form 2861, *Cross-Reference*

FAA Form 7460-1, *Notice of Proposed Construction or Alteration*

Abbreviations and Acronyms

ABDR—Aircraft Battle Damage Repair

AC—Aircraft Commander

ACC—Air Combat Command

ACR—Authorization Change Requests

AD—Airworthiness Directives

ADR—Aircraft Document Review

AETC—Air Education and Training Command

AFCSM—Air Force Computer Systems Manual

AFETS—Air Force Engineering and Technical Service

AFI—Air Force Instruction

AFLCMC—Air Force Life Cycle Management Center

AFMAN—Air Force Manual

AFMC—Air Force Materiel Command

AFPAM—Air Force Pamphlet

AFPD—Air Force Policy Directive

AFR—Air Force Reserve Command

AFREP—Air Force Repair and Enhancement Program

AFRIMS—Air Force Records Information Management System

AFSC—Air Force Specialty Code

AFSCI—Air Force Sustainment Center Instruction

AFTO—Air Force Technical Order

AGE—Aerospace Ground Equipment

AIRCAT—Automated Inspection, Repair, Corrosion, and Aircraft Tracking

ALC—Air Logistics Complex

ALIS—Autonomic Logistics Information System

AMC—Air Mobility Command

AME—Alternate Mission Equipment

AMU—Aircraft Maintenance Unit

AMS—Air Mobility Squadron

AMXS—Aircraft Maintenance Squadron

ANG—Air National Guard

APU—Auxiliary Power Unit

AQL—Acceptable Quality Level

ARC—Air Reserve Component

AS—Allowance Standard

ASC—Aircraft Service Changes

ASIP—Aircraft Structural Integrity Program

ASM—Aircraft Structural Maintenance

AVDO—Aerospace Vehicle Distribution Office

AWM—Awaiting Maintenance

AWP—Awaiting Parts

BCS—Bench Check Serviceable

BSL—Basic Systems Listing

BSP—Base Support Plan

CA—Cannibalization Authority

CAAP—COMAFFOR Apportionment and Allocation Process

CA/CRL—Custodian Authorization/Custody Receipt Listing

CAD/PAD—Cartridge Actuated Device/Propellant Actuated Device

CAI—Critical Application Items

CANN—Cannibalization

CAT I—Category I

CAT II—Category II

CB—Customer Bulletins

CBM+—Condition-Based Maintenance Plus

CBRNE—Chemical, Biological, Radiological, Nuclear, and high-yield Explosive

CBU—Cluster Bomb Unit

CCY—Calculated Cycles

CD—Deputy Commander (MXG/CD)

CDA—Commercial Derivative Aircraft

CDB—Central Database

CDDAR—Crashed, Damaged or Disabled Aircraft Recovery

CE—Civil Engineer

CEMS—Comprehensive Engine Management System

CETS—Contractor Engineering and Technical Services

CFETP—Career Field Education and Training Plan

CFT—Contract Field Team

CM—Configuration Management

CMD—Commercial Mobile Device

CMS—Component Maintenance Squadron

CND—Can Not Duplicate

COMAFFOR—Commander, Air Force Forces

Cont/Exp—Contingency/Expeditionary

COMSEC—Communications Security

CONUS—Continental United States

CPINS—Computer Program Identification Numbering System

CRF—Centralized Repair Facility

CSI—Critical Safety Items

CTK—Composite Tool Kit

CCW—Counter Chemical Warfare

DAFI—Department of Air Force Instruction

DBM—Database Manager

DCA—Design Control Activity

DCC—Dedicated Crew Chief

DCMA—Defense Contract Management Agency

DDR—Daily Demand Rate

DEV—Deviation

DFT—Depot Field Team

DIAMONDS—Defense Integration and Management of Nuclear Data Services

DIFM—Due-in From Maintenance

DISA—Defense Information System Agency

DIT—Data Integrity Team

DLA—Defense Logistics Agency

DMS—Decentralized Materiel Support

D23—Repair Cycle Asset Management Listing

DOC—Designed Operational Capability

DoD—Department of Defense

DoDI—Department of Defense Instruction

DoDD—Department of Defense Directive

DOI—Date of Installation

DOM—Date of Manufacture / Director of Maintenance

DOP—Dropped Object Prevention / Director of Propulsion

DR—Deficiency Report

DLADS—Defense Logistics Agency Disposition Service

DRU—Direct Report Unit

DSV—Detected Safety Violations

eTools—Electronic Tools

E&E—Electrical & Environmental

EAWP—Engine Automated Work Package

ECM—Electronic Countermeasures

ED—Incapacitated

EHM+—Engine Health Management

EHR—Event History Recorder

E&I—Evaluation and Inspection

EID—Event Identification Description / Equipment Identification Designator

EM—Engine Management/Emergency Management

EMS—Equipment Maintenance Squadron

EMXG/CC—Expeditionary Maintenance Group Commander

ENMCS—Engine Not Mission Capable for Supply

EOD—Explosive Ordnance Disposal

EOR—End of Runway

EOT—Engine Operating Time

EPE—Evaluator Proficiency Evaluation

ER—Exceptional Release

ERRC—Expendability, Recoverability, Reparability Code

ES—Equipment Specialist

ESOH—Environment Safety and Occupational Health

ESOHMS—Environment, Safety, and Occupational Health Management System

ESP—Expeditionary Site Plan

ESS—Environmental Stress Screening

ETIC—Estimated Time in Commission

ETIMS—Enhanced Technical Information Management System

ET&D—Engine Trending and Diagnostics

ETS—Engineering and Technical Services/Engine Test Stand

EW—Electronic Warfare

EWS—Electronic Warfare System

EX—Exercises/Contingencies

FAA—Federal Aviation Administration

FAR—Federal Acquisition Regulation

FCC—Flying Crew Chief

FCF—Functional Check Flight

FHP—Flying Hour Program

FMxC2—Field Maintenance Command and Control

FO—Foreign Object

FOA—Field Operating Unit

FOD—Foreign Object Damage

FOM—Facilitate Other Maintenance

FOUO—For Official Use Only

FSL—Full Systems Listing

FSR—Field Service Representatives

FY—Fiscal Year

GBU—Guided Bomb Unit

GEOLOC—Geographical Location

GITA—Ground Instructional Trainer Aircraft

GOX—Gaseous Oxygen

GP—Group

GSU—Geographically Separated Units

HAF—Headquarters, US Air Force

HAZMAT—Hazardous Material

HF—High Frequency

HHQ—Higher Headquarters

HPO—Hourly Post-flight

HPT—High Pressure Turbine

HQ—Headquarters

HSC—Home Station Check

IAW—In Accordance With

ID—Identification / Integrated Defense

I-Deck—Initialization Deck

IETM—Interactive Electronic Technical Manuals

IFCS—Instrument and Flight Control Systems

IFE—In-Flight Emergency

IFR—In Flight Refueling

ILS-S—Integrated Logistics Systems-Supply

IMDS—Integrated Maintenance Data System

IMIS—Integrated Maintenance Information System

IP—Instructor Pilot

IPCOT—In-Place Consecutive Overseas Tour

IPI—In-Process Inspection

ISO—Isochronal Inspection

I/UA—Immediate and Urgent Action

ISU/DOR—Issue/Due-Out Release

JCN—Job Control Number

JDD—Job Data Documentation

JDRS—Joint Deficiency Reporting System

JEDMICS—Joint Engineering Data Management Information and Control System

JEIM—Jet Engine Intermediate Maintenance

JML—Job Standard Master Listing

JOAP—Joint Oil Analysis Program

JST—Job Standard

KTL—Key Task List

LAN—Local Area Network

LCN—Logistics Control Number

LEAP—Logistics Evaluation Assurance Program

LM—Limited-use Munition

LME—Locally Manufactured Equipment

LMR—Land Mobile Radio

LO—Low Observable

LOX—Liquid Oxygen

LPT—Low Pressure Turbine

LRS—Logistics Readiness Squadron

LRU—Line Replaceable Unit

LSC—Load Standardization Crew

LV—Emergency Leave

MAJCOM—Major Command

MC—Mission Capable

MDF—Mission Data File

MDS—Mission Design Series

MEL—Minimum Equipment Level

MESL—Minimum Essential Subsystems List

MFG—Munitions Family Group

MFM—MAJCOM Functional Manager

MGN—Mission Generation Networks

MI—Management Inspection

MICAP—Mission Impaired Capability Awaiting Parts

MIL—Master Inventory List

MILSPEC—Military Specification

MIL-STD—Military Standard

MIS—Maintenance Information Systems

MMA—Maintenance Management Analysis

MMHE—Munitions Materiel Handling Equipment

MOA—Memorandum of Agreement

MOC—Maintenance Operations Center

MOU—Memorandum of Understanding

MPS—Military Personnel Section

MRPL—Minimum Required Proficiency Load

MRSP—Mobility Readiness Spares Package

MSA—Munitions Storage Area

MSE—Maintenance Scheduling Effectiveness

MSEP—Maintenance Standardization & Evaluation Program

MSG—Mission Support Group

MT—Maintenance Training

MSM—DS Maintenance Scheduling Module

MUNS—Munitions Squadron

MX—Maintenance

MXG—Maintenance Group

MXG/CC—Maintenance Group Commander

MXG/CD—Maintenance Group Deputy Commander

MXO—Maintenance Operations

MXS—Maintenance Squadron

MX SUPT—Maintenance Superintendent

NAF—Numbered Air Force

NATO—North Atlantic Treaty Organization

NCE—Nuclear Certified Equipment

NCOIC—Non-Commissioned Officer in Charge

NDI—Nondestructive Inspection

NIE—Normally Installed Equipment

NLT—Not Later Than

NMC—Non Mission Capable

NPA—Non-Powered AGE

NORAD—North American Aerospace Defense Command

NRTS—Not Repairable This Station

NSN—National Stock Number

NSS—Noise Suppression System

NWRM—Nuclear Weapons-Related Materiel

O&M—Operations and Maintenance

OAP—Oil Analysis Program

OBIGGS—On-Board Inert Gas Generating Systems

OBOGS—On-Board Oxygen Generating Systems

OCF—Operational Check Flight

OCONUS—Outside Continental U.S.

OFP—Operations Flight Program

OG—Operations Group

G/CC—Operations Group Commander

OI—Operating Instruction

OIC—Operations-in-Charge

OJT—On-the-Job Training

OPLAN—Operational Plan

OPR—Office of Primary Responsibility

ORE—Operational Readiness Exercises

OS—Operational Squadron

OSS—Operations Support Squadron

OSS&E—Operational Safety Suitability and Effectiveness

OTI—One Time Inspection

OWC—Owning Work Center

P&R—Programs and Resources

PAA—Primary Aerospace Vehicle (Aircraft) Authorized

PACAF—Pacific Air Forces

PAFSC—Primary AFSC

PAI—Primary Aerospace Vehicle (Aircraft) Inventory

PAS—Protective Aircraft Shelter / Personnel Assignment Symbol (Code)

PBR—Percent of Base Repair

PCS—Permanent Change of Station

PDM—Programmed Depot Maintenance

PE—Personnel Evaluation/Periodic Inspection

PED—Portable Electronic Device

PH—Phase

PIC—Purpose Identifier Code / Pilot in Command

PIM—Product Improvement Manager

PIP—Product Improvement Program

PIT—Platform Information Technology

PM—Primary Munition/Program Manager

PMA—Portable Maintenance Aids

PMC—Partially Mission Capable

PME—Precision Measurement Equipment

PMEL—Precision Measurement Equipment Laboratory

PMO—Program Management Office

PO—Program Office

POC—Point of Contact

PPE—Personal Protective Equipment

PRP—Personnel Reliability Program

PRS—Performance Requirements Statement

PS&D—Plans, Scheduling, and Documentation

PWS—Performance Work Statement

QA—Quality Assurance

QASP—Quality Assurance Surveillance Plan

QE—Quarterly Evaluation

QEC—Quick Engine Change

QRL—Quick Reference List

QVI—Quality Verification Inspections

RAMPOD—Reliability, Availability, Maintainability for Pods

RC—Recommended Change

RegAF—Regular Air Force

REMIS—Reliability and Maintainability Information System

RIL—Routine Inspection List

RN—Repair Network

RNM—Repair Network Manager

RPA—Remotely Piloted Aircraft

SB—Service Bulletins

SCR—Special Certification Roster

SDAP—Special Duty Assignment Pay

SE—Support Equipment

SEI—Special Experience Identifier

SI—Special Inspection

SIPRNET—Secret Internet Protocol Router Network

SM—Support Munitions

SME—Subject Matter Expert

SMR—Source of Maintenance and Recoverability

SNCO—Senior Non-Commissioned Officer

SOW—Statement of Work

SPRAM—Special Purpose Recoverable Authorized Maintenance

SQ—Squadron

SQ/CC—Squadron Commander

SRAN—Stock Record Account Number

SRU—Shop Replaceable Unit

SEL—Senior Enlisted Leader (Enlisted Duties)

TA—Transient Alert

TAA—Training Aid Aircraft

TAC—Total Accumulated Cycles

TBA—Training Business Area

TCC—Transaction Condition Code

TCI—Time Change Item

TCTO—Time Compliance Technical Order

TD—Training Detachment

TDV—Technical Data Violation

TDY—Temporary Duty

TFI—Total Force Integration

TMDE—Test Measurement and Diagnostic Equipment

TMS—Type Model Series

TNB—Tail Number Bin

TO—Technical Order

TODA—Technical Order Distribution Account

TODO—Technical Order Distribution Office

TTML—Test/Training Munitions List

TTP—Tactics, Techniques & Procedures

UCML—Unit Committed Munitions List

UCR—Unsatisfactory Condition Report

UEM—Unit Engine Manager

UFC—Unified Facilities Criteria

UHF—Ultra High Frequency

UII—Unique Item Identifier

UMD—Unit Manpower Document

UPMR—Unit Personnel Management Roster

USAF—United States Air Force

USAFE—United States Air Forces in Europe

UTC—Unit Type Code

UTE—Utilization (rate)

UTM—Unit Training Manager

VHF—Very High Frequency

W&B—Weight and Balance

WASP—Web Applications Software Product

WCE—Work Center Event

WG—Wing

WG/CC—Wing Commander

WG/CD—Vice Wing Commander

WJQS—Work Center Job Qualification Standard

WLCMT—Weapons Load Crew Management Tool

WLCTP—Weapons Load Crew Training Program

WLT—Weapons Load Training

WRE—War Readiness Engine

WRM—War Reserve Materiel

WS—Weapons Standardization

WSM—Weapon System Manager

TQC—Weapons Task Qualification Crew

WTQM—Weapons Task Qualification Training Manager

WWID—Worldwide Identification (code for TCMax®)

WWM—Wing Weapons Manager

WX—Weather

WUC—Work Unit Code

Terms

Aircraft and Equipment Impoundment—Isolation of an aircraft or equipment due to an unknown malfunction or condition making it unsafe for use or flight.

Aircraft Purpose Identifier Codes (PIC)—specified in DAFI 21-103, PIC are applied to assigned aerospace vehicles to facilitate standardization of reporting. Examples of PIC are: CC=Combat, BQ=major maintenance awaiting AFMC decision or action; DJ=awaiting depot level maintenance work. Refer to DAFI 21-103 for a listing of all specific PIC.

Air Reserve Component—The Air National Guard and Air Force Reserve together form the ARC.

Allowance Standard (AS)—Authorized document that identifies the amount and type of equipment for an organization.

Alternate Mission Equipment (AME)—Equipment identified to a higher end-item, not listed in the table of allowance. Normally, -21 equipment.

Automated Inspection, Repair, Corrosion, and Aircraft Tracking (AIRCAT)—is the Individual Aircraft Tracking Program (IATP) of record for the C-130 as mandated by the USAF Aircraft Structural Integrity Program (ASIP). This effort includes development and maintenance of an extensive Oracle database and a wide variety of both client, server, and web-based applications to provide data entry, reporting, and analysis.

Awaiting Maintenance (AWM)—Designation for a deferred discrepancy on an aircraft awaiting maintenance.

Awaiting Parts (AWP)—Designation for a deferred discrepancy on an aircraft awaiting parts.

Bench Stocks—Stores of expendability, recoverability, reparability coded (ERRC) XB3 items kept on-hand in a work center to enhance maintenance productivity.

Cannibalization—Authorized removals of a specific assembly, subassembly, or part from one weapons system, system, support system, or equipment end-item for installation on another end-item to meet priority mission requirements with an obligation to replace the removed item.

Centralized Repair Facility—A facility that performs repairs for a specified region or bases.

Certified Load Crew Member—A load crew member trained and certified by position according to **Chapter 10**.

Classified Processing Area (CPA)—Areas identified by the unit which have had an Emission Security assessment and have been approved by the by the wing Information Assurance office to be utilized to discuss or process classified information IAW AFI 16-1404.

Code 1, Code 2, Code 3, Code 4, Code 5—Landing status codes used by aircrew to inform maintenance of their inbound aircraft's condition. A Code 1 aircraft has no additional discrepancies other than those it had when it last departed; a code 2 aircraft has minor discrepancies, but is capable of further mission assignments; a code 3 aircraft has major discrepancies in mission-essential equipment that may require repair or replacement prior to

further mission tasking; a code 4 indicates suspected or known nuclear, biological, or chemical contamination; and a code 5 indicates battle damage. Codes 4 and 5 are entered into the MIS as code 8.

Commercial Derivative Aircraft (CDA)—Any fixed or rotary-wing aircraft procured as a commercial Type Certified off-the-shelf aircraft, and whose serial number is listed on an FAA-approved Type Certified Data Sheet.

Commodity Time Compliance Technical Order—TCTO concerning a designated item, subsystem, or system that is not identified as a weapon or military system.

Composite Tool Kit (CTK)—A controlled area or container used to store tools or equipment and maintain order, positive control, and ease of inventory. CTKs are assembled as a kit and designed to provide quick, easy visual inventory and accountability of all tools and equipment. CTKs may be in the form of a toolbox, a shadow board, shelves, system of drawers (Stanley Vidmar®, Lista®), cabinets, or other similar areas or containers. The CTK contains tools and equipment necessary to accomplish maintenance tasks, troubleshooting, and repair.

Condition—**Based Maintenance Plus**—A set of maintenance processes and capabilities derived from real-time assessment of weapon system condition obtained from embedded sensors, external tests and measurements using portable equipment. The goal of CBM+ is to perform maintenance only when internal and/or external sensors indicate the need instead of performing maintenance on a periodic basis. **Consumable Items**—Also known as “Consumption” or “Expendable” Items designated XB3. Items which are consumed in use, or which lose their original identity during periods of use by incorporation into or attachments upon another assembly. Issued on an as required basis and consist of such supplies as maintenance parts or office supplies.

Contracting Officer Representative (COR)—A COR is an individual designated IAW Department of Defense Federal Acquisition Regulation Supplement subsection 201.602-2 and authorized in writing by the contracting officer to perform specific technical or administrative functions.

Crashed, Damaged or Disabled Aircraft Recovery (CDDAR)—The ability to move damaged or disabled aircraft using specialized equipment.

Critical Application Item (CAI)—An item that is essential to weapon system performance or operation, or the preservation of life or safety of operating personnel, as determined by the military services. The subset of CAI whose failure could have catastrophic or critical safety consequences is called CSIs. Refer to **Attachment 7**.

Critical Safety Item (CSI)—A part, assembly, installation equipment, launch equipment, recovery equipment, or support equipment for an aircraft or aviation weapons system that contains a characteristic any failure, malfunction, or absence of which could cause a catastrophic or critical failure resulting in the loss or serious damage to the aircraft or weapons system, an unacceptable risk of personal injury or loss of life, or an uncommanded engine shutdown that jeopardizes safety. Damage is considered serious or substantial when sufficient to cause a 'Class A' mishap. The determining factor in CSIs is the consequence of failure, not the probability that the failure or consequence may occur. For the purpose of this instruction "Critical Safety Item", "Flight Safety Critical Aircraft Part", "Flight Safety Part", "Safety of Flight Item", and similar terms are synonymous.

Cross-tell—Cross-tells are used to highlight trends, benchmarks or safety conditions relating to maintenance equipment, personnel, training, or processes. A cross-tell is initiated to assist other maintenance or logistics personnel with similar equipment to do their jobs more safely and/or efficiently. Typically, a cross-tell will be initiated when a condition or trend is discovered regarding but not limited to, a weapon system or common components that should be shared with other users or potential users. This information should be transmitted using signed and encrypted e-mail to ensure widest dissemination and ensure it is brought to the attention of unit commanders in order to prevent or mitigate mishaps, injury or damage to AF personnel, equipment or property. Typically, cross-tells will provide relevant background information and history and can include such information as NSNs, part numbers, specific location of problem areas.

Customer Wait Time—Customer Wait Time for LRUs is the total elapsed time between the issuance of a customer order and satisfaction of that order, regardless of source (immediate issues or backorders), and can include issues from wholesale and/or retail stocks as well as various other arrangements. Customer Wait Time for end items (engines and pods) includes time for the retrograde and serviceable transportation legs.

Debriefing—Program designed to ensure malfunctions identified by aircrews are properly reported and documented.

Decertification—The removal of certification status from a person for a specific task

Dedicated Crew Chief—DCCs are first-level supervisors in the flightline management structure who manage and supervise all maintenance on their aircraft, and are selected on the basis of initiative, management and leadership ability, and technical knowledge.

Delayed or Deferred Discrepancies—Malfunctions or discrepancies not creating NMC or PMC status that are not immediately corrected.

Delayed Release—Munition or store that fails to eject from an aircraft upon firing of impulse cartridge, but releases sometime afterwards. Release times qualifying "delayed" bombs are outlined in MDS-specific technical orders.

Demand Response Team—Two-member team where one person reads technical order steps and the other person performs the task and responds when each step is completed.

Depot Level Maintenance—Provides the capability to maintain materiel coded for organizational, intermediate and depot levels of maintenance. Includes maintenance requiring the overhaul, upgrading, or rebuilding of parts, assemblies, or subassemblies, and the testing and reclamation of equipment as necessary IAW AFPD 21-1

Dispatchable CTK—CTK issued out and is designed to be used outside the work center.

Equipment Custodian—Individual responsible for all in-use equipment at the organizational level whose duties include requisitioning, receiving, and controlling of all equipment assets.

Equipment Identification Designator (EID)—A number assigned to a piece of shop equipment, used to track status and accountability.

Equipment Items—Item authorized in the allowance standard within an organization.

Evaluated Load—A loading task that is assessed according to **Chapter 10**.

Expendability, Recoverability, Reparability, Category (ERRC)—Used to categorize Air Force inventory into various management groupings. The grouping determines the type of management used throughout the logistics cycle, designates the process to be used in computing requirements and are used in the correction and reporting of asset and usage data. (such as, XB3, XF3, XD2, NF2, NF4).

Flight Chief—NCO responsible to the maintenance officer or superintendent for management, supervision, and training of assigned personnel.

FK or FV—Prefix used to identify the munitions supply account. FV denotes units utilizing the TICMS and FK denotes units utilizing ILS-S or manual records supply point within a munitions'' operations unit for conventional munitions.

Functional Checklist—locally developed checklists used to identify the steps required to react to specific events. Functional checklists are required for use by functional area(s) during actions such as aircraft crash, mass loads, severe weather warning or evacuation, self-inspections.

Hung Ordnance—Any item attached to the aircraft for the purpose of dropping or firing which has malfunctioned or failed to release. In addition, hung ordnance includes the following items: (1) External fuel tanks after unsuccessful jettison attempt; (2) Remaining ordnance after an inadvertent release; (3) 20/30 mm ammunition after a gun malfunction (no fire, unplanned cease fire, runaway gun, or gun unsafe indication); (4) Any stores determined to be in an unsafe condition.

Inadvertent Release—Uncommanded launch or release of a store or ordnance or launch or release of a store or ordnance other than those selected when a launch or release command was generated (system malfunction); does not include an unintentional release. If commanding a single release, do not consider a double bomb release as an inadvertent release if the releases occur from a practice bomb dispenser.

Individual Tools and Equipment—Tools and equipment that are available for individual sign-out but stored in the tool room in storage bins, cabinets, shelves with every item having an assigned location (example, flashlights, ladders). **Integrated Logistics System-Supply (ILS-S)**—is the overarching term used to describe the system(s) used by base retail materiel management operations. ILS-S is comprised of the Enterprise Solution–Supply. In many cases the term ILS-S is used to identify system related functions and/or references.

Intermediate-Level Maintenance—Maintenance consisting of those off-equipment tasks normally performed using the resources of the operating command at an operating location or at a centralized intermediate repair facility.

In Process Inspection (IPI)—Inspection performed during the assembly or reassembly of systems, subsystems, or components with applicable technical orders. An IPI is accomplished and documented by an authorized IPI inspector other than the technician performing the specific step of a task that requires the IPI.

"Knock It Off"—"Knock it Off" empowers all Airman regardless of rank to terminate an operation or situation which they perceive is unsafe or too dangerous. "Knock it Off" includes using a recognizable "audible" (capable of being heard) from anyone in an effort to prevent a potential mishap.

Lead Crews—A load crew certified by the load standardization crew (LSC), which is assigned to WS to assist in conducting the weapons standardization program. **Levels**—Computed and authorized requirements for a quantity of assets.

Loading Standardization Crew (LSC)—A load crew designated by the WWM and the WS superintendent to administer the weapons standardization program. LSC members have certification and decertification authority.

Loading Task—The actions required by one crew member, in a designated position, to accomplish a munitions load.

Local Commander—The group commander with responsibility for maintenance (as applicable to loading technical data).

Maintenance Capability—Unit's ability to generate and sustain weapon systems to support the mission. It is composed of personnel, capacity (facilities, support equipment, and parts), and weapons systems and is affected by policies and business practices.

Maintenance Cyber Discipline—A focus on daily cyber hygiene activities which requires continuous attention in order to mitigate daily threats by creating a culture of cyber awareness, discipline, and strict compliance.

Maintenance Training—Any proficiency, qualification, or certification tasking required by a technician to perform duties in their primary AFSC.

Master Inventory List (MIL)—Primary source document for inventory of CTKs. The MIL indicates the total number of items in each drawer or section of the tool kit. MIL may be automated.

Mission Design Series (MDS)—Alpha and numeric characters denoting primary mission and model of a military weapons system.

Mission Generation Network—The MGN supports all Organizational-level, on-equipment and off-equipment maintenance and is optimized at the Wing-level across the USAF. MGN consists of the cumulative effort required to generate and sustain sortie and mission production to meet assigned mission requirements.

Minimum Required Proficiency Load (MRPL)—Recurring loading of munitions for which a person is certified.

Munitions Decertification—Removal of the certification status of a person that precludes them from loading a specific type of munitions or MFG.

Normally Installed Equipment (NIE)—launchers, and pylons normally installed on an aircraft.

No-Lone Zone—Area where the two-person concept must be enforced because it contains nuclear weapons, nuclear weapons systems, or certified critical components.

Non-Consumable Item—Also referred to as a “non-expendable” or “equipment” item. Durable items that are capable of continuing or repetitive use by an individual or organization.

Non-Release—System malfunction in which a weapon does not release from the delivery system.

Off-Equipment Maintenance—Maintenance tasks that are not or cannot be effectively accomplished on or at the weapon system or end-item of equipment but require the removal of the component to a shop or facility for repair.

On-Equipment Maintenance—Maintenance tasks that are or can be effectively performed on or at the weapon system or end-item of equipment.

Operating Stock—The bits and pieces needed to support a maintenance work center that does not meet the criteria of bench stock. It includes reusable items such as dust covers, hydraulic line covers, caps, items leftover from work orders, TCTOs. Items deleted from bench stock that are less than a full Unit of Issue (UI) are not considered operating stock but may be retained as work order residue.

Operational Safety, Suitability & Effectiveness (OSS&E)—OSS&E is an outcome of properly applied systems engineering principles, processes, and practices. Well-integrated configuration management and control, deficiency reporting and response, reliability, maintainability, integrity, and other engineering practices ensure that base-lined engineering characteristics of systems and end items are not allowed to degrade as a result of maintenance, repairs, parts substitutions, and similar activities. The PM is responsible for the assurance OSS&E throughout the life cycle of each configuration of each component of each system.

Organizational Level Maintenance—Maintenance consisting of those on-equipment tasks normally performed using the resources of an operating command at an operating location.

PACER WARE—is the unclassified term for an actual change or notification of a deficiency to an Electronic Warfare system.

Personnel Protective Equipment (PPE)—Equipment required to do a job or task in a safe manner.

Plan—A forecasted scheme of sequenced and timed events for accomplishing broad objectives. The plan is the product of annual, quarterly, and monthly planning of scalable operations and maintenance activities necessary to achieve long term mission requirements.

Preload—A complete munition and suspension equipment package ready for loading.

Primary Aerospace Vehicle Authorization (PAA)—The number of aircraft authorized to a unit for performance of its operational mission. The primary authorization forms the basis for the allocation of operating resources to include manpower, support equipment, and flying-hour funds.

Primary Aerospace Vehicle Inventory (PAI)—The aircraft assigned to meet the primary aircraft authorization. Includes PMAI, PTAI, PDAI and POAI.

Production Superintendent (Pro Super)—Senior NCO responsible for squadron maintenance production. Directs the maintenance repair effort.

Program Manager (PM)—The designated individual with responsibility for and authority to accomplish program objectives for development, production, and sustainment to meet the user's operational needs. The PM will be accountable for credible cost, schedule, and performance reporting to the Milestone Decision Authority.

Programmed Depot Maintenance (PDM)—Maintenance activities requiring skills, equipment, or facilities not normally possessed by operating locations.

Project Funds Management Records—a record maintained in the material accounting system to provide for control over that portion of each responsibility center manager operating budget programmed for purchase of expense materiel from the Defense Business Operations Funds stock

activity fund. It is used to record available expense authority, current month and fiscal year-to-date sales, sales returns, and due outs for both supplies and expense equipment.

Quality Assurance (QA)—Office or individual who monitors maintenance (organic or contractor) on a daily basis.

Quarterly Evaluation (QE)—Recurring calendar task evaluations required by munitions and weapons personnel.

Quick Reference List (QRL)—Listing of fast moving, high use items required for primary mission aircraft. The basic purpose of the QRL is to provide maintenance personnel with a speedy way to place a demand on the supply system.

Rag—A remnant of cloth purchased in bulk or a standardized, commercial quality, vendor-supplied shop cloth (uniform size and color) or similar material used in general industrial, shop, and flightline operations.

Reclama—A request to a duly constituted authority to re-consider its decision or its proposed action (see JP 1-02).

Recoverability Code—A one position code assigned to end items and support items to indicate the recoverability intention and the level of maintenance authorized disposition action on unserviceable support items; and for reparable items, it is used to indicate the lowest maintenance level responsible for repair, disposition, or condemnation of the item.

Recurring Discrepancy—A recurring discrepancy is one that occurs on the second through fourth sortie or attempted sortie after corrective action has been taken and the system or sub- system indicates the same malfunction when operated.

Reliability-Centered Maintenance—A logical discipline for developing a scheduled-maintenance program that will realize the inherent reliability levels of complex equipment at minimum cost.

Remote Split Operations—Occurs when the ground control stations, the Unmanned Aerial Vehicle (UAV) launch and recovery functions, and the satellite uplink are geographically separated.

Repair Cycle Asset—Any recoverable item with an expendability, recoverability, reparability code (ERRC) category of XD or XF.

Repair Recommendation—An idea or proposal to repair an item that is not currently repaired or is beyond the capability of the work center. An AFREP initiative is generated when an asset has a demand level of "greater than three" per calendar year. All new AFREP initiatives will be staffed through the applicable organizations.

Repairable—Unserviceable items that can be economically repaired and restored to a serviceable condition.

Repeat Discrepancy—A repeat discrepancy is a pilot reported discrepancy (PRD) occurring on the same system or subsystem on the first sortie or sortie attempt after that PRD has been signed off.

Retrograde—Returning assets (reparable assets) from the field to their source of repair.

Schedule—Planned events that result in final review and agreement of how to execute a proposed plan of sequenced and timed events. Results in a binding commitment captured in writing and approved by signature between operations and maintenance to complete activities required to accomplish agreed upon objectives. Refers to the execution phase of weekly and daily operations and maintenance activities.

SEEK EAGLE—The Air Force certification program for determining safe carriage, employment and jettison limits, safe escape, and ballistics accuracy, when applicable, for all stores in specified loading configurations on USAF aircraft.

SERENE BYTE—is the unclassified term for an exercise change or deficiency notification to an Electronic Warfare system.

Shop CTK—Tool kits (not dispatched) used by work center personnel during a shift, provided a single person is responsible for the tool kit.

Shop Stock—Includes items such as sheet metal, electrical wire, fabric, and metal stock, used and stored within a maintenance work center to facilitate maintenance.

Source Code—Codes assigned to end items and support items to indicate the manner of acquiring items for the maintenance, repair, or overhaul of end items.

Source, Maintenance, Recoverability (SMR) Code—A code assigned to parts and assemblies that provides maintenance activities with repair level responsibilities, support method and disposition instructions. The SMR codes are also input into the supply and maintenance automated data system. The uniform SMR code is composed of three parts, consisting of a two-position source code, a two-position maintenance code, and one position recoverability code.

Spares—Serviceable assets that are available for future use, and in the logistics pipeline. The term spare carries the assumption that there are already enough assets in the AF inventory to satisfy end item or quantity per aircraft requirements.

Special Certification Roster (SCR)—Management tool that provides supervisors a listing of personnel authorized to perform, evaluate, and inspect critical work.

Special Purpose CTK—Small individually issued tool kits that because of the nature of contents or type of container could preclude shadowing or silhouetting (example, launch kits, recovery kits, cartridge cleaning kits, oxygen servicing kits).

Subcrew—Two or more certified and/or qualified personnel who may perform specific tasks.

Supply Point—Forward warehouse located within or near the maintenance work center.

Supply Reports—There are many examples of "Supply Reports" used to record supply transactions. The Daily Document Register (D04) provides a means for organizations to review all document numbers processed during the day by the SBSS. The Project Funds Management Records and Organization Cost Center Record Update and Reconciliation (D11) show the current status and internal balance of the Project Funds Management Record by supplies and equipment. The Repair Cycle Asset Management Listing (D23) is used to monitor repair cycle assets and as a management product to monitor the stock position and repair cycle status of repairable (DIFM) assets. It may be produced in several sequences and is provided to the customer daily.

Sub-Pool—A parking area designated by the Airfield Operations Flight that provides authorized pooling of serviceable AGE to enhance close proximity support to using organizations.

Tactical/Theater Airborne Reconnaissance System (TARS)—is a sensor package offers improved timeliness, reduced support costs, and improved operational capability over film systems. Once fielded, this system will provide the tactical commander with an organic system capable of responding in Near Real-Time (NRT) (in time) to battlefield requirements.

Tail Number Bins (TNB)—Locations established and controlled to store issued parts awaiting installation and parts removed to FOM. Holding bins are set up by tail number, serial number, or identification number.

Task Assignment List—Functional grouping of procedural steps from applicable -33 series TOs, by crew position, to be accomplished in sequence by each crew member during an operation.

Technical Administrative Function—Function responsible for ordering and posting instructions, processing all orders, enlisted performance ratings, and general administrative tasks for the section.

Technical Data—Information (regardless of the form or method of the recording) of a scientific or technical nature, including computer software documentation. As applied in this publication, it includes information required for the design, development, production, manufacture, assembly, operation, training, testing, repair, maintenance, or modification of defense articles.

Technical Order Distribution Office (TODO)—Function required to maintain records on TOs received and distributed.

Time Compliance Technical Order (TCTO)—Authorized method of directing and providing instructions for modifying equipment and performing or initially establishing one-time inspections.

Tool Storage Facility/Tool Room—A controlled area within a work center designated for storage and issue of tools and equipment.

Total Asset Visibility—The capability to provide users with timely and accurate information on the location, movement, status, and identity of units, personnel, equipment, materiel, and supplies. It also includes the capability to act upon that information to improve overall performance of the Department of Defense's logistic practices.

Unintentional Release—Store or ordnance launched or released through pilot error.

Unique Item Identifier (UII)—The set of data elements marked on items that are globally unique, unambiguous, and robust enough to ensure data information quality throughout life, and to support multi-faceted business applications and users.

Unit Committed Munitions List (UCML)/Test/Training Munitions List (TTML)—The UCML/TTML is a list of primary munitions (PM), support munitions (SM), and limited-use munitions (LM) necessary to meet unit operational and training requirements.

Unmanned Aerial Vehicle (UAV)—An unmanned aircraft that is either remotely piloted (such as, Predator) or programmed (such as, Global Hawk).

Urgency Justification Code—Two-digit code used to reflect the impact and type of need. The Urgency of Need Designator fills the first position of the Urgency Justification Code. Use of Urgency of Need Designator 1, A and J is restricted and is verified by designated personnel.

Utilization Rate (UTE Rate)—Average number of sorties or hours flown per primary assigned aircraft per period. Usually, time period is based on a monthly rate.

War Readiness Engine (WRE) Levels—The quantity of net serviceable engines required to support the Air Force war tasking and to sustain operational units' war efforts until pipelines are filled and repair capabilities are available. These engines are to be available to support a weapon system from the start of the war until re-supply (via base, intermediate, CRF or depot repair) is established.

War Reserve Materiel (WRM)—Consists of enterprise managed, dynamically positioned equipment and consumables that contribute to initial operations and provide initial support cross the full range of military operations. It enhances Agile Combat Support capability to reduce the time required to achieve an operational capability and/or produce an operational effect.

Weapons Certification—The act of verifying and documenting a person's ability to load a particular type of aircraft, and munition or MFG within established standards.

Weapons Locally-Manufactured Equipment (LME)—All equipment that measures, tests, or verifies system, subsystem, component, or item integrity. It also includes equipment such as handling dollies, storage racks (except storage shelves), maintenance stands, or transport adapters. It does not include simple adapter cables and plugs constructed as troubleshooting aids to replace pin-to-pin jumper wires specified in TOs.

Weapons Standardization (WS)—Organization comprised of the WWM, a Superintendent, the Load Standardization Crew, an academic instructor, and lead crews.

Weapons Task Qualification—A munitions related task not requiring certification.

Weight and Balance (W&B) Program—Program used in calculating, verifying, updating, and computing weight and balance on a weapon system.

Attachment 2

AIRCRAFT COMMANDER FEEDBACK ON FCC

Figure A2.1. Aircraft Commander Feedback on FCC.

MEMORANDUM FOR <Unit Designation/Office Symbol> *Date*
<Street>
<Base, State, and Zip Code>
FROM: <Aircraft Commander>
<Street>
<Base, State, and Zip Code>
SUBJECT: Aircraft Commander Feedback of the Flying Crew Chief
(FCC) Was the FCC knowledgeable of the aircraft and the systems?
a - Extremely knowledgeable c - Lacks knowledge
b - Sufficient knowledge d - Not observed
Did the FCC know the status of PMC and NMC discrepancies?
a - Always c - Rarely
b - Most of the time d - Never
Did the FCC perform duties willingly and enthusiastically?
a - Always c - Never b
- Sometimes d - Not
Observed
What type of working relationship did the FCC have with the aircrew?
a - Outstanding c - Fair
b - Good d - Poor
Rate the overall maintenance support provided by the FCC:
a - Outstanding c - Fair
b - Good d - Poor
This FCC was:
a - An asset to the FCC program c - Just getting by b - A hard
worker, but needs more experience d - Detriment to the FCC program
Remarks:
POC is <FCC Program Manager's Name, office symbol, duty phone number>.<signed>
Aircraft Commander

Note*:* Please fold and return to the squadron FCC Program Manager upon return to home station.

Attachment 3

QUARTERLY FCC REPORT FORMAT

Figure A3.1. Quarterly FCC Report Format.

MEMORANDUM FOR MAJCOM/A4L *Date*
FROM: <Unit Designation/Office Symbol>
<Street>
<Base and Zip Code>
SUBJECT: <State fiscal quarter (FY20/1)> Quarterly Flying Crew Chief Report (RCS: AF/A4L(Q&A)0011)

IAW AFI 21-101 <unit designations> report is submitted.
Number of C-coded FCC positions on the Unit Manpower Document entitled to be filled. Include approved changes (losses/increases):
Number of people filling C-coded positions:
Number of qualifying missions flown per quarter by C-coded crew chiefs. Include the number of TO directed missions:
Number of qualifying missions flown by personnel without C-coded prefix. Include TO directed missions flown by non-C-coded prefix personnel:
Number of all missions away from home station that required FCCs:
Total number of days TDY for all C-coded crew chiefs on qualifying missions:
Total number of days TDY for all non-C-coded crew chiefs on qualifying missions:
Unit and MAJCOM remarks and overall program assessment. Include remarks to justify vacant positions: FCC Program Manager is <rank, name>, office symbol, DSN number.
<Sign>
Commander, <Unit Designation>

Attachment 4

ANNUAL FCC REPORT

Figure A4.1. Annual FCC Report.

MEMORANDUM FOR MAJCOM/A4L or DOM *Date*

FROM: <Unit designation/Office Symbol>
<Street>
<Base and Zip Code>
SUBJECT:<state fiscal year (FY20)> Annual Flying Crew Chief Report RCS: AF/A4L(Q&A)0011) IAW AFI 21-101<unit designations> report is submitted.
Number of C-coded FCC positions on the Unit Manpower Document entitled to be filled. Include approved changes (losses/increases):
Number of people filling C-coded positions:
Number of qualifying missions flown per quarter by C-coded crew chiefs. Include the number of TO directed missions:
Number of qualifying missions flown by personnel without C-coded prefix. Include TO directed missions flown by non-C-coded prefix personnel:
Number of all missions away from home station that required FCCs:
Total number of days TDY for all C-coded crew chiefs on qualifying missions:
Total number of days TDY for all non-C-coded crew chiefs on qualifying missions:
Unit and MAJCOM remarks and overall program assessment. Include remarks to justify vacant positions: FCC Program Manager is <rank, name>, office symbol, DSN number.
<Sign>
Commander, <Unit Designation>

Attachment 5

FCC SDAP REQUEST

Figure A5.1. FCC SDAP Request.

MEMORANDUM FOR MAJCOM/A4L or DOM *Date*

FROM: <Unit Designation/Office Symbol>
<Street>
<Base and Zip Code>

SUBJECT: Flying Crew Chief (FCC) SDAP Positions <Increase/Decrease> Request

IAW <unit designations> requests <increase or decrease> of <state quantity of positions>. Provide brief justification; include comments about force structure changes, additional mission requirements. FCC Program Manager is <rank, name>, office symbol, DSN number.
<Sign>
Commander, <Unit Designation>

Attachment 6

FOREIGN OBJECT DAMAGE (FOD) REPORT

Figure A6.1. Foreign Object Damage (FOD) Report.

MEMORANDUM FOR *Date*

FROM:<Unit Designation/Office Symbol> <Street> <Base and Zip Code>
SUBJECT: <Foreign Object Report>. FOD program report number (unit, year, and month, followed by sequence number -- example, 301FW-060501).

Type of report: Initial/Formal Update/Final FOD Report
Date and Time of Incident:
Unit and Base of Incident:
Origin of Sortie:
When discovered (Preflight, Postflight, In-Coming, ETS)
Owning Unit, Base and MAJCOM
MDS and Tail Number (N/A for ETS incidents)
Engine Type, Model, Series (TMS):
Engine S/N:
Engine Position (If Applicable):
Time Since Overhaul:
Description of Incident:
Material Failure: (Yes or No)
Tech Data Deficiency: (Yes/No) Preventable/Non-Preventable:
Investigation Findings:
Action Taken to Prevent Recurrence:
Parts Cost: Labor Cost: Total Cost:
Additional Comments (if necessary):

<Sign>
FOD Monitor, <Unit Designation>

Attachment 7

CRITICAL APPLICATION ITEMS & CRITICAL SAFETY ITEMS

A7.1. CRITICAL APPLICATION ITEMS (CAIs). For the purpose of this instruction, it is an item that is essential to weapon system performance or operation, or the operating personnel as determined by AFI 20-106IP, *Management of Aviation Critical Safety Items*.

A7.1.1. Includes flight safety items, life support, critical safety items (CSI), and nuclear hardened items. For systems including radar, avionics, munitions, contact the PO for the system to obtain the CAI designation.

A7.1.2. The management of CAIs (contains unique repair and manufacturing qualifications; material and manufacturing process requirements; and extensive testing requirements after repair) is a complex process. These specified procedures rest with the program manager.

A7.1.3. Other than TO and PO approved repairs, Electronic Warfare (EW) Systems are Critical Application Items and prohibited from consideration under the AFREP program. Performing repairs on EW system components may render the entire EW system degraded. Environmental Stress Screening (ESS) of repaired EW components is mandatory. Many EW components cannot be repaired due to electrical characteristics that are not visible or evident without special test facilities and procedures, none of which are available to field personnel or unqualified contractors.

A7.2. CRITICAL SAFETY ITEMS (CSIs). For the purpose of this instruction, CSIs are items whose failure may cause loss of life, permanent physical disability or major injury, loss of a system, or significant damage to equipment.

A7.2.1. Special attention is placed on CSIs due to potential catastrophic or critical consequences of failure; Public Law 108-136, section 802, *Quality Control in Procurement of Aviation Critical Safety Items and Related Services*, was enacted to address aviation CSIs. The public law addresses three concerns:

A7.2.1.1. The Design Control Activity (DCA) is responsible for processes related to identification and management of CSIs used in procurement, modification, repair, and overhaul of aviation systems. The DCA is defined as the systems command of a military Service responsible for the airworthiness certification of the system in which a CSI is used.

A7.2.1.2. For contracts involving CSIs, DoD is restricted to DCA approved sources.

A7.2.1.3. The law requires that CSI deliveries and services meet the technical and quality requirements established by the DCA.

A7.2.2. ODM 4140.01, *DoD Supply Chain Materiel Management Procedures*, establishes procedures for the management of aviation CSIs. AFI 20-106IP, *Management of Aviation Critical Safety Items*, addresses requirements for identification, acquisition, quality assurance, management, repair, and disposition of aviation CSIs.

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE MATERIEL COMMAND
WRIGHT-PATTERSON AIR FORCE BASE OHIO

DAFI21-101_AFMCSUP_AFMCGM2023-01
27 June 2023

MEMORANDUM FOR AFTC/AFSC/FLDCOMs

FROM: HQ AFMC/A4/10
4375 Chidlaw Road
Wright-Patterson AFB OH 45433-5006

SUBJECT: Air Force Materiel Command (AFMC) Guidance Memorandum (GM) to AFI 21-101_AFMCSUP, *Aircraft and Equipment Maintenance Management*.

By order of the Commander, Air Force Materiel Command, this AFMC Guidance Memorandum immediately changes AFI 21-101_AFMCSUP, dated 10 November 2020. Compliance with this Memorandum is mandatory. To the extent its directions are inconsistent with other AFMC publications, the information herein prevails, in accordance with DAFI 90-160, *Publications and Forms Management*. Ensure all records created as a result of processes prescribed in this publication are maintained in accordance with AFI 33-322, *Records Management and Information Governance Program*, and disposed of in accordance with the Air Force Records Disposition Schedule located in the Air Force Records Management System.

This GM incorporates DAFI21-101_AFMCSUP_AFMCGM 2022-01, dated 5 July 2022, that implemented the reorganization and transfer of United States Space Force responsibility to publish MAJCOM level supplemental guidance to DAFI 21-101, *Aircraft and Equipment Maintenance Management*, to AFMC as the identified servicing MAJCOM. Additionally, this GM added a requirement under Maintenance Group Commander responsibilities to establish local procedures for application intervals of HydroSkip on F-16 transparencies and it incorporates two recommendations for change of publication. The use of an asterisk (*) identifies new guidance added to prior GM.

Our POC is Mr. Art Buck, HQ AFMC/A4MM, at DSN 674-3014 or arthur.buck.2@us.af.mil.

This Memorandum becomes void after one year has elapsed from the date of this Memorandum, or upon publication of an Interim Change or rewrite of DAFI21-101_AFMCSUP, whichever is earlier.

C. M. VON HOFFMAN, Major General, USAF
Director of Logistics, Civil Engineering,
Force Protection and Nuclear Integration

Attachment:
Guidance Changes

DAFI21-101_AFMCSUP_AFMCGM2023-01 (27 June 2023)
Attachment
Guidance Changes

(Replace)(AFMC) DAFI 21-101, *Aircraft and Equipment Maintenance Management*, is supplemented as follows: This supplement identifies specific processes and procedures that are unique to AFMC and implements reorganization direction establishing AFMC as servicing MAJCOM for United States Space Force (USSF). It provides DAFI 21-101 MAJCOM supplemental guidance in an USSF Addendum to this supplement that applies to the USSF units/personnel and those with USSF contractual obligation, when associated with AFMC where AFMC is the servicing MAJCOM.

This supplement applies to Air Force Materiel Command organizations and personnel that develop, test, and maintain aerospace platforms and associated equipment. Supplement applicability: Air Force Test Center (AFTC) Test Wing organizations (96 TW and 412 TW) and the USAF Aircraft Battle Damage Repair Office Air Force Sustainment Center (AFSC) (AFSC/LGPM). AFSC Air Logistics Complexes (ALCs) do not follow AFI 21-101 or this AFMC Supplement, for Depot Maintenance Management guidance see AFMCI 21-100, *Depot Maintenance Management*. This publication applies to Air Force Reserve Command (AFRC) units when assigned or associated with AFMC where AFMC is lead. This publication does not apply to the Air National Guard. Numerous assigned missions within AFMC are not organized under the standard Wing Organization concept for Aircraft Maintenance Management IAW AFI 38-101, *Manpower and Organization*. Non-Standard Organizations (NSOs) require deviations (applicability, variance, and/or differences in organizational placement of responsibilities/processes) from DAFI 21-101 and this supplement. DEV – Deviation to provide/scope applicability for NSO logistics/maintenance in an addendum(s) to the MAJCOM supplement is approved by AF/A4L IAW DAFI21-101. Therefore, NSOs will follow the addendum(s) only, not the parent AFI nor this AFMC Supplement; **Exception:** USSF NSO(s) will follow the USSF addendum to this supplement and the parent DAFI, but not the AFMC Supplement. The respective Addendum(s) will scope NSO requirements in meeting the intent of the AFI and this AFMC Supplement based on the respective organizational mission(s). The following organizations are identified as NSOs (In the event of a conflict with identification of NSOs in this guidance, AFI21-101_AFMCSUP_Addendum A, *Non Standard Organization (NSO) Logistics Maintenance Management* or AFI 21-101_AFMCSUP_Addendum C, *Air Force Research Laboratory (AFRL) Logistics Maintenance Management*, will take precedence): Air Force Life Cycle Management Center (AFLCMC) units: 66th Air Base Group (ABG), 88th Air Base Wing (ABW), Cryptologic and Cyber Systems Division (HNC) (specifically the Technical Application Products and Space COMSEC Maintenance mission areas), 645 Aeronautical Systems Group (AESG), Armament Sustainment Division (ASD) EBWMT Missile and EBWWE Weapons Engineering Laboratories (Labs), EBWWG Gunsmith Shop (GSS) specifically the geographically separated maintenance function in support of Small Arms/Light Weapons (SA/LW) located at Joint Base Lackland San Antonio, Munitions Sustainment Division (MSD) Laboratory (EBH), and Global Ammunitions Control Point (GACP) Afloat Preposition Fleet (APF) Flight/Cell (EBHMA); AFTC units: Arnold Engineering and Development Complex (AEDC), 704th Test Group (TG) and Plant 42, and Specialized Management Office (SMO); and AFSC units: 72nd ABW, 72nd Logistics Readiness Squadron (LRS)/LGRMW, 75 ABW, 649 MUNS, 78 ABW, 78 LRS/LGRW. Throughout this supplement, the civilian equivalent (unless no civilian may hold the position) may be applied to any reference to a military rank, grade or position. All references to aircraft and equipment maintenance in AFI21-101 include support equipment, test equipment, special projects equipment, etc. The authorities to waive wing/unit

level requirements in this publication are identified with a Tier ("T-2, T-3") number following the compliance statement. See DAFMAN 90-161, *Publishing Processes and Procedures*, for a description of the authorities associated with the tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority; if not-tiered, send through chain of command to publication OPR. Submit recommendations for change or improvement to this instruction on AF Form 847, *Recommendation for Change of Publication*, in accordance with DAFI 90-161. For questions on interpreting this instruction, first contact your Quality Assurance Office/activity. Send questions to the OPR at AFMC/A4M Workflow (AFMC.A4M.Workflow@us.af.mil), 4375 Chidlaw Rd, Bldg 262 Room C117 WPAFB OH 45433-5006. Sustainment Operating Instructions (SOIs) are F-35 joint program instructions provided by the Joint Program Office. They are developed with Service/Partner participation and provide source documentation for Air Force policies/instructions specific to the F-35 where legacy instructions may not be adequate for the given topic. AFMC units may use SOI source documentation/information that is relevant and complements AFI21-101 and AFMC Sup. SOIs requiring a deviation from AFI21-101 and AFI21-101_AFMCSUP requires the unit to submit a waiver. SOIs may be accessed at the following web site: https://cs.eis.af.mil/f35/sustainment/Logistics%20Support%20Products%20Library/Forms/AllItems.aspx. Air Force Research Laboratory applicability is also identified as a NSO, in the event of a conflict with identification of NSO in this guidance, AFI21-101_AFMCSUP_Addendum C, *Air Force Research Laboratory (AFRL) Logistics Maintenance Management*, will take precedence. This publication must be supplemented by the implementing activities. Ensure all records created as a result of processes prescribed in this publication are maintained IAW Air Force Instruction 33-322, *Records Management and Information Governance Program*, and disposed of IAW the Air Force Records Disposition Schedule located in the Air Force Records Information Management System. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the AFMC.

References throughout to "Air Force Instruction (AFI) 63-140" are hereby changed to read "Department of the Air Force Instruction (DAFI) 63-140".

***(Add)** 2.4.59. F-16 (only) Establish local procedures for application intervals of HydroSkip on F-16 transparencies (not to include LUNA transparencies, if installed).

(Change) 11.10.1. **(AFMC)** The following are the interim roles and responsibilities until AFMC supplement to DAFI 63-140 is published by HQ AFMC/A4/10/A4-EN.

(Change) 11.10.1.1. **(Added-AFMC)** AFMC ASIP OPR will coordinate with other command ASIP OPR (as necessary), unit ASIP Program Manager, and Program Office (PO) ASIP Manager to resolve Individual Aircraft Tracking (IAT) data submission problems, aircraft hardware/software discrepancies, and programmatic issues that affect valid data capture rates.

(Add) 11.10.1.2. Maintenance Group Commander will:

(Add) 11.10.1.2.1. Appoint an officer, NCO, or civilian as the MXG ASIP Program Manager. **(T-2)**

(Add) 11.10.1.2.2. Ensure effective measures are in place to capture and report ASIP aircraft usage data (Individual Aircraft Tracking and/or Loads Environment Spectrum Survey) to achieve the required data capture/validity rate.

(Add) 11.10.1.3. MXG ASIP program manager will :

(Add) 11.10.1.3.1. Develop MXG ASIP Program Manager, AMU ASIP monitors, and Debrief section responsibilities and training program (as applicable).

(Add) 11.10.1.3.2. MXG ASIP program manager will track and submit to AFMC/A4M (AFMC.A4M.Workflow@us.af.mil) a quarterly IAT status report IAW Attachment X for all assigned manned/unmanned, home station/deployed aircraft, by MDS. **(T-2)**

(Add) 11.10.1.3.2.1. Unit quarterly IAT reports will be submitted to the AFMC ASIP OPR (AFMC.A4M.Workflow@us.af.mil) NLT the fifth duty day of the quarter (Jan, Apr, Jul, & Oct).

(Add) 11.10.1.3.2.2. Unit quarterly IAT reports will include amplifying remarks to explain IAT valid data submission rates below 90%, and listed by month in the remarks section of the template, see **Table 11.3.**

(Add) 11.10.1.3.3. Units possessing manned or unmanned weapon systems that do not have an approved IAT system will contact the AFMC ASIP OPR (AFMC.A4M.Workflow@us.af.mil) for reporting guidance.

(Add) 11.10.1.3.4. MXG ASIP program manager will coordinate with the MAJCOM ASIP OPR and MDS ASIP Manager to obtain guidance and resolution when ASIP usage data collection and submission issues are encountered.

(Add) 11.10.1.3.5. MXG ASIP program manager will coordinate with the MAJCOM ASIP OPR and PO ASIP Manager to obtain feedback on data capture rates and to implement corrective actions as needed to achieve the required rates.

(Add) 11.10.1.3.6. MXG ASIP program manager will provide oversite and ensure units are complying with planning and collection of ASIP collection plans and data IAW **para 11.10.1.4.1** and **11.10.2.1** of this instruction.

(Add) 11.10.1.4. AMU ASIP monitors will:

(Add) 11.10.1.4.1. Develop and publish procedures to collect and submit ASIP aircraft usage data at home station and deployed locations. **(T-3)**

(Add) 11.10.1.4.2. Ensure of collection of IAT ASIP data at the unit level, IAW **para 11.10.2.1** of this instruction.

(Add) 11.10.1.4.3. When valid ASIP submission rates fall below 90%, devise plan in coordination with the MXG ASIP program manager to improve valid capture rates.

(Change) 11.10.2. **(AFMC)** Operational Requirements.

(Add) 11.10.2.1. AMUs/Mx Units will collect, track, and submit IAT data (no later than the end of the next duty day) IAW specific aircraft technical orders and/or ASIP Master Plans. **(T-2)**

(Add) Table 11.3. , **AFMC Individual Aircraft Tracking (IAT) Status Reporting Template.**

BASE	UNIT	MDS(s)	Reporting Quarter
Sample Base	96 MXG	F-XX	Jan –Mar 2022

ITEM	VALUE
Number of Recorder or DTC Downloads Required	225
Number of Recorder or DTC Downloads Submitted	72
Recorder Submission Rate	32%
[redacted]	
Number of Sorties Flown	635
Number of Forms Submitted	550
Percent Captured	88.60%

COMMENTS
The objective is to submit 100% of required collected data. Search in progress for missing forms. Download hard drive corrupt all files lost, new hard drive on order EDD 30 Oct 2014.

Monthly break down (AFTO Form 239)			
Jan sorties flown:			
Jan downloads required:		Downloads submitted:	
Jan forms submitted:			
Feb sorties flown:			
Feb downloads required:		Downloads submitted:	
Feb forms submitted:			
Mar sorties flown:			
Mar downloads required:		Downloads submitted:	
Mar forms submitted:			**0**

***(Replace)** 11.14.1. **(AFMC)** See AFMC Sup **para 11.14.3** through **11.14.4.2** for Hangar Queen Management Program

(Add) 11.38.3.4.1.1. See **paragraph 11.38.6** and subparagraphs.

(Add) 11.38.6. Oil Analysis Program (OAP) Responsibilities and Requirements.

(Add) 11.38.6.1. MAJCOM A4M Responsibilities. **(T-2)**

(Add) 11.38.6.1.1. Appoints a qualified SNCO to manage Command OAP and serve as a point of contact for OAP activities. **(T-2)**

(Add) 11.38.6.2. MXG/CC Responsibilities. **(T-2)**

(Add) 11.38.6.2.1. Appoints a Wing OAP Manager and alternate. **(T-2)**

(Add) 11.38.6.2.2. Ensures the NDI/OAP facility is on a priority repair list with base Civil Engineer. **(T-2)**

(Add) 11.38.6.2.3. Ensures base Civil Engineer maintains an alternate power source of sufficient voltage capacity at the OAP lab to be used in times of power outage. This will allow the OAP process to continue without delay. **(T-2)**

(Add) 11.38.6.2.4. Ensures the NDI/OAP facility has a Class A telephone and a direct line to MOC to expedite the reporting of abnormal wear-metal trends. **(T-2)**

(Add) 11.38.6.3. Wing OAP Manager Responsibilities. **(T-2)**

(Add) 11.38.6.3.1. Manages the OAP IAW T.O. 33-1-37-1, *Joint Oil Analysis Program Manual*, and other applicable directives. **(T-2)**

(Add) 11.38.6.3.2. Develops procedures to establish policy and requirements for the wing OAP. Include a standardized method to ensure the total oil serviced since last OAP sample can be tracked and accurately entered on the DD Form 2026, *Oil Analysis Request*. **(T-2)**

(Add) 11.38.6.3.3. Ensures all organizations requiring OAP support appoint an OAP Manager and alternate using an appointment letter. **(T-2)**

(Add) 11.38.6.3.4. Provide consolidated quarterly OAP data report to the MXG/CC, the Squadron Operations Officer/Maintenance Superintendent, Propulsion Flight Chief, all organization OAP Managers, and the NDI Section Chief. **(T-2)** As a minimum, the following information will be included in the quarterly report:

(Add) 11.38.6.3.4.1. Number of OAP samples processed. **(T-2)**

(Add) 11.38.6.3.4.2. Number and percentage of DD Form 2026 errors. **Note:** Count each DD Form 2026 that has any errors as one error, then divide the number of discrepant DD Form 2026s by the total number of OAP samples processed for the error percentage. **(T-2)**

(Add) 11.38.6.3.4.3. Number of OAP laboratory maintenance recommendations. **(T-2)**

(Add) 11.38.6.3.4.4. Average OAP sample response time. **Note:** Enter sample response time to the nearest tenth of an hour and do not include the time when the OAP lab is not manned. **(T-2)**

(Add) 11.38.6.3.4.5. Number and percentage of OAP samples that exceeded required sample response times. Obtain the percentage by dividing the number of OAP samples exceeding required sample response time by the total OAP samples processed. **(T-2)**

(Add) 11.38.6.3.4.6. Number and percentage of aircraft engines not sampled as required by

applicable technical order. Accomplish this by dividing the number of aircraft engines not sampled as required by the total OAP samples processed. **(T-2)**

(Add) 11.38.6.3.4.6.1. Number of OAP lab maintenance recommendations confirmed by physical finding of abnormal wear or potential for catastrophic failure "hits". **(T-2)**

(Add) 11.38.6.3.4.6.2. For Scanning Electron Microscope/Energy Dispersive X-ray equipped bases: Number of Magnetic Chip Detector (MCD) analyzed.

(Add) 11.38.6.3.4.6.3. For SEM/EDX equipped bases: Number and percentage of Level 1, 2, and 3 warnings by material type. **(T-2)**

(Add) 11.38.6.3.4.6.4. For SEM/EDX equipped bases: Number of unserviceable MCDs found. **(T-2)**

(Add) 11.38.6.3.4.6.5. For SEM/EDX equipped bases: Number and percentage of CAF Form 22, *Technical Manual (TM) Change Recommendation and Reply*, errors. **Note:** Count each CAF Form 22 that has any errors as one error, and then divide the number of discrepant CAF Form 22s by the total number of MCDs analyzed for the error percentage. **(T-2)**

(Add) 11.38.6.3.4.6.6. For SEM/EDX equipped bases: Average SEM/EDX analysis response time. **Note:** This is the time from when the MCD is pulled to the time results are reported to the MOC. Enter the response time to the nearest tenth of an hour and do not include the time when the OAP lab is not manned. **(T-2)**

(Add) 11.38.6.3.4.6.7. For SEM/EDX equipped bases: Number and percentage of MCDs that exceeded required delivery time. Obtain the percentage by dividing the number of MCDs exceeding required delivery time by the total number of MCDs processed. **(T-2)**

(Add) 11.38.6.4. Operations Officer/Maintenance Superintendent Responsibilities. **(T-2)**

(Add) 11.38.6.4.1. Ensures all assigned aircraft are sampled IAW the applicable aircraft T.O. **(T-2)**

(Add) 11.38.6.4.2. Ensures OAP samples are delivered to the OAP lab with a DD Form 2026 filled out IAW T.O. 33-1-37-1. **(T-2)**

(Add) 11.38.6.4.2.1. In the DD Form 2026 "hours/miles since overhaul block, for engines with engine monitoring systems (EMS) use engine operating time unless the specific technical order directs otherwise (e.g., F110 engine use EMS inflight time). Reconcile NDI/OAP lab and aircraft records using downloaded EMS data accordingly. For engines without EMS, use engine flying hours. **(T-2)**

(Add) 11.38.6.4.3. Ensures flightline personnel verify with the OAP lab that the information entered in the Oil Analysis Record matches during scheduled aircraft records checks. Verify, as a minimum, engine operating hours, time since oil change, oil serviced since last records check/OAP sample, engine serial number(s) and aircraft serial number. **Note:** MXG/CC or equivalent may waive verification of OAP records against aircraft records when aircraft are deployed and the scheduled aircraft records check is due. **(T-2)**

(Add) 11.38.6.4.4. Identifies AMU OAP Managers and alternates by appointment letter. Forward a copy to the Wing OAP Manager and the OAP laboratory. The letter will include grade, name, duty phone, AFSC, organization and office symbol. OAP manager will be a NCO

and will serve as the primary liaison between their AMU and the OAP lab for all OAP issues. Ensures assigned OAP Managers or alternates attend all OAP meetings involving their AMU. **(T-2)**

(Add) 11.38.6.4.5. Ensures all aircraft engines under special OAP codes IAW T.O. 33-1-37 are not flown until results of the OAP sample(s) are known. Ensure no aircraft engines are operated until the following DD Form 2026 discrepancies are corrected and verified with the OAP lab: equipment and/or end item serial number error, hours (EOT or EFH) since overhaul error, oil change error, and oil added since last sample error. These items are essential to oil analysis trending and require removal of that engine from service until the discrepancy is corrected. **(T-2)**

(Add) 11.38.6.4.6. Ensures DD Form 2026 with equipment and/or end item serial number error, hours since overhaul error and oil added since last sample error are corrected immediately. **(T-2)**

(Add) 11.38.6.4.7. Ensures all maintenance actions affecting oil-wetted engine components are provided to the OAP lab using the remarks section of the DD Form 2026 or a suitable local form. **(T-2)**

(Add) 11.3.6.5. Propulsion Flight Chief Responsibilities. **Note:** When no Propulsion Flight exists or the Propulsion Flight performs no maintenance on the affected oil-wetted system, the MXG/CC or designated representative or equivalent assumes these responsibilities. **(T-2)**

(Add) 11.38.6.5.1. Ensures accurate and timely deficiency reports are submitted through the unit PIM to the applicable ALC engine program offices on all engines requiring tear down or overhaul due to an OAP laboratory maintenance recommendation and on all oil-wetted component failures. **(T-2)**

(Add) 11.38.6.5.2. Ensures a copy of the Oil Analysis Record is provided to the applicable repair facility for each engine undergoing scheduled maintenance or overhaul. **(T-2)**

(Add) 11.38.6.5.3. Makes the final decision regarding all OAP engine maintenance action recommendations. **(T-2)**

(Add) 11.38.6.5.4. Ensures all Propulsion Flight maintenance actions which affect oil- wetted engine components are provided to the OAP lab. This will be done by using the remarks section of the DD Form 2026 submitted with the OAP sample. **(T-2)**

(Add) 11.38.6.5.5. Appoints OAP Managers and provides the names by appointment letter to the Wing OAP Manager and the OAP lab. Include grade, name, duty phone, organization, AFSC and office symbol. **(T-2)**

(Add) 11.38.6.5.6. Ensures assigned OAP Managers or alternates attend all OAP meetings. **(T-2)**

(Add) 11.38.6.6. MOC Responsibilities. **(T-2)**

(Add) 11.38.6.6.1. Maintains an OAP status on each assigned aircraft showing all lab recommendation codes next to the aircraft serial number. Prior to commencing the flying day, verify status of aircraft or engines on special surveillance. **(T-2)**

(Add) 11.38.6.6.2. Relays to the OAP lab information regarding engine changes on- and off-station as they occur but no later than 0800 the next duty day. **(T-2)**

(Add) 11.38.6.6.3. Notifies the OAP lab when the cross country/deployed aircraft return.

(Add) 11.38.6.6.4. Initiates follow-up action when the oil analysis record from cross country/deployed aircraft is not returned to the OAP lab. **(T-2)**

(Add) 11.38.6.7. NDI/OAP lab NCOIC Responsibilities.

(Add) 11.38.6.7.1. Ensures the scheduled aircraft records check is documented on the affected engine's Oil Analysis Record with the date the check was accomplished and OAP lab person's initials. **(T-2)**

(Add) 11.38.6.7.2. Ensures a copy of the Oil Analysis Record or a suitable automated form is provided to the propulsion flight for each engine undergoing scheduled maintenance or overhaul at depot, JEIM or CRF. **(T-2)**

(Add) 11.38.6.7.3. Immediately notifies MOC and the propulsion flight chief when an installed engine is restricted from operation or is placed on special sampling. **(T-2)**

(Add) 11.38.6.7.4. Ensures analysis results on all installed engines are provided to MOC after analysis of the OAP sample is complete. **(T-2)**

(Add) 11.38.6.7.5. Immediately notifies test cell and the propulsion flight chief when abnormal OAP results are discovered on test cell engines. **(T-2)**

(Add) 11.38.6.7.6. Ensures DD Form 2026s with equipment and/or end item serial number error, hours since overhaul error and oil added since last sample error are corrected immediately. **(T-2)**

(Add) 11.38.6.7.7. Tracks aircraft OAP sample response times for all assigned aircraft to ensure response time compliance. **(T-2)**

(Add) 11.38.6.7.8. Maintains a current appointment letter of all customer OAP managers. **(T-2)**

(Add) 11.38.6.8. OAP Sample Response Time Requirements for Routine OAP Samples. **Note:** The OAP sample response time begins at the time the OAP sample is taken and ends at the time the oil analysis results are reported to the MOC. **(T-2)**

(Add) 11.38.6.8.1. 2 1/2 hours for one and two engine aircraft. Deliver the sample to the OAP lab within 75 minutes of engine shutdown. MXG/CC may adjust the 2 1/2 hour rule as needed to accommodate flying windows. When the OAP lab is not manned, they shall provide results to the MOC NLT 2 hours after the beginning of the next shift. **Note:** OAP response time does not apply to aircraft that are geographically separated from the supporting OAP lab; however, aircraft will not fly beyond the applicable -6 T.O. sampling interval. **(T-2)**

(Add) 11.38.6.8.2. Five hours for all other aircraft. When the OAP Lab is not manned, they shall provide results to the MOC NLT 2 hours after the beginning of the next shift. **Note:** OAP response time does not apply to aircraft that are geographically separated from the supporting OAP lab; however, aircraft will not fly beyond the applicable -6 T.O. sampling interval. **(T-2)**

(Add) 11.38.6.8.3. Four hours for engine ground/trim and test cell runs. **(T-2)**

(Add) 11.38.6.8.4. Immediately processes/analyzes special "Red Cap" samples after drawing the sample. The OAP lab will assign priority to "Red Caps" over routine samples and expedite results to MOC. **(T-2)**

(Add) 11.38.6.9. OAP Requirements for Cross-Country Flights/Deployments. **(T-2).**

(Add) 11.38.6.9.1. Flightline personnel place an Oil Analysis Record in the aircraft AFTO Form

781-series forms jacket prior to departure. **(T-2)**

(Add) 11.38.6.9.2. The OAP lab personnel ensure the Oil Analysis Record contains at least the last 10 analyses. The flightline expediter or pro super notifies the OAP lab in advance for cross-country documents. **(T-2)**

(Add) 11.38.6.9.3. Flightline personnel sign for the Oil Analysis Record at the OAP lab and return it to the lab the day the aircraft returns to home station. **(T-2)**

(Add) 11.38.6.9.4. The OAP lab notifies MOC if the Oil Analysis Record is not returned. **(T-2)**

(Add) 11.38.6.9.5. The OAP lab reviews the returned Oil Analysis Record for adverse trends and takes necessary action. **(T-2)**

(Add) 11.38.6.9.6. AMUs will follow the OAP procedures in this supplement at the deployment sites. **(T-2)**

(Add) 11.38.6.9.7. Deployed OAP personnel shall have telephone or radio communication with MOC and the AMU to expedite reporting of abnormal OAP trends. **(T-2)**

(Add) 11.38.6.10. OAP Requirements for Transient Aircraft. **(T-2)**

(Add) 11.38.6.10.1. Transient maintenance personnel sample aircraft as required by this section and applicable -6 technical order. **(T-2)**

(Add) 11.38.6.10.2. Transient maintenance personnel draw the OAP sample and make a Red Dash entry on the AFTO Form 781A, *Maintenance Discrepancy and Work Document* indicating, "Engine oil analysis results due". **(T-2)**

(Add) 11.38.6.10.3. When OAP capability exists at a transient location and an OAP sample is required, the OAP sample results will be known prior to aircraft departure. **(T-2)**

(Add) 11.38.6.10.4. Transient bases without OAP capability shall take required OAP samples and ensure samples are given to aircrew for processing at next base. **(T-2)**

(Add) 11.38.6.10.5. If OAP sample results are not provided before aircraft departure, the results shall be forwarded via FAX, e-mail or most expeditious manner by the local MOC or transient maintenance to the aircraft's next destination (either MOC, TA, or base operations). **(T-2)**

(Add) 11.42. Condition Based Maintenance Plus (CBM+). CBM+ is the application and integration of appropriate processes, technologies, and knowledge-based capabilities to improve the reliability and maintenance effectiveness of USAF systems and components. CBM+ is maintenance performed based on evidence of need provided by RCM analysis and other enabling processes and technologies. The CBM+ Process has four distinct phases, including Component Selection, Enhanced Reliability Centered Maintenance (eRCM), Sensor-Based Algorithms, and CBM+ Deployment.

(Add) 11.42.1. Predictive Maintenance Alert Loop (PMAL). A six-step collaborative process that allows stakeholders to receive and act upon the results of eRCM analyses and/or sensor-based algorithms/modules. PMAL transforms eRCM forecasts and sensor-based algorithm alerts into Mx and supply chain actions and is a critical component in the integration of a successful USAF Predictive Mx culture.

(Add) 11.42.2. Governance. A CBM+ Team is assigned per weapon system and includes

representatives from AFLCMC/RO; Program Office; the MAJCOM, including direct CBM+ support, Weapon System Managers/Weapon System Teams (WSMs/WSTs) and field unit contacts; and AFSC supply chain management. For platforms managing many main operating bases, a field representative may also serve as an optional member of the CBM+ Team to provide feedback on the execution of Mx. The CBM+ Team oversees the execution of the PMAL. The CBM+ Team meets on an as-needed basis to discuss the most recently published forecast, the locations of affected aircraft, and the availability of supply to make informed, collaborative decisions and recommendations.

(Add) 11.42.3. Plan and Schedule Maintenance. Refer to the respective MAJCOM guidance on how and when to schedule maintenance for assigned locations. When supply is limited or aircraft are deployed or preparing for mission deployment, the MAJCOM may prioritize Mx requirements or coordination with applicable supporting organizations.

(Add) 11.42.3.1. Access the CBM+ Forecast via the Predictive Analytics and Decision Assistant tool at: https://cbmplus.cce.af.mil/. Units must access the CBM+ Forecast on the 15th of each month (or the next duty day if the 15th falls on a weekend or holiday) in order to forecast the maintenance schedule priority. Communicate any inconsistencies to the MAJCOM WST/managers. **(T-2) Note:** Individual CBM+ component threshold hours will change over time.

(Add) 11.42.3.1.1. Units can contact the AFMC/A4M CBM+ manager at: AFMC.A4M.Workflow@us.af.mil to obtain information/sponsorship to gain access to the CBM+ Forecast via the Predictive Analytics and Decision Assistant tool.

(Add) 11.42.3.2. Work Unit Codes/Logistics Control Numbers (components) selected for CBM+ are tracked by individual aircraft tail numbers to predict the component's remaining life to failure. The intent of CBM+ is to drive unscheduled maintenance into scheduled maintenance, thereby optimizing the limited maintenance resources and improving aircraft availability.

(Add) 11.42.3.3. CBM+ Access. If available, maintenance units will utilize the CBM+ Forecast applicable for assigned MDS(s) to view, schedule maintenance, order parts, complete replacement actions, and record the maintenance actions for each aircraft.

(Add) 11.42.3.4. The scheduling priority is based on the CBM+ threshold with the highest priority for aircraft with components over the threshold, followed by the aircraft with components forecasted for removal within the next 30, 60, 90, 120, 150, 180-day intervals.

(Add) 11.42.3.5. Each CBM+ component forecasted for removal should be scheduled in conjunction with the closest scheduled maintenance event where the CBM+ maintenance action can take place. **Example:** Units may determine, through the local scheduling process, that an aircraft with a component forecasted for removal that is within the 30-day to 180-day threshold is already scheduled down and may elect to complete the CBM+ maintenance action ahead of an aircraft that has a component that is over the threshold. This is a local decision and meets the objective of CBM+ by employing opportunistic maintenance to prevent an anticipated part failure.

(Add) 11.42.3.5.1. Consult maintenance tasks SMEs for the typical time duration the maintenance action takes in order to appropriately schedule the task as required.

(Add) 11.42.3.5.2. Parts loaded into the MIS that are CBM+ items will be loaded to fully track

component history and life usage. Automated History Events will be enabled for parts loaded with CBM+ Work Unit Codes/Logistics Control Numbers and the Maintenance Type Interval will be established as "H" (for hours) based on the end item's operating time.

(Add) 11.42.3.6. Units should align the CBM+ forecasted maintenance with other planned/scheduled events and order the part(s) to ensure the DIFM 14-day policy is not violated.

(Add) 11.42.3.6.1. Units are to use project code 063 and urgency justification AU/BU when ordering the CBM+ WUC/LCN part.

(Add) 11.42.3.6.2. Units should not pull parts from the MRSP to fill CBM+ parts orders.

(Add) 11.42.3.7. Units are encouraged to utilize profile job standards for each CBM+ WUC/LCN to standardize maintenance entries.

***(Add) 12.6. (AFMC) Maintenance Personnel Requirements**. Air Force Sustainment Center (AFSC) Instruction 62-100, *Military Repair Station Program*, has been superseded by AFSCI 62-603, *Military Repair Station Program*.

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

Abbreviations and Acronyms

CBM+—Condition-Based Maintenance Plus

eRCM—Enhanced Reliability Centered Maintenance

IAT—Individual Aircraft Tracking

MCD—Magnetic Chip Detector

NSOs—Non-Standard Organizations

PMAL—Predictive Maintenance Alert Loop

SBA—Sensor-Based Algorithms

SEM/EDX—Scanning Electron Microscope/Energy Dispersive X-ray

SOIs—Sustainment Operating Instructions

WSMs/WSTs—Weapon System Managers/Weapon System Teams

Administrative Change to AFI 21-101 AFMC SUP, *Aircraft and Equipment Maintenance Management*

OPR: HQ AFMC/A4MM

References throughout to “Air Force Instruction (AFI) 21-101” are hereby changed to read “Department of the Air Force Instruction (DAFI) 21-101”, where applicable referencing to DAFI21-101_DAFGM2021-01dated 1 October 2021, until AFI 21-101 AFMC SUP is fully revised. 30 November 2021.

Reference in Table 11.1. (AFMC) Mandatory Special Certification Roster and Prerequisites, Item 5 Installed Engine Run Certifying Officials, MAJCOM/ANG Prerequisites, is hereby changed from “2A373/7/8” to read “2A373/5/7/8”. 30 November 2021.

BY ORDER OF THE SECRETARY OF THE AIR FORCE

AIR FORCE INSTRUCTION 21-101

16 JANUARY 2020

AIR FORCE MATERIEL COMMAND Supplement

10 NOVEMBER 2020

Maintenance

AIRCRAFT AND EQUIPMENT MAINTENANCE MANAGEMENT

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This publication implements Air Force Policy Directive (AFPD) 21-1, Maintenance of Military Materiel. It is the basic Air Force Instruction (AFI) for all weapon system and support equipment maintenance management guidance. It provides the minimum essential guidance and procedures to safely and effectively maintain, service, and repair weapon systems and support equipment.

This publication applies to all military and civilian members of the Regular Air Force (RegAF), Air Force Reserve (AFR) and Air National Guard (ANG) and those with contractual obligation to comply with Air Force publications. Supplements and addendums are written in accordance with

(IAW) AFI 33-360, Publication and Forms Management. Supplements must identify and document Major Command (MAJCOM), AFR, and ANG required deviations (applicability, variance, exception and differences in organizational placement of responsibilities/processes) in their supplement and addendums with the abbreviation "(DEV)". Place the "DEV" entry after the **Paragraph** number and directly preceding the affected text, such as (AMC) (DEV) Use the... or (ADDED-AMC) (DEV) Use the...). All supplements and addendums are submitted to the Air Force Maintenance Division (AF/A4LM) @ **usaf.pentagon.af-a4.mbx.a4lm-maintenance-policy@mail.mil** for approval and are published in the e-Publishing website. The authorities to waive wing and unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See AFI 33-360 for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the requestor's commander for non-tiered compliance items. For questions on interpreting this instruction, first contact your MAJCOM maintenance functional activity. Refer recommended changes and questions about this publication through your MAJCOM, AFR or ANG, to the Office of Primary Responsibility (OPR) using the Air Force (AF) Form 847, Recommendation for Change of Publication; route AF Forms 847 from the field through the appropriate functional chain of command. Ensure all records created as a result of processes prescribed in this publication are maintained in accordance with AFI 33-322, *Records Management and Information Governance Program*, and disposed of in accordance with the Air Force Records Disposition Schedule located in the Air Force Records Information Management System. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the AF.

(AFMC) This publication implements AFI21-101. It supplements specific processes and procedures that are unique to AFMC. This supplement applies to Air Force Materiel Command organizations and personnel that develop, test, and maintain aerospace platforms and associated equipment. Supplement applicability: Air Force Test Center (AFTC) Test Wing organizations (96 TW and 412 TW) and the USAF Aircraft Battle Damage Repair Office Air Force Sustainment Center (AFSC) (AFSC/LGPM). AFSC Air Logistics Complexes (ALCs) do not follow AFI 21-101 or this AFMC Supplement, for Depot Maintenance Management guidance see AFMCI 21-100, *Depot Maintenance Management.* This publication applies to Air Force Reserve Command (AFRC) units when assigned or associated with AFMC where AFMC is lead. This publication does not apply to the Air National Guard. Numerous assigned missions within AFMC are not organized under the standard Wing Organization concept IAW AFI 38-101, *Manpower and Organization*. AFMC Non-Standard Organizations (NSO) require deviations (applicability, variance, and/or differences in organizational placement of responsibilities/processes) from AFI21-101 and this supplement. DEV – Deviation to provide/scope applicability for NSO logistics/maintenance in an addendum(s) to the MAJCOM supplement is approved by AF/A4L IAW AFI21-101. Therefore, NSOs will follow the addendum(s) only, not the parent AFI nor this AFMC Supplement. The respective Addendum(s) will scope NSO requirements in meeting the intent of the AFI and this AFMC Supplement based on the respective organizational mission(s). The following organizations are identified as NSOs (In the event of a conflict with identification of NSOs in this guidance, AFI21-101_AFMCSUP_Addendum A *Non Standard Organization (NSO) Logistics Maintenance Management* or AFI 21-101_AFMCSUP_Addendum C *Air Force Research Laboratory (AFRL) Logistics Maintenance Management* will take precedence): Air

Force Life Cycle Management Center (AFLCMC) units: 66th Air Base Group (ABG), 88th Air Base Wing (ABW), Cryptologic and Cyber Systems Division (HNC) (specifically the Technical Application Products and Space COMSEC Maintenance mission areas), 645 Aeronautical Systems Group (AESG), Armament Sustainment Division (ASD) EBWMT Missile and EBWWE Weapons Engineering Laboratories (Labs), EBWWG Gunsmith Shop (GSS) specifically the geographically separated maintenance function in support of Small Arms/Light Weapons (SA/LW) located at Joint Base Lackland San Antonio, Munitions Sustainment Division (MSD) Laboratory (EBH), and Global Ammunitions Control Point (GACP) Afloat Preposition Fleet (APF) Flight/Cell (EBHMA); AFTC units: Arnold Engineering and Development Complex (AEDC), 704th Test Group (TG) and Plant 42, and Specialized Management Office (SMO); and AFSC units: 72nd ABW, 72nd Logistics Readiness Squadron (LRS)/LGRMW, 75 ABW, 649 MUNS, 78 ABW, 78 LRS/LGRW. Throughout this supplement, the civilian equivalent (unless no civilian may hold the position) may be applied to any reference to a military rank, grade or position. All references to aircraft and equipment maintenance in AFI21-101 include support equipment, test equipment, special projects equipment, etc. The authorities to waive wing/unit level requirements in this publication are identified with a Tier ("T-2, T-3") number following the compliance statement. See Department of the Air Force Instruction (DAFI) 33-360, *Publications and Forms Management*, for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority; if not-tiered, send through chain of command to publication OPR. Submit recommendations for change or improvement to this instruction on Air Force (AF) Form 847, Recommendation for Change of Publication in accordance with DAFI 33-360. For questions on interpreting this instruction, first contact your Quality Assurance (QA) Office/activity. Send questions to the Office of Primary Responsibility (OPR) at AFMC/A4M Workflow (**AFMC.A4M.Workflow@us.af.mil**), 4375 Chidlaw Rd, Bldg 262 Room C117 WPAFB OH 45433-5006. Sustainment Operating Instructions (SOIs) are F-35 joint program instructions provided by the Joint Program Office (JPO). They are developed with Service/Partner participation and provide source documentation for Air Force policies/instructions specific to the F-35 where legacy instructions may not be adequate for the given topic. AFMC units may use SOI source documentation/information that is relevant and complements AFI21-101 and AFMC Sup. SOIs requiring a deviation from AFI21-101 and AFMC Sup requires the unit to submit a waiver. SOIs may be accessed at the following web site: **https://cs.eis.af.mil/f35/sustainment/Logistics%20Support%20Products%20Library/Forms/AllIte** ms.aspx. Air Force Research Laboratory (AFRL) Applicability. AFRL is also identified as a NSO, in the event of a conflict with identification of NSO in this guidance, AFI21-101_AFMC_SUP_Addendum C, *Air Force Research Laboratory (AFRL) Logistics Maintenance Management* will take precedence. This publication must be supplemented by the implementing activities. Ensure all records created as a result of processes prescribed in this publication are maintained IAW Air Force Instruction 33-322, *Records Management and Information Governance Program*, and disposed of IAW the Air Force Records Disposition Schedule located in the Air Force Records Information Management System. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the AFMC.

SUMMARY OF CHANGES

This corrective action revises the following paragraphs: 10.3.1.; 10.3.3.3.3.; 10.11.1.; 10.11.2.1.1.; 10.12.; 10.13.1.; 10.13.1.1., 10.13.6.1 and 11.8.3.15. Additionally, this corrective action deletes para 6.10.1.3.3.1.

Significant changes include the addition of Maintenance Cyber Discipline requirements, Decentralized Materiel Support, incorporation of four AFIs superseded above and establishes a Wing Avionics Manager Position requirement. Additionally, eTool and World Wide Identification (WWID) management procedures were expanded to provide standardized enterprise requirements. MAJCOMs/ANG designated to establish Special Certification Roster (SCR) prerequisites to optimize workforce alignment to mission requirements.

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This publication has been substantially revised and must be completely reviewed in its entirety. Significant changes include the addition of Maintenance Cyber Discipline requirements, Decentralized Materiel Support, incorporation of four AFIs superseded above and establishes a Wing Avionics Manager Position requirement. Additionally, eTool and World Wide Identification (WWID) management procedures were expanded to provide standardized enterprise requirements. MAJCOMs/ANG designated to establish Special Certification Roster (SCR) prerequisites to optimize workforce alignment to mission requirements.

(AFMC) This supplement has been substantially revised and must be completely reviewed in its entirety. It incorporates approved changes submitted through AF Form 847 and the AFMC policy guidance from HQ AFMC/A4M Policy Risk Assessment Effort policy changes A.) Delete the MAJCOM mandatory Quality Assurance (QA) Routine Inspections. B.) Modify to remove flight chief will coordination work beyond Aerospace Ground Equipment (AGE) capability. C.) Remove; Individuals authorized to operate trim box will perform at least one trim utilizing the trim box every 180 days. D.) Remove Command Key Task List (KTL) in favor of using Lead Command KTL. E.) Add required Command guidance to standardized AF Repair Enhancement Program (AFREP). F.) Designate GACP Afloat Preposition Fleet (APF) Cell as a Non Standard Organization (NSO). Additionally, changed policy guidance for Foreign Object Damage (FOD) and Dropped Object Program (DOP) reporting procedures, and designates AF Test Center Specialized Management Office (AFTC/SMO) a NSO. Additional changes were within the Flying Crew Chief Program responsibilities from aircraft commander to Flying Crew Chief, annual CDDAR equipment inventory procedures, establishment of Aircraft Battle Damage Evaluator and training program, Commercial Derivative Aircraft guidance, maintaining serial number inventory accountability for all Communications Security (COMSEC)/Controlled Cryptographic Item (CCI), Maintenance Operations will develop a training plan for individuals assigned to QA that will inspect MXO functions and ensuring fire detection and foam suppression training is included in unit facility manager/occupant training briefings, Maintenance Plans, Scheduling and Documentation (PS&D) guidance and added scheduling option for the use of Rapid Crew Swaps, and deletes the requirement to send the annual AGE inventory to HQ AFMC/A4MM.

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Chapter 1

MANAGEMENT OVERVIEW, SUPPORTING CONCEPTS AND REQUIREMENTS.

1.1. Introduction. This instruction prescribes basic aircraft and equipment maintenance management policy implementation and procedures used throughout the United States Air Force (USAF) to perform Mission Generation (MG) functions.

1.2. Organization. AF organizations are structured according to AFI 38-101, *Air Force Organization*, or as authorized by the Director of Manpower, Organization & Resources (AF/A1M). Contracted maintenance functions are not required to organize IAW AFI 38-101, but will implement the organization as outlined in their proposal as accepted by the government. For the definition of "Lead Command" see AFPD 10-9, *Lead Command Designation and Responsibilities for Weapon Systems.*

1.2. (AFMC) [DEV] Organization. Completed a High Performing Organization pilot program for DoD and is authorized the following deviations to continue taking advantage of the efficiencies achieved during that program:

1.2.1. **(Added-AFMC)** [DEV] The 412th Maintenance Squadron, Component Repair Flight (412 MXS/MXMA), consolidates Avionics, Armament Flight, and the Electro-Environmental, Battery Shop and Egress functions of the Accessory Flight in addition to Tow Targets sections.

1.2.2. **(Added-AFMC)** [DEV] The 412 MXS, Maintenance Flight (MXMX), consolidates the functions of the Maintenance Support Flight (MXMT) and the pneudraulic and fuels functions of the Accessories Flight (MXMC).

1.2.3. **(Added-AFMC)** [DEV] The 412 MXS, Munitions Flight (MXMW) is responsible for the Armament (MXMR) function for Bomber aircraft only due to the geographic location/separation at Edwards AFB, South Base.

1.3. Maintenance Concept. Per AFPD 21-1, organizational, intermediate and depot maintenance capabilities for operational readiness shall be maintained to ensure effective and timely response to peacetime operations, mobilizations, national defense contingencies and other emergencies. **Note:** Guidance for the use of Additive Manufacturing to build replacement parts is prescribed in AFI 63-101/20-101, *Integrated Life Cycle Management*.

1.3.1. As a minimum each capability will be able to:

1.3.1.1. Organizational: launch and recover sorties, maintain and repair materiel coded for organizational level repair.

1.3.1.2. Intermediate: repair materiel coded for organizational and intermediate level repair in back shops, centralized repair facilities, or both.

1.3.1.3. Depot-level Maintenance: Provides the capability to maintain materiel coded for organizational, intermediate and depot levels of maintenance. Includes maintenance requiring the overhaul, upgrading, or rebuilding of parts, assemblies, or subassemblies, and the testing and reclamation of equipment as necessary.

1.3.2. Organizational and intermediate-level maintenance is organized into two mutually exclusive networks, the Mission Generation Network (MGN) and the Repair Network (RN). The MGN is optimized for mission generation at the wing level and consists of authorized "on-

equipment" and "off-equipment" maintenance capabilities required to launch, recover, configure, inspect and repair AF systems and equipment. The RN supports the MGN by providing the maintenance required to fulfill operational needs outside the capability or capacity of MGN activities. The interface between the two networks takes place when the MGN activity relinquishes control of reparable assets to the RN activity (such as, supply counter turn-in) or changing an end item Purpose Identifier Code (PIC) from an operational activity to a repair network activity (such as, depot maintenance).

1.3.2.1. Most MGN units possess a complement of equipment and supplies necessary to perform on-equipment and off-equipment maintenance.

1.3.2.2. RN units may reside at bases that perform mission generation. RN requirements and processes are identified in AFI 20-117, *Repair Network Management*.

1.3.3. MAJCOMs assigned combat coded fighter aircraft will coordinate with Mission Design Series (MDS) lead and using commands and the MAJCOM Operations Directorate (MAJCOM/A3) to develop and document standardized MDS and Primary Aerospace Vehicle (Aircraft) Authorized (PAA) specific utilization rate standards in their supplements to this instruction. At a minimum the rates will:

1.3.3.1. Consider aggregated and analyzed unit generation capability data to identify and document standard MDS turn patterns by PAA in their supplements to **Chapter 14**.

1.3.3.2. Account for standard avionics and weapons training configurations.

1.3.3.3. Account for standard Technical Order (TO) driven turn time inspections and Average Sortie Duration.

1.3.3.4. Include a process for supporting units in assessing shortfalls and developing action plans.

1.3.4. Requests for Assistance. If a maintenance activity requires assistance for evaluation, repair, or both, beyond unit capability, requests are made IAW AFI 21-103, *Equipment Inventory, Status and Utilization Reporting*; TO 00-25-107, *Maintenance Assistance*; and TO 00-20-14, *AF Metrology and Calibration Program*, or automated process as approved by the MDS Program Manager (PM) (for example, C-130 Automated Inspection, Repair, Corrosion and Aircraft Tracking (AIRCAT), F-16 Technical Assistance Request). All requests for assistance must be coordinated through the originating MAJCOM and Lead Command as applicable. **(T-2)**.

1.4. Aircraft Maintenance Tactics, Techniques and Procedures (TTP). TTPs are developed from lessons learned and best practices that provide valuable reference documents to improve maintenance processes and procedures. Maintenance leaders should utilize the maintenance fundamentals TTP volumes (Aircraft, Munitions and Missile) to effectively and efficiently support mission generation. Maintainers who attend the USAF Advanced Maintenance and Munitions Operations School are trained in advanced operational, expeditionary and tactical maintenance management concepts stemming from the alumni's development and formalization of TTPs. Maintenance Group Commander (MXG/CC) should identify their Advanced Maintenance and Munitions Operations School graduates and utilize them as advisors and instructors to enhance mission capability. AFTTP 3-4.21V1, *Aircraft Maintenance*, can be found at: **https://cs2.eis.af.mil/sites/10070/Documents/AFTTP3-4.21V1ACMX.pdf**. For additional

information on Advanced Maintenance and Munitions Operations School and TTP development see Air Force Manual (AFMAN) 21-111, *Advanced Maintenance and Munitions Operations School*.

1.5. Aircraft and Equipment Readiness. Aircraft and equipment readiness is the maintenance mission. The maintenance function ensures assigned aircraft and equipment are safe, serviceable, and properly configured to meet mission needs. Maintenance actions include, but are not limited to, inspection, repair, overhaul, modification, preservation, refurbishment, troubleshooting, testing, analyzing condition, performance and maintenance documentation. All levels of supervision need to place emphasis on safety, quality, and timeliness in the performance of maintenance. The concept of quality maintenance must be fostered by each supervisor and technician to ensure the integrity and skill of each maintainer is not degraded. To the greatest extent possible, maintenance is accomplished on a preplanned scheduled basis. Planning provides the most effective and efficient use of people, facilities, and equipment, reduces unscheduled maintenance, and allows for progressive actions toward maintaining and returning aircraft and equipment to safe operating condition. Exploiting repair network capability and maintaining visibility of repair cycle assets throughout the maintenance cycle are also critical elements of the equipment maintenance program.

1.5.1. Preventive Maintenance. AF units implement and manage the tasks specified in the scheduled recurring maintenance program for their assigned aircraft and associated support equipment (SE). Preventive maintenance is achieved through the inspection requirement concepts described in TO 00-20-1, *Aerospace Equipment Maintenance Inspection, Documentation, Policy, and Procedures*, and applicable weapon system -6 TO

1.5.2. MAJCOMs that conduct Mission Generation Assessments or similar weapon system logistic evaluations in order to validate unit readiness will:

1.5.2.1. Provide units a standardized assessment report containing, at a minimum, positive, negative and areas for improvement feedback to facilitate crosstell to like units.

1.5.2.1.1. Analyze unit generation processes to capture and communicate best practices.

1.5.2.1.2. Analyze unit generation performance to identify and communicate noteworthy trends.

1.5.2.2. Directorates of Logistics, Engineering & Force Protection (MAJCOMs A4s) will semi-annually report their top three trends and causal factors to the Logistics Board to facilitate debate to identify and mitigate potential limiting factors. Submit MAJCOM top three trends to the AF/A4LX workflow no later than 30 days prior to each Logistics Board meeting for consolidation at: **usaf.pentagon.af-a4.mbx.a4-elg-workflow@mail.mil**.

1.6. Maintenance Discipline. It is the responsibility of all maintenance personnel to comply with all written guidance to ensure required repairs, inspections, and documentation are completed in a compliant, safe, timely, and effective manner. Supervisors are responsible for enforcing and establishing a climate that promotes maintenance and supply discipline. Unless expressly stated otherwise in a particular instruction, waiver, or deviation in this AFI granted by the appropriate authority, all Airmen must follow AFIs. **(T-1)**. AFIs do not provide optional guidance, and failure to comply with AFIs can result in disciplinary action as described in AFI 1-1, *Air Force Standards*.

Civilian personnel who violate punitive publications may also be subject to disciplinary action. See AFI 33-360 for more detailed information on the use of punitive language in publications.

1.6.1. Compliance Terminology. For the purposes of this instruction, the following definitions apply:

1.6.1.1. Shall, Must, Will - Indicates mandatory requirements. **Note:** "Will" is also used to express a declaration of purpose for a future event.

1.6.1.2. Should - Indicates a preferred method of accomplishment.

1.6.1.3. May - Indicates an acceptable or suggested means of accomplishment.

1.6.2. Use of TOs and TO Supplements. All personnel will enforce compliance with technical data. **(T-1)**. Use of prescribed technical data to maintain aircraft and equipment is mandatory and will be conducted and managed IAW TO 00-5-1, *Air Force Technical Order System*. **(T-1)**.

1.6.3. AFTO Form 492, *Maintenance Warning Tag*. The Air Force Technical Order (AFTO) Form 492, *Maintenance Warning Tag*, is used as prescribed in technical data, local procedures, or both, to flag a condition that could cause damage or injury if ignored. Refer to TO 00-20-1 for additional guidance. **Note:** The AFTO Form 492 is replacing the AF Form 1492, *Warning Tag* referenced in AFMAN 91-203, *Air Force Occupational Safety, Fire, and Health Standards*. Use of the AF Form 1492 is authorized until supplies are exhausted.

1.7. Communications Security (COMSEC)/Controlled Cryptographic Item (CCI) Accountability. The Air Force COMSEC/Central CCI Authority is the Cryptologic and Cyber Systems Division, Joint Base San Antonio-Lackland, Texas.

1.7.1. Installed COMSEC/CCI accountability will be accomplished IAW AFMAN 17-1302-O, *Communications Security (COMSEC) Operations* and AFI 23-101, *Air Force Material Management*. **(T-1)**. Ensure all serially controlled and serially tracked COMSEC/CCI information is entered into the Maintenance Information System (MIS) IAW TO 00-20-2, *Maintenance Data Documentation*. **(T-1)**.

1.7.1.1. Maintain serial number inventory accountability for all COMSEC/CCI issued or removed to Facilitate Other Maintenance (FOM) in Tail Number Bin (TNB) IAW **Paragraph 9.19**. Tail Number Bins of this instruction.

1.7.1.2. Questions concerning COMSEC/CCI accountability can be directed to the Cryptologic and Cyber Systems Division's COMSEC Policy Office Air Force Life Cycle Management Center (AFLCMC/HNCLS).

1.7.1.2. **(AFMC)** Questions concerning COMSEC/CCI accountability can be directed to the Cryptologic and Cyber Systems Division's COMSEC Policy Office Air Force Life Cycle Management Center (AFLCMC/HNC-PS).

1.7.2. Maintenance Cybersecurity Discipline.

1.7.2.1. Maintaining positive maintenance cyber discipline practices of Department of Defense (DoD) Information Technology (IT) is critical to sustaining the mission. Department of Defense Instruction (DoDI) 8500.01, *Cybersecurity*, defines both hardware and software that is physically part of, dedicated to, or essential in real-time to the mission assurance of special purpose weapon systems. DoD IT is the most common IT encountered

in flightline environments, and includes (but is not limited to) electronic tools (eTools), aircraft and associated support equipment. The culture of positive cybersecurity awareness and actions necessary to sustain cyber resiliency is required by all maintenance personnel to mitigate allusive cyber threats and optimize enduring mission generation capabilities.

1.7.2.1.1. All users perform an integral role in prevention, detection, and reporting suspected corrupted software of DoD IT which includes Information Systems (IS) and Platform Information Technology (PIT), which is an electronic platform with information technology for a specific function. See **Table 1.1**

Table 1.1. Tiered Interface Examples.

TIER	Type of Interface	Examples	Applicable TOs
1	On-Board	EC-130, XX-135, E-3, E-8	Device TO
2	Directly Connected	F-22 PMA, F-35 PMA, Viper MLV, CAPRE, CETS, DTADS	Device TO
3	Indirectly Connected	Test Eqpt., Support Eqpt., ATS, ATE, AIS, VDATS	TO 33-1-38
4	Not Connected	eTools	TO 00-5-1

1.7.2.1.1.1. All users must consult airframe Security Classification Guides, TO 33-1-38, *Cybersecurity for Automatic Test Equipment and Support Test Equipment (ATE/STE)*. TO 33-1-38 provides guidance for Cybersecurity Incident Reporting and refers users to applicable technical manuals, instructions and publications when determining the classification of cybersecurity incidents and vulnerability documents. **(T-1)**.

1.7.2.1.2. Authorized and unauthorized uses of IT and PIT. All users must have the ability to distinguish between authorized and unauthorized uses. **(T-1)**.

1.7.2.1.2.1. Authorized uses must be vetted through a formal cybersecurity assessment process and be directed in specific TO guidance. **(T-1)**. The governing TOs or equivalent publications specifically define authorized uses.

1.7.2.1.2.2. Unauthorized uses include: connecting any hardware, uploading or downloading software, or media not explicitly defined by TOs. This includes but is not limited to: personal devices, phones, tablets, computers, Universal Serial Bus drives, and similar devices.

1.7.2.1.2.3. DoD IT, derivative AF Publications, and TOs provide users guidance on Automated Computer Program Identification Number System devices acquired from local Communications Squadrons and media obtained from DoD contractors.

1.7.2.1.2.4. All users will follow the applicable TO when directly or indirectly connecting computers and equipment to the aircraft or support equipment, and when uploading or downloading data. **(T-1)**.

1.7.2.1.2.5. All users will immediately discontinue use, report, and turn into the appropriate functional authority IT and PIT (WAM, Wing Cybersecurity Office,

and the Mission Defense Teams/Cyber Squadron, if assigned) that are suspect for containing malicious software, malicious code, software bugs or unauthorized use. **(T-1)**.

1.7.2.1.2.6. All users will complete Maintenance Cyber Discipline Training annually in Advanced Distributed Learning Service (ADLS) or equivalent training method. **(T-1)**.

1.7.2.1.3. MDS Lead Commands in coordination with the applicable PM will develop MDS and Support Equipment (SE) cyber threat mitigation methods and procedures for Organizational and Intermediate level maintenance activities. The methods and procedures must detect malicious code, report cyber incidence and issues, and remediate the incidence and issue affecting the MDS or SE. **Note:** Mitigation plan should be developed per DoDI 8500.01; TO 33-1-38, DoD 8570.01M, *Information Assurance Workforce Improvement Program*; Military Standard (MIL-STD)-38784A, *General Style and Format Requirements For Technical Manuals*; 17- series AFIs.

1.7.2.1.3.1. The cyber threat mitigation methods must include MDS and SE specific training requirements. **(T-1)**. **Note:** Training requirements could include training aids, for example, computer-based training on how the flightline maintainer should scan support equipment for malicious software.

1.7.2.1.3.2. Lead Commands must ensure current MDS and SE specific malicious code definitions are available to ensure positive cyber threat mitigation management support is available. **(T-1)**.

1.7.2.1.3.2.1. MAJCOM and ANG will report system-specific cyber incidents to the applicable MDS Lead Command.

1.7.2.1.3.2.2. MAJCOM and ANG will follow airframe Security Classification Guides, TOs, and applicable technical manuals when providing “cross tell” to inform their subordinate units about system-specific cyber incidents, threats, and issues.

1.7.3. **eTools.**

1.7.3.1. eTools are portable electronic devices (such as laptop computer, handheld device) that operate in a disconnected mode and, are certified to inter-operate on AF networks. eTools are mission critical; the primary purpose is for viewing electronic technical publications and in some cases are used to exchange maintenance data with approved MIS at the point of maintenance. eTools are procured IAW AFMAN 17-1203, *Information Technology (IT) Asset Management (ITAM)*. **Note:** eTools do not include electronic devices and test equipment issued and configuration managed by a system PM (aircraft test and support equipment).

1.7.3.2. MAJCOM/ANG A4s, will develop and implement standardized guidance on the management, use, storage, configuration, content update, security and cyber hygiene processes necessary to support the approved use of all assigned eTools consistent and IAW the weapon system MDS specific technical orders and threat specific Air Force and DoD cyber publications.

1.7.3.3. The MAJCOM/ANG A4 guidance will include any assigned command-wide cyber threat awareness and mitigation strategies with reference to supporting publications, technical orders, and MAJCOM eTool OPR contact information in their supplement or addendum to this AFI.

1.8. Environmental Compliance. It is the responsibility of all maintenance personnel to comply with all written guidance to ensure compliance with hazardous material, hazardous waste management and air emissions record keeping as required for environmental compliance IAW AFI 90-821, *Hazard Communication (HAZCOM) Program*, installation Environment, Safety, and Occupational Health Management System/Environment Management System (ESOHMS/EMS) policy/guidance and applicable environmental requirements and guidance. **(T-1)**.

1.9. Publications. Units may tailor procedures to the unique aspects of their own maintenance operation and publish directives, instructions, supplements, addendums, and, for functional areas, Operating Instructions (OI) IAW AFI 33-360.

1.9.1. Develop, control, and maintain functional and emergency action checklists. At a minimum, each checklist is titled, dated and coordinated with the wing safety office. Functional checklists are not to be used in place of or to circumvent technical data for operation, servicing, inspection or maintenance of aircraft, aircraft systems, munitions, and all other equipment supporting aircraft and munitions maintenance.

1.9.2. Methods and Procedures Technical Orders (MPTOs): Due to the close relationship between MPTOs and this AFI, all changes and revisions to the MPTOs cited in **Attachment 1,** References of this AFI will be routed from Air Force Material Command (AFMC) to AF/A4LM for content review for conflicts and policy gaps identification and mitigation prior to submission for publication.

1.10. Maintenance Training. Maintenance training provides initial, recurring and advanced proficiency, qualification, or certification skills needed by a technician to perform duties in their primary Air Force Specialty Code (AFSC), Civilian Job Series, or equivalent. Maintenance training includes combat and sortie generation skills not normally integrated into peacetime operations (such as, munitions handling, and external fuel tank build-up, hot refueling). Maintenance training carries an equal priority with the operational training mission. For maintenance training policy and guidance, refer to AFI 36-2650, *Maintenance Training* and MAJCOM supplements.

1.11. Modification Management. A modification proposal is a recommendation to change the operation, use, or appearance of AF equipment. Modifications (temporary, permanent, or safety) to AF aircraft or equipment are expressly prohibited without PM approval. **Note:** PM is used in this publication as defined in AFPD 63-1, *Integrated Life Cycle Management*. Refer to AFI 63-101/20-101, for modification management procedures.

1.11.1. Modifications to Munitions. All proposed modifications to aircraft-carried munitions include AFI 63-101/20-101 and SEEK EAGLE certification IAW AFI 63-101/20-101and Air Force Pamphlet (AFPAM) 63-129, *Air System Development Process and Procedures*. All modifications to AF nuclear munitions or their associated support and training equipment are nuclear certified IAW AFI 91-103, *Air Force Nuclear Safety Design Certification Program* and AFI 63-125, *Nuclear Certification Program*. All modifications to AF conventional

munitions or their associated support and training equipment are certified IAW AFI 91-205, *Non-Nuclear Munitions Safety Board*.

1.12. Maintenance Information Systems (MIS). MIS refers to automated maintenance information systems that support and enable maintenance business processes. MIS is used to document maintenance actions and track fleet health. The information entered into the MIS is accomplished IAW TO 00-20-2 and matches the content of the aircraft forms. MIS data entries do not have to be accomplished by the same individual who documented the aircraft forms, but employee numbers, man numbers, and User IDs of individuals accomplishing the actual work are entered into the MIS. Red Ball maintenance is documented IAW **Chapter 11**. Data integrity is the responsibility of every member of the unit. All personnel are responsible for ensuring accuracy and completeness.

1.12.1. Units use the approved MIS for their assigned weapon system.

1.12.2. Serial numbers will be documented in the MIS for all serially-controlled and tracked assemblies that are identified by an asterisk in the Work Unit Code (WUC) or Logistics Control Number (LCN) manual IAW TO 00-20-2.

1.13. General Safety Guidance. Maintenance personnel are exposed to a large variety of hazardous situations, machinery, equipment, and chemicals. Most hazardous situations can be avoided by following approved procedures, asking for assistance when needed, and using all required personal protective equipment (PPE).

1.13.1. Safety "Knock It Off" and Risk Management. Due to the inherent danger to life, limb, and property associated with maintenance operations, personnel are empowered to terminate an operation or situation which they perceive is unsafe or too dangerous. When supervisors or crew leaders become task-focused, junior personnel are often better able to assess the danger; however, deferring to the experience and judgment of the supervisor or crew leader, they may choose to remain silent, missing an opportunity to break the mishap sequence chain. Maintenance commanders and supervisors are responsible for fostering a culture in their units so that a simple, but recognizable "audible" from anyone can prevent a potential mishap. **Note:** See AFI 90-802, *Risk Management*, and AFPAM 90-803, *Risk Management (RM) Guidelines and Tools* for additional information.

1.13.2. Visitors. Unit Commanders shall not permit visitors to operate any AF equipment unless they are qualified to operate such equipment and are doing so in the performance of their assigned official duties. **(T-1)**. Visitors will not be allowed in the flightline area if munitions operations are present IAW AFMAN 91-201, *Explosive Safety Standards*. **(T-1)**.

1.14. Duty Shifts and Rest Periods. MXG/CC or equivalent will establish minimum requirements that ensure units (home station or deployed) maintain an equitable distribution of supervision (Officer and Senior Non-Commissioned Officer (SNCO)) across all on-duty shifts in their supplement to this AFI. **(T-2)**.

1.14.1. During normal operations, maintenance personnel are scheduled for duty based on a 40-hour work week. Maintenance personnel duty hours are aligned to provide optimal mission support.

1.14.2. Personnel will not be scheduled for more than 12 hours of continuous duty time. **(T-1)**. Duty time begins when personnel report for duty and ends when their supervisor releases

them. Time spent in exercise or contingency deployment processing lines and in-transit counts toward the total duty day. Exception: MXG/CCs are the final approval authority for duty time extensions exceeding the 12-hour limit up to a maximum of 16 hours. **Note:** Aircraft or detachment commanders assume this responsibility in Temporary Duty (TDY)/travel status.

1.14.3. Commanders and supervisors will provide a rest period after each shift. **(T-1)**. A rest period is a block of time that gives a person the opportunity for 8 hours of uninterrupted sleep in a 24-hour period. **Note:** This rest period also applies during exercises or inspections.

1.14.4. Personnel will not handle, load or perform maintenance on nuclear weapons, conventional munitions, or egress explosives beyond a 12-hour continuous duty period. **(T-1)**. This requirement may not be waived for exercises or inspections; however, the 12-hour continuous duty period may be exceeded for shift turnover or administrative actions only and will be avoided to the maximum extent possible. The MXG/CC or equivalent may waive this requirement during advance defense readiness conditions, actual emergencies as defined in DoD Directive 3150.02, *Department of Defense Nuclear Weapons Surety Program*, or to resolve an unexpected event (such as disabled vehicle, Weapons Storage and Security System fault, hoist failure).

1.14.5. In alert force or standby duty situations where facilities are available for resting, established norms may be exceeded. Adjust rest periods to allow for 8 hours of uninterrupted sleep.

1.14.6. Commanders and supervisors will ensure individuals are afforded adequate duty rest periods and breaks to prevent fatigue or thermal injury. **(T-1)**. Stop anyone if fatigue may jeopardize safety. In all cases, aircraft commanders or supervisors ensure aircraft maintenance personnel are not required to perform duty when they have reached the point of physical or mental fatigue rendering them incapable of performing their assigned duties safely and reliably.

1.14.7. MAJCOM Commanders will assume the risk for any Flying Crew Chief (FCC) deviations from normal duty shifts, rest periods, and exceedance of the 16-hour maximum duty day. MAJCOM Commanders will publish risk-mitigation procedures in order to meet critical mission requirements.

1.15. Communications. Commanders shall develop communication plans according to AF mission requirements. **(T-2)**. See **Chapter 11** for detailed communication requirements.

1.15.1. Effective maintenance accomplishment requires the ability to efficiently and effectively communicate across all facets of the maintenance operation. Communication technology (government issued Portable Electronic Devices (PED), Portable Maintenance Aid (PMA), radios, cell phones, computers, wireless internet) must be available to expedite personnel, equipment, material, and maintenance data throughout the maintenance complex. **(T-2)**.

1.15.2. MAJCOMs will publish guidance for the use and control of personal communications devices (personal cell phones, tablets and computers) on the flightline, in munitions areas, hangars, and other industrial work areas as required to mitigate cyber risk and ensure compliance with cyber and communication AFI requirements relevant to their operational environments.

1.15.2.1. **(Added-AFMC)** Cell Phones/Cameras in Industrial Areas. Cell phones/cameras are prohibited when directed by safety/classified/special access requirements or TOs. Note these areas will be clearly marked with signs so it is obvious to all that it is an electronic device/cell phone restricted area. **(T-2).**

1.15.2.2. **(Added-AFMC)** Use of a privately owned cell phone or communication devices are authorized in the industrial/production areas except while performing hands-on maintenance activities. Employees will remove themselves from any maintenance activity, aircraft, or high traffic areas prior to using a communication device. **(T-2).**

1.15.2.3. **(Added-AFMC)** Use of portable music/video players, electronic games or other personal electronic hearing impairing devices are authorized in industrial production areas except where audio warning cues are used. Prohibited items do not include, stereos and other sizable devices**.**

1.15.3. Unit Commanders will enforce procedures that prohibit the introduction of government or personal cellular, personal communications system, Radio Frequency (RF), Infrared (IR) wireless devices, and other devices such as cell phones and tablets, and devices that have photographic or audio recording capabilities into areas (for example, rooms, offices) where classified information is stored, processed, or discussed IAW AFMAN 17-1301, *Computer Security (COMPUSEC)*. **(T-1)**. Coordinate waiver requests with the applicable Approving Official (AO), and ensure adherence to Certified TEMPEST Technical Authority (CTTA) requirements IAW Department of Defense Directive (DoDD) 8100.02, *Use of Commercial Wireless Devices, Services, and Technologies in the DoD Global Information Grid (GIG)* written approval by the AF CTTA IAW AFI 16-1404, *Air Force Information Security Program*, NIST SP 800-53A Revision 4, *Assessing Security and Privacy Controls in Federal Information Systems and Organizations: Building Effective Security Assessment Plans*, and the Enterprise Authorizing Official (AO) IAW AFI 31-101, *Integrated Defense (ID)* and AFMAN 17-1301. **(T-1)**.

1.16. Maintenance Repair Priorities. Maintenance repair priorities are listed in **Table 1.2** This does not prohibit the Production Superintendent (Pro Super), in coordination with the Maintenance Operations Center (MOC), from changing the maintenance repair priority when warranted. During tasked Operational Plan (OPLAN) or operational exercise, the pre-planned maintenance flow determines the job sequence. The maintenance repair priority and the Logistics Readiness Squadron (LRS) delivery priorities (listed in Air Force Handbook (AFH 23-123V, *Materiel Management* Reference Information) are normally identical. Raising or lowering maintenance repair priorities does not necessarily require a corresponding change in the LRS delivery priority. However, the Pro Super may authorize the use of a less responsive LRS delivery priority.

Table 1.2. Maintenance Repair Priority Designators.

PRIORITY	APPLICATION
1	Aircraft on alert status, war plan or national emergency missions, including related Aerospace Ground Equipment (AGE), munitions and Munitions Support Equipment.

2	Primary mission aircraft, related AGE, munitions, and munitions support equipment, for the first 8 work hours after landing or start of recovery or within 6 work hours of a scheduled launch, alert or test flight and during simulated generation or Operational Readiness Exercises (ORE). Air evacuation, rescue, weather (WX) mission aircraft, related AGE, munitions, and munitions support equipment. All transient support, and FAA aircraft. Flight or missile crew training simulator, other training equipment or related AGE required repair, which is impacting the mission by preventing or delaying student training.
3	Primary mission aircraft, engines, air launched missiles and related AGE, munitions and munitions equipment, and equipment undergoing scheduled or unscheduled maintenance, if not performed or repaired will prevent or delay mission accomplishment. Transient air vehicles not otherwise listed. Administrative aircraft within 8 hours of scheduled flight or on alert status with standby crews. Time change requirements for nuclear weapons. Repair cycle assets to satisfy a Mission Impaired Capability Awaiting Parts (MICAP) condition. Spares not available in supply. Critical end items and spares not available in supply. Routine maintenance of aircrew or missile-training simulator, or other training devices or related AGE or sites and aircraft or equipment used for maintenance training. Avionics shop electronic AGE and automated test stations.
4	Routine or extensive repair of primary air mission and related AGE and repair cycle assets. Administrative aircraft undergoing scheduled or unscheduled maintenance. Routine maintenance of AGE, not otherwise listed above. War Reserve Materiel (WRM) items due maintenance or inspection.

	Inspection, maintenance, and Time Compliance Technical Order (TCTO) compliance of Mission Support Kit or Mobility Readiness Spares Package (MRSP) materiel. Extensive repair of aircrew or missile training simulators, other training devices, or related AGE. Inspection, maintenance, and TCTO compliance of munitions and munitions equipment, excluding spares excess to base requirements not listed above. Scheduled calibration and unscheduled repairs on Precision Measurement Equipment (PME) not listed above. Scheduled maintenance to include periodic inspections, routine TCTO, Master Configuration Lists (MCL) Grounding, and Time Change Items (TCIs). Primary mission Comprehensive Engine Management System (CEMS) or equipment including associated AGE undergoing extensive repair or modification.
5	Non-tactical or non-primary-mission aircraft undergoing extensive repair. Fabrication and repair of aeronautical items not carrying a higher priority. Bench stock requirements. Extensive repair of aircrew training devices. Time change requirements not listed above. Routine repair of AGE and repair cycle assets. Alternate and other CEMS or equipment, including associated AGE undergoing extensive repair or modification. Clearing routine delayed discrepancies on training equipment or AGE, and routine maintenance which will not impair or affect mission accomplishment. Equipment requirements.
6	Fabrication and repair of non-aeronautical items. Repair cycle asset shortages required to fill a peacetime operating stock authorization
7	Spares/repair cycle assets excess to base requirements.

1.17. Associate Unit Program/Total Force Integration (TFI). The USAF employs the Associate Unit/TFI program in some locations where RegAF and Air Reserve Component (ARC) units are collocated and share aircraft, equipment, facilities, and other resources IAW AFI 90-

1001, *Planning Total Force Associations (TFAS)*, and MAJCOM supplements. For the purpose of this instruction, in an Active Association, the ANG or AFR owns the aircraft, and RegAF personnel will follow ANG or AFR maintenance policy. **(T-1)**. In an ARC association, AFR owns the aircraft, and ANG personnel will follow AFR guidance, or vice versa. **(T-1)**. In a classic association, RegAF owns the aircraft, and ANG or AFR personnel will follow RegAF maintenance policy. **(T-1)**. Type of association is determined by the Program of Record for the associated unit.

1.18. Performance-Based Activities. MAJCOMs may publish the basic responsibilities for managing performance-based activities.

1.18.1. If published MAJCOMs will:

1.18.1. **(AFMC)** Performance-based activities (AFMC/A1MR) are coordinated/collaborated with the appropriate HQ AFMC/A4/10 MAJCOM Functional Manager (MFM)/Functional Area Manager (FAM).

1.18.1.1. Designate focal points for organizational, functional, and technical questions pertaining to each performance-based activity program.

1.18.1.2. Specify measurement areas and performance levels required for aircraft, systems, and equipment operated or maintained by performance-based activities.

1.18.1.3. Specify the forms, methods of documentation, and frequency of reporting used to assess performance-based activities and ensures these requirements are included in the Quality Assurance Surveillance Plan (QASP).

1.18.1.4. Ensure units with assigned Contracting Officer Representative personnel meet requirements in AFI 63-138, *Acquisition of Services*.

1.18.1.5. Ensure aircraft depot maintenance contracts, Statements of Work (SOW), and Performance Work Statements (PWS) are coordinated with the applicable MAJCOM Functional, to include Munitions.

1.18.2. Unit Commanders will:

1.18.2.1. Designate a focal point for all functional, technical, and contracting officer representative matters pertaining to performance-based activities. **(T-1)**.

1.18.2.2. In coordination with the contracting officer and the Program Manager of Functional Services Manager, provide specific guidance to the performance-based activity to ensure proper maintenance discipline and flight worthiness of aircraft and subsystems. **(T-2)**.

1.18.2.3. Develop and publish contingency procedures for support of continuing operations in the event of disruption, termination, or default of contracts. **(T-1)**.

1.19. Changes to Technical Orders. Official TO updates are the only valid authority for maintaining TO accuracy and currency. To maintain this currency, the AF has instituted an enterprise electronic TO Recommended Change (RC) process.

1.19.1. The Enhanced Technical Information Management System (ETIMS) is the required system for Recommended Change management and this process replaces the AFTO Form 22, *Technical Manual(TM) Change Recommendation and Reply*, AFTO Form 252, *Technical Order Publications Change Request* and the AF Form 847.

1.19.2. There are specific organizations that may require the deviations or exceptions for those who do not have access to ETIMS. Refer to TO 00-5-1 for specific guidance on the RC process.

Chapter 2

ROLES AND RESPONSIBILITIES

2.1. General. This chapter outlines responsibilities for commanders and key leaders involved in maintenance activities. Compliance of this instruction, in units where there is not a military commander responsible for maintenance, the applicable civilian Director of Maintenance (DOM) will ensure compliance with all responsibilities in this instruction. **(T-1)**. For organizations without all commanders and key leaders assigned, MAJCOMs will identify equivalent positions of authority commensurate with the responsibilities of the leadership positions identified in this **Chapter** in a MAJCOM supplement to this instruction.

2.1. (AFMC) General. The civilian equivalent (unless no civilian may hold the position) may be applied to any reference to a military rank, grade or position.

2.1.1. For the purpose of this instruction, contractor equivalents are as follows: A1C—aircraft servicer or apprentice/journeyman; SrA (1-year time-in-grade)—aircraft worker or field maintenance worker or higher; SSgt—aircraft mechanic or field maintenance mechanic or higher; TSgt—senior mechanic or craftsman; MSgt—lead mechanic; SMSgt/CMSgt/maintenance officer—foreman, branch chief or higher. MAJCOMs may determine grade and skill level equivalents for civilians.

2.1.2. The functional authority to determine the need and design for civilian uniforms, under the purview of maintenance is delegated to the MAJCOMs/ANG. As such, all functional authority requirements set forth in AFI 36-128, *Pay Settings and Allowances* will also reside at the respective MAJCOM. The routing requirements for final approval of uniform requests and the establishment of uniform allowances will be in accordance with AFI 36-128.

2.2. Wing Commander (WG/CC) Responsibilities. The WG/CC allocates resources to meet all mission requirements. The WG/CC will:

2.2.1. Ensure that maintenance organizations are not overtasked with augmentation duties outside maintenance functional areas. **(T-1)**.

2.2.2. Conduct a "Wing Standup" meeting. **(T-1)**. The MAJCOM/ANG will establish “Wing Standup” meeting frequency that synchronizes communications necessary to optimize fleet readiness and mission generation capability in their supplement to this AFI. **(T-2)**.

2.2.2. **(AFMC)** [DEV] Daily “Wing Standup” meeting may be delegated to the MXG/CC or OG/CC. At a minimum, the WG/CC will chair this meeting once a week. **(T-2)**

2.2.3. Ensure a coordinated wing or base instruction is developed that implements procedures to control tools, equipment, electronic devices, and establishes cyber discipline and reporting requirements that provide operational guidance across all wing or base agencies dispatching to aircraft runway, taxiways, parking and maintenance areas. **(T-1)**.

2.2.3.1. Ensure home station Base Support Plans (BSP) include contingency eTools bare base, comm-out and cyber-out operating procedures based on worst-case deployment requirements. Periodically exercise operations (as part of scheduled local exercises) in this simulated deployed environment to validate equipment, personnel and processes provide the required mission generation capability. **(T-1)**.

2.2.3.1.1. Develop and maintain local cyber abatement and status reporting procedures that optimize cyber resiliency and the ability to mitigate and recover from cyber threats affecting assigned mission or sortie generation operations. **(T-1)**.

2.2.3.1.2. Ensure maintenance and communications organizations have procedures in place to effectively collaborate and expeditiously respond to cybersecurity incidents for maintenance Platform Information Technology (PIT) and report in accordance with TO 33-1-38 or equivalent publication. **(T-1)**.

2.2.4. Ensure maintenance and operations develop a joint annual maintenance and Flying Hour Program (FHP) that establishes a balance between the requirement for sorties and maintenance capability. **(T-1)**. The WG/CC will:

2.2.4.1. Establish a joint MXG and OG planning and scheduling cycle to ensure the best use of aircraft, equipment, and personnel to accomplish short-term sortie production and long-term fleet health. **(T-1)**.

2.2.4.2. Approve the weekly; monthly, quarterly, and annual flying or test schedules IAW **Chapter 14** **(T-1)**.

2.2.4.3. Direct the use of the Maintenance Capability and Capacity (MxCAP2) model or equivalent, if available, for the assigned MDS. **(T-1)**. The MxCAP2 model provides the ability to forecast and evaluate the impact of changing requirements (such as, deployments, changes in aircraft availability, maintenance AFSC shortages, or locally developed scenarios) on a maintenance unit's sortie generation capacity.

2.2.4.3. **(AFMC)** Due to the non-standard nature of the test mission, the use of the MxCAP2 model is not conducive in projecting annual flying capabilities. Use of local tools is authorized.

2.2.5. Vector future leaders to attend the Senior Leader Mission Generation (SLMG) Course following the course description and criteria listed in **Chapter 11** **(T-1)**.

2.2.6. Sustain a Crashed, Damaged, or Disabled Aircraft Recovery (CDDAR) capability for assigned active airfields and runways IAW **Chapter 11** and develop a wing publication IAW AFI 33-360 containing specific responsibilities for all applicable base support agencies. **(T-1)**.

2.2.7. Identify specific responsibilities and outline unique materiel management support requirements necessary to optimize wing level maintenance and mission generation operations. Establish processes and responsibilities for maintenance units and work centers without material management support in a local publication. **(T-1)**.

2.3. Wing Vice Commander (WG/CV) Responsibilities. The WG/CV (or equivalent) will:

2.3.1. Manage the Foreign Object Damage (FOD) and Dropped Object Prevention (DOP) Programs. **(T-1)**. The WG/CV is the FOD/DOP Prevention Program Manager and will appoint a qualified technical sergeant (or above), civilian equivalent, or contractor, if designated by performance work statement, as the FOD/DOP Prevention Monitor(s) IAW **Chapter 11** **(T-1)**.

2.3.2. Ensure the wing safety office, base operations, and emergency services actively participates in development and coordination of base functional and emergency action checklists. **(T-2)**. Ensure content includes and complies with all required safety standards,

evacuation distances and MDS specific hazards (such as, egress systems, Hydrazine). **(T-1)**. Ensure checklists address all known hazards associated in responding to mishaps, adverse weather, natural disaster, and other emergency responses. **(T-2)**. **Note:** Review, update and coordinate functional and emergency action checklist with using units every two years IAW **Paragraph 6.3.4**.

2.4. Maintenance Group Commander (MXG/CC) Responsibilities. In addition to the responsibilities listed below, the MXG/CC or equivalent must ensure compliance with the maintenance requirements and programs in **Chapter 11** **(T-1)**. Approved variations in the MXG organization does not relieve the MXG/CC of compliance with all the requirements of this AFI. **(T-1)**. The MXG/CC (or equivalent) will:

2.4.1. Establish a radiation protection program IAW AFI 48-109, Electromagnetic Field Radiation Occupational & Environmental Health Program, when applicable. **(T-1)**.

2.4.2. Appoint an MXG Environmental Coordinator IAW AFI 32-7001, *Environmental Management*. **(T-1)**. Refer to AFI 90-821, installation ESOHMS/EMS policy, guidance and applicable environmental requirements and guidance, AFMAN 91-203, and AFMAN 32-7002, *Environmental Compliance and Pollution Prevention*, for additional guidance.

2.4.3. Ensure maintenance is only performed by personnel who are trained, qualified, and certified, unless under the direct supervision of a trainer or certifier. **(T-1)**.

2.4.4. Ensure standardization of maintenance discipline, procedures, organizational structures, compliance, and management philosophy. **(T-1)**.

2.4.5. Coordinate functional and emergency action checklist with Fire Emergency Services, Wing Safety, and the Airfield Operations Flight in developing adverse weather procedures for protecting aircraft and equipment IAW AFMAN 91-203, AFI 10-2501, *Air Force Emergency Management Program*, and MDS-specific technical data. **(T-1)**.

2.4.6. Establish and support a Data Integrity Team (DIT), refer to **Chapter 5** **(T-1)**.

2.4.7. Approve and publish In Process Inspection (IPI) listings every two years IAW **Chapter 6** **(T-1)**.

2.4.8. Ensure the Maintenance Standardization and Evaluation Program (MSEP) requirements are implemented IAW **Chapter 6** **(T-1)**.

2.4.9. Ensure effective management of the MXG's total maintenance training program IAW AFI 36-2651, *Air Force Training Program* and AFI 36-2650. **(T-1)**. **Note:** The MXG/CC may authorize the Munitions Squadron, Flight Commander, or Chief to chair the munitions scheduling and training meetings and publish schedules. The MXG/CC will:

2.4.9.1. Ensure Master Training Plans (MTPs) are developed IAW AFI 36-2651 and training is accomplished according AFI 36-2650. **(T-1)**.

2.4.9.2. Assign and manage Special Experience Identifier (SEI) referenced in the Air Force Enlisted Classification Directory at: **https://www.my.af.mil/gcss-af/USAF/ep/globalTab.do?channelPageId=s6925EC134CCB0FB5E044080020E329A9** in the AF Portal.

2.4.9.3. Support the maintenance training program by allocating aircraft, personnel, facilities and equipment. **(T-1)**.

2.4.10. Approve requests for assistance IAW **Chapter 1** after they are coordinated with Plans, Scheduling, and Documentation (PS&D), Quality Assurance (QA), and all applicable maintenance organizations. **(T-1)**.

2.4.11. Designate a focal point for all functional, technical, and COR matters pertaining to performance-based activities. **(T-1)**. Refer to **Chapter 1**

2.4.12. Review the weekly, monthly, quarterly, annual flying or test schedules IAW **Chapter 5** and **Chapter 14** **(T-1)**.

2.4.13. Ensure munitions are accounted for IAW AFMAN 21-201, *Munitions Management*, AFMAN 21-200, *Munitions and Missile Maintenance Management*, AFI 21-203, *Nuclear Accountability*, and AFI 20-110, *Nuclear Weapons-Related Materiel Management*. **(T-1)**.

2.4.14. Establish measures that ensure all maintenance personnel are assigned IAW the Duty Title Tool, are available, and utilized to accomplish critical maintenance tasks necessary to integrate maintenance capabilities that optimize Aircraft Availability (AA). **(T-1)**. Maximize utilization of 7-skill level maintenance personnel in the grade of E-5 to E-7 in direct mission generation roles and minimize their use in staff positions or non-maintenance duties. **(T-1)**. **Note:** Consider utilization of Civil Service MXG/SQ Unit Program Coordinators to consolidate programs to maximize availability of sortie generation maintainers (NCOs) on the flightline to maximize AA.

2.4.15. Establish Minimum Equipment Levels (MELs) for essential maintenance assets to include engines, pods, AGE, vehicles, advocate and reconcile authorized shortfalls and overages. **(T-1)**. Coordinate with the applicable MAJCOM functional to advocate with the respective Program Manager to address any requests to change authorized quantities. **(T-1)**.

2.4.16. Implement an effective Corrosion Prevention and Control Program IAW TO 1-1-8, *Application and Removal of Organic Coatings, Aerospace and Non-Aerospace Equipment*; TO 35-1-3, *Corrosion Prevention and Control, Cleaning, Painting, and Marking of USAF Support Equipment;* TO 1-1-691 *Cleaning and Corrosion Prevention and Control, Aerospace and Non Aerospace Equipment*. **(T-1)**.

2.4.16.1. Appoint a WG Corrosion Manager (2A7X3, 2A7X5) to implement local requirements, ensure implementation of MAJCOM directed requirements and act as the focal point for communicating with external stakeholders. **(T-1)**.

2.4.17. Ensure a nuclear surety program is implemented (if applicable) IAW AFI 91-101, *Air Force Nuclear Weapons Surety Program*, and nuclear munitions are maintained, handled and accounted for IAW AFMAN 21-204, *Nuclear Weapons Maintenance*, AFI 21-203. **(T-1)**.

2.4.17.1. For units possessing Nuclear Certified Equipment (NCE), the MXG/CC will ensure personnel are trained in the proper use of nuclear flagwords, mishap and deficiency reporting instructions IAW AFMAN 91-221, *Weapons Safety Investigations and Reports* and AFI 91-204, *Safety Investigation and Reports*. **(T-1)**.

2.4.18. Ensure effective management of the Engine Trending and Diagnostic (ET&D) program IAW AFMAN 20-116, *Propulsion Life Cycle Management for Aerial Vehicles*. **(T-1)**.

2.4.19. Establish CDDAR capability IAW **Chapter 11** and applicable MDS technical data. **(T-1)**. The MXG/CC will ensure resources and trained personnel are available to perform responsibilities of the CDDAR Program. **(T-1)**.

2.4.20. Develop a 10-year facility plan specifying maintenance, upgrade, and replacement projections for the group's facilities. **(T-1)**. The MXG/CC will:

2.4.20.1. Coordinate plan updates with the installation Civil Engineer (CE) annually. **(T-1)**.

2.4.20.2. Coordinate and prioritize group maintenance facility work orders monthly. **(T-2)**.

2.4.21. Ensure adequate government issued Personal Wireless Communications Systems are available to support mission requirements. **(T-1)**. Refer to **Chapter 11** for further information on Personal Wireless Communications Systems requirements.

2.4.22. Ensure repair cost evaluations are performed and appropriate levels of review and repair authorization are established in squadrons, flights, and repair sections IAW TO 00-20-3, *Maintenance Processing of Repairable Property and The Repair Cycle Asset Control System*, TO 00-25-240, *Uniform Repair/Replacement Criteria for Selected USAF Support Equipment (SE)* and TO 35-1-24, *Air Force Economic Repair/Replacement Criteria For Selected Warner Robins Logistics Complex (ALC) Managed Support Equipment (SE)*. **(T-1)**.

2.4.23. Ensure effective use of the assigned AF Engineering and Technical Services (AFETS), Contractor Engineering and Technical Services (CETS), and contracted Field Service Representatives (FSRs) IAW **Chapter 11** **(T-1)**.

2.4.24. Establish the group maintenance awards and recognition program to meet AF and MAJCOM requirements refer to **https://access.afpc.af.mil/Trophies/searchtrophies.aspx**. **(T-1)**.

2.4.25. Ensure procedures are followed to properly turn in recoverable and consumable items IAW AFI 23-101. **(T-1)**.

2.4.26. Ensure the applicable section "safes" all static display aircraft/systems IAW the applicable 00-80-series and weapon system-specific TOs. **(T-1)**.

2.4.27. Approve MXG Key Task List (KTL) and Routine Inspection Lists (RIL). **(T-1)**.

2.4.28. Ensure an orientation program is developed and conducted for all personnel newly assigned to MXG maintenance or equivalent maintenance activities IAW AFI 36-2650. **(T-1)**.

2.4.29. Implement MAJCOM Lead the Fleet (Pacer) Program for engine type IAW AFMAN 20-116. **(T-2)**.

2.4.30. Establish and document MXG local manufacture procedures and controls in a supplement to this instruction. **(T-1)**.

2.4.31. Ensure the MXG Oil Analysis Program (OAP) complies with **Chapter 11** **(T-1)**.

2.4.32. Appoint a Stock Record Account Number (SRAN) Engine Manager (EM) or a Unit Engine Manager (UEM) to accomplish duties outlined in TO 00-25-254-1, *Comprehensive Engine Management System (CEMS) (D042) Engine Status, Configuration, and TCTO Reporting Procedures*. **(T-1)**.

2.4.33. Ensure Engine Health Management Plus (EHM+) duties are performed IAW AFMAN 20-116 for EHM products managed by Air Force Life Cycle Management Center AFLCMC/LP. If EHM data is not managed by AFLCMC/LP, ensure Contractor Logistics Support (CLS) provided EHM products are managed according to respective contract. **(T-1)**.

2.4.34. Ensure the Aero Club is operated IAW AFI 34-101, *Air Force Morale, Welfare, and Recreation (MWR) Programs* and Use Eligibility, when assigned. **(T-1)**.

2.4.35. Appoint a hot refueling/hot defueling OPR for the Wing (WG) and designate an OPR for hot refuel training (if applicable) IAW **Chapter 11** **(T-1)**.

2.4.36. Ensure maintenance requirements (such as, aircraft turnaround, alternate fuel cell, hot refueling, end-of-runway (EOR) check area, engine run spots, explosive load (cargo) areas) are included in the base parking plan. **(T-1)**.

2.4.37. Ensure unit personnel collect and report Aircraft Structural Integrity Program (ASIP) data IAW AFI 63-140, *Aircraft Structural Integrity Program* and **Chapter 11** **(T-1)**.

2.4.38. Ensure aircraft shelters at bases with permanently assigned aircraft are maintained, unless otherwise stipulated in contracting arrangements, IAW **Chapter 11** **(T-1)**. **Note:** If an aircraft shelter is used for other than its designed purpose, the using activity will maintain it. **(T-1)**.

2.4.39. Ensure aircraft and equipment sun shades are maintained IAW **Chapter 15** **(T-1)**.

2.4.40. Ensure management of the Weight and Balance (W&B) program IAW **Chapter 6** **(T-1)**.

2.4.40. **(AFMC)** MXG/CC is the W&B authority, the W&B authority is not required to be W&B certified, if they are not performing weight and balance tasks IAW 1-1B-50, *Aircraft Weight and Balance.*

2.4.41. Coordinate with the Operations Group (OG) and establish Functional Check Flight (FCF), Operational Check Flight (OCF), and High Speed Taxi Check programs. **(T-1)**.

2.4.42. Implement the Hangar Queen Program IAW **Chapter 11** **(T-1)**.

2.4.43. Develop a MXG Impoundment Program and ensure compliance with the procedures IAW **Chapter 7** **(T-1)**.

2.4.44. Establish written procedures to review and clear “repeat”, “recur”, and “cannot duplicate” (CND) discrepancies. **(T-1)**.

2.4.45. Ensure compliance with Identification Friend or Foe Program or equivalent IAW **Chapter 11** (if equipped). **(T-1)**.

2.4.45. **(AFMC)** [DEV] The 412th Electronic Warfare Group (412 EWG) will appoint a Radar Warning Receiver/Radar Threat Warning managers for the 412 TW. **(T-2).**

2.4.46. Provide Subject Matter Expertise (SME) support for the development of the wing or installation instruction to control tools, equipment, and electronic devices from all wing agencies dispatching to aircraft parking, runway, taxi areas and aircraft maintenance areas IAW **Paragraph 2.2.3** and **Chapter 8** **(T-1)**.

2.4.47. Establish written guidance on individual responsibilities and specific procedures for Cannibalization (CANN) actions IAW **Chapter 11** **(T-1)**.

2.4.47.1. Ensure aircraft possessed by AFMC for depot maintenance are not cannibalized without coordination through the MAJCOM functional manager who will then request approval from the applicable Air Logistics Complex (ALC) Maintenance Group Commander/Director and Program Manager. **(T-1)**.

2.4.48. Establish local procedures for management and maintenance of assigned Ground Instructional Training Aircraft (GITA) and Training Aircraft Aids (TAA) to ensure they remain useful and safe within guidelines stated in **Chapter 11**, AFI 84-103, *U.S. Air Force Heritage Program*, AFI 21-103, and 23-series publications. **(T-1)**.

2.4.49. Sustain a Transient Alert (TA) function (if required). **(T-1)**. The MXG/CC will establish procedures and furnish necessary personnel and facilities for handling transient aerospace vehicles to ensure that servicing, inspection, and maintenance are consistent with the mission of each transient aerospace vehicle. **(T-1)**. Special consideration should be given to medical or air evacuation aerospace vehicle, emergency missions, and special missions.

2.4.49.1. **(Added-AFMC)** When issuing or renewing a TA contract, owning/requiring activity will use the Standardized TA Services Performance Work Statement. POC is 763 ESS/PKB. **(T-2).**

2.4.50. Ensure Air Force Repair and Enhancement Program (AFREP) is managed IAW **Chapter 11** **(T-1)**.

2.4.51. Ensure unit FCC program(s) are established IAW **Chapter 11**, if applicable. **(T-1)**.

2.4.52. Establish procedures to ensure assigned units have sufficient eTools availability for technical order viewing. **(T-1)**.

2.4.53. Develop procedures and assign responsibilities to ensure aircraft, aircraft system forms, equipment forms, and MIS documentation are complete, accurate, and a thorough review is accomplished for each shift. **(T-1)**. Documented procedures as a minimum will include:

2.4.53.1. The process to ensure aircraft, aircraft systems and equipment status is correctly reflected in maintenance forms and the MIS IAW TO 00-20-1, *Aerospace Equipment Maintenance, Inspection, Documentation, Policies and Procedures*, TO 00-20-2, AFI 21-103 and **Chapter 1**. **(T-1)**.

2.4.53.2. The process for recovering aircraft, aircraft systems from extensive maintenance events and down time (CANN, local depot maintenance (MX)) include independent screening and validation that all maintenance actions (IPIs, operational checks, configuration management, W&B, serial number (S/N) tracking (COMSEC/CCI and other significant items as designated by an asterisk in the applicable WUC/LCN Manual), AFTO Form 95, *Significant Historical Data* have been accurately documented in the forms, MIS, or both before being scheduled for a sortie or mission. **(T-1)**.

2.4.53.3. The process for determining if an OCF or FCF is required. **(T-1)**.

2.4.54. Ensure that when no 2W1X1 weapons AFSCs are assigned and units are required to install/remove chaff/flare on unique mission aircraft, train and qualify personnel to perform

these tasks IAW procedures outlined in AFMAN 21-201 and **Chapter 11** **(T-1)**. As a minimum, the program will include academic, explosive safety, load and unload training. **(T-1)**.

2.4.55. Appoint a Wing Avionics Manager (WAM) or designated representative to act as the maintenance focal point for wing avionics related programs. **(T-1)**. **Note:** See **Chapter 11** for WAM responsibilities.

2.4.55.1. Designate individuals to be primary responders and facilitators for maintenance cybersecurity incident reporting (typically the Wing Avionics Manager). **(T-2)**.

2.4.56. Ensure storage, physical security, corrupt systems quarantine procedures, and cyber threat mitigation management of MXG assigned PIT and eTools is supported and sustained. **(T-1)**.

2.4.57. Establish a read file or equivalent for distributing maintenance cross-talk messages, QA newsletters, Higher Headquarters (HHQ) and local policy announcements, technical notifications, and other important maintenance information to all assigned airman. **(T-1)**.

2.4.58. Ensure personnel are trained and appointed as Aircraft Battle Damage Evaluators IAW **Chapter 11** **(T-1)**.

2.5. Deputy Maintenance Group Commander (MXG/CD). The MXG/CD will:

2.5.1. Chair and designate mandatory attendees for the daily maintenance production/scheduling meeting. **(T-1)**. The purpose of this meeting is to verify aircraft and equipment utilization, scheduled maintenance requirements, establish work priorities, and coordinate schedule changes for the next day. Topics reviewed will include as a minimum:

2.5.1.1. Aircraft and aircraft system status. **(T-1)**.

2.5.1.2. MICAP and repair cycle status. **(T-1)**.

2.5.1.3. AF Form 2407s, Weekly/Daily Flying Schedule Coordination. **(T-1)**.

2.5.1.4. Current-day flying and maintenance schedule execution. **(T-1)**.

2.5.1.5. Remaining portion of the current day's schedule. **(T-1)**.

2.5.1.6. Previous week/day's flying and maintenance schedule deviations to the published schedule. **(T-1)**.

2.5.1.7. Prioritizing aircraft requiring/competing for shared resources. **(T-1)**.

2.5.1.8. Special inspections (SIs). **(T-1)**.

2.5.1.9. Time Change Items (TCIs). **(T-1)**.

2.5.1.10. Time Change Technical Orders (TCTOs). **(T-1)**.

2.5.1.11. Depot Field Team (DFT)/Contract Field Team (CFT) schedules. **(T-1)**.

2.5.1.12. Due In From Maintenance (DIFMs) to ensure no overdue DIFM assets exist. **(T-1)**.

2.5.1.13. Condition Based Maintenance (CBM+) component status to ensure proactive aircraft maintenance practices.

2.6. MXG Superintendent Responsibilities. In addition to the Group Superintendent responsibilities outlined in Air Force Handbook (AFH) 36-2618, *The Enlisted Force Structure*, the MXG Superintendent is responsible to the MXG/CC and shall advise and assist the MXG/CC on their responsibilities as outlined in this **Chapter**. The MXG Superintendent will:

2.6.1. Conduct a quarterly manning meeting with Squadron Superintendents and Wing Weapons Manager (WWM) to review MXG manning status, Duty Title Tool usage, and ensure manning resources are strategically distributed to provide the greatest possibility for mission success. **(T-1)**. The MXG Superintendent is the focal point for ensuring squadron superintendents receive adequate manpower management training.

2.6.1.1. Meeting will consist of a review and evaluation of the impact on the MXG of personnel actions such as: work center/organizational manpower Authorization Change Requests (ACR), AFSC changes, re-training, special duty requests, special assignment actions (SWAP, Palace Chase), SEI balance, overseas Date Eligible for Return from Overseas extensions/In Place Consecutive Overseas Tour (IPCOT) requests, physical profile changes and personnel rotation plans as applicable to enhance mission effectiveness. **(T-1)**.

2.6.1.2. MXG Superintendent will provide the MXG/CC coordinated manning recommendations that develop enlisted individual experience and knowledge for consideration. **(T-1)**.

2.6.2. Ensure all AFSC 2A and 2W maintenance personnel are only assigned authorized duty titles. **(T-1)**. Reference the Duty Title Tool: **https://cs2.eis.af.mil/sites/10820/medac/2A_DTT/SitePages/Home.aspx**, and the AFSC 2W1 Standardized Duty Titles located at **https://cs2.eis.af.mil/sites/12231/2W1%20Standardized%20Duty%20Titles/Forms/AllItems.aspx** for all assigned AFSC 2W1X1 and 2W100 positions.

2.7. Wing Weapons Manager (WWM). The WWM is the wing's focal point for all weapons loading and armament systems related matters and serves as the functional manager for all assigned 2W1X1's. The WWM's primary efforts focus on compliance, continuity, and standardization. The WWM will be a 2W100 CMSgt assigned directly to the MXG/CC. **(T-1)**. In units where 2W1 personnel are assigned but no 2W100 authorization exists, the MXG/CC will appoint the most qualified 2W1 to fulfill WWM responsibilities outlined in this **Chapter (T-1)**. Weapons activities required to support the generation of peacetime training sorties generally do not reinforce primary combat skills. Therefore, the WWM plays a key role in ensuring that the unit is able to produce combat loaded aircraft. The WWM is charged with providing technical and managerial advice to senior leaders in matters of weapons loading and armament systems. The WWM coordinates with the Aircraft Maintenance Squadrons, Weapons Sections, Armament Flight, Wing Safety, Wing Weapons and Tactics Officer, the Munitions Squadron/Flight, and other unit agencies on weapons related matters. The WWM is a certifying official and evaluator for weapons loading task certifications and qualifications. WWM will coordinate on support agreements and provide support for geographically separated units (GSU). **(T-1)**. Exception: Unless outlined under additional TFI guidance. The WWM is the wing Point of Contact (POC) for all 2W1XX manpower issues to include coordination on all manning (AFSC, grade and skill-level) changes, work center and organizational changes. The WWM will:

2.7.1. Review and coordinate on the Unit Manpower Document(s) (UMD). **(T-1)**. The WWM will ensure assignment of position numbers to new arrivals, and existing 2W1 personnel are properly assigned on the UMD to balance 2W1XX grades, experience and skill-levels between all 2W1XX work centers across the wing. **(T-1)**. The WWM will coordinate on all 2W1 personnel position change requests. **(T-1)**.

2.7.2. Ensure sufficient quantities of serviceable load crew training munitions are available to support both load crew and Dual Loading Operations training programs. **(T-1)**.

2.7.3. Ensure all wing 2W1X1 personnel regardless of duty position receive initial and recurring weapons academics. **(T-1)**. The WWM will ensure introductory training is provided to newly assigned personnel on aircraft familiarization, safe for maintenance, explosive safety, weapons release and gun system safety prior to performing duties (as applicable to work center). **(T-1)**.

2.7.4. Designate the Weapons Standardization (WS) Superintendent (SUPT), Loading Standardization Crew (LSC), lead crews as WS certifying officials and the primary weapons academic instructor. **(T-1)**. The WWM may designate the weapons section Non-Commissioned Officer in Charge (NCOIC) to perform WS functions of academics and weapons task qualification in HH-60/CV-22 units.

2.7.5. Determine the number of load crews (based on unit taskings), other than the LSC and lead crews, to be certified on support or limited use munitions. **(T-1)**. In nuclear-tasked units, the WWM will determine the number of load crews required to be certified on applicable nuclear weapons in support of OPLANs when the OPLANs' Designed Operational Capability (DOC) statement does not dictate load crew requirements. **(T-1)**. **Note:** The WWM coordinates with the MXG/CC in determining the number of load crews to be certified on support or limited use munitions.

2.7.5.1. Determine need for cross-loading program in coordination with wing safety and approved by MXG/CC. WWM will establish procedures and a training program, as a minimum will include: checklist documentation, restrictions, inherent safety and list of authorized conventional munitions. **(T-1)**. If required, a training program and procedures will be established per **Paragraph 10.16.9**.

2.7.6. Use the Weapons Load Crew Management Tool (WLCMT) or MAJCOM-equivalent automated database to track load crew certification and qualification status. **(T-1)**.

2.7.7. Monitor overall load crew status and advise the MXG/CC when the number of fully certified load crews fall below the Unit Committed Munitions List (UCML) or Test/Training Munitions List (TTML) minimum requirements. **(T-2)**. If this occurs and cannot be corrected within 30 days, a secure message will be sent via Secret Internet Protocol Router (SIPR), through the MXG/CC, to the appropriate MAJCOM 2W1XX functional manager. **(T-1)**. **Note:** All 2W1X1s working outside their respective work center or Duty AFSC will be qualified and certified if possible to fill load crew shortfalls before sending a message to the MAJCOM. **(T-2)**. The MAJCOM will send the message via SIPR to AF/A4LW at **usaf.pentagon.af-a4.mbx.a4lw-workflow@mail.mil**. The message will include:

2.7.7. **(AFMC)** When TTML minimum load crew certification numbers are not met for 30 consecutive days, updates and projected resolution date will be sent to HQ AFMC/A4/10/A4MW every 30 days until TTML minimums are met. **(T-2).**

2.7.7.1. Number of 2W1X1 personnel authorized and assigned by work center, skill level (primary AFSC) and grade for the entire wing. Include all work centers to which 2W1X1 personnel are assigned.

2.7.7.2. Number of 2W1X1 personnel working outside the AFSC/work center.

2.7.7.3. Number of 2W1X1s not able to perform primary duties and the reason.

2.7.7.4. Number of fully certified crews. Include corrective action, get well date, and 30/60-day load crew status projection. If the standard cannot be reached in 60 days, provide the reason.

2.7.7.5. Remarks: List limiting factors, equipment shortages, availability of training aircraft.

2.7.8. Annually review DOC Statements, OPLANs, Syllabus, Ready Aircrew Program tasking memorandum, UCML/TTMLs, unit-tasked Unit Type Code (UTC) requirements (for equipment and personnel) and UMD to identify any disconnects or problems for weapons. **(T-2)**. The WWM will coordinate changes and appendices with the Wing Weapons and Tactics Officer and the Munitions Squadron/Flight and report any findings to the MAJCOM. **(T-1)**.

2.7.8.1. In taskings that involve 2W1's, the WWM ensures no shortfalls exist by aligning required skill level, grade, line remarks and Career Field Education and Training Plan (CFETP) qualifications against tasked UTCs to include Aerospace Expeditionary Force taskings for all assigned 2W1XX personnel. The WWM will start a training program to eliminate any identified shortfalls. **(T-1)**.

2.7.9. Resolve scheduling conflicts affecting weapons loading and Dual Loading Operation training programs. **(T-3)**.

2.7.10. Provide input during development of local exercises involving weapons loading and armament functions and serve as an advisor/evaluator to the Wing Inspection Team (WIT). **(T-3)**.

2.7.11. Ensure a recognition program for weapons and armament personnel is established. **(T-2)**.

2.7.12. Ensure standardization of load crew Composite Tool Kit (CTK) by aircraft MDS to the maximum extent possible to provide interoperability of load crews; and, in coordination with the Weapons Section NCOIC and WS Superintendent, determine the number of CTKs required. **(T-2)**.

2.7.12.1. Load crew CTK contents will be approved by the WWM. **(T-2)**.

2.7.13. In coordination with Wing Safety, Airfield Operations Flight, and Quality Assurance, develop an installation publication or supplement to this AFI for parking, launch and recovery of explosives-loaded aircraft, end-of-runway procedures, hung stores/jammed gun system safing and to outline situations warranting impoundment of aircraft with hung ordnance, delayed release or jammed gun systems. **(T-1)**.

2.7.14. The WWM will ensure arm/de-arm of munitions loaded aircraft is accomplished in approved areas. **(T-1)**. Immediately-prior-to-launch and "safing" procedures may be performed in the aircraft parking area for contingencies, unit exercises, and daily training missions as

quantity distance clearance allows with the approval of Wing Safety, Airfield Operations Flight, and the MXG/CC.

2.7.15. Inform the MAJCOM, within 24 hours, of any significant weapons or armament related issues such as dropped/hung munitions, equipment and aircraft release reliability or deficiency problems, and weapons safety or mishap issues. **(T-2)**. **Note:** Units follow MAJCOM and local reporting instructions.

2.7.15.1. If a unit has an incident, it is important to preserve the evidence to the maximum extent allowable by operational requirements and safety. An example would be segregating an aircraft gun versus destroying it if it poses no immediate danger. This allows for evaluation of all the evidence and the ability to recreate the mishap conditions.

2.7.16. Monitor weapons release/gun fire-out rates, malfunctions and corrective actions to assess weapons and armament systems reliability. **(T-1)**.

2.7.16.1. Weapons release reliability rates are calculated by dividing the number of successful releases by the number of attempts.

2.7.16.2. The gun fire-out rate is calculated by dividing the number of successful bursts by the number attempted. Once a malfunction occurs, any further attempts for the purpose of clearing the malfunction should not be counted as attempts.

2.7.17. Ensure compliance with local accountability procedures IAW AFI 11-212, *Munitions Requirements for Aircrew Training*, and AFMAN 21-201. **(T-1)**. In conjunction with the Weapons Section(s) and Munitions Flight, the WWM will develop a standard local format for the AF Form 2434, *Munitions Configuration and Expenditure Document*. **(T-2)**. A computer-generated product may be used if it contains all required information.

2.7.18. Coordinate with Maintenance Supervision, Munitions Squadron/Flight, Operations Support Squadron (OSS) Operations Plans, and Wing Safety in developing nuclear weapons operations procedures (such as, convoy, custody transfer, no-lone-zone), if applicable. **(T-3)**.

2.7.19. Conduct a quarterly meeting with representatives from Weapons Standardization, Wing Safety, Quality Assurance, Munitions Squadron/Flight, Armament Flight, and Weapons Section(s) to discuss and resolve any weapons-related issues, concerns or problems. **(T-1)**. Weapons AFETS are encouraged to attend.

2.7.20. Ensure enroute training requirements for inbound 2W1X1 personnel are identified and requested through the MAJCOM, as applicable. **(T-2)**.

2.7.21. Monitor WRM Rack, Adapter, Pylons and guns/components status to ensure required assets are available to support OPLAN taskings. **(T-1)**.

2.7.22. Provide monthly load crew, weapons release and gun reliability rates, equipment, and tester status (9405 report, or equivalent) to MAJCOM No Later Than (NLT) the 5th of each month. **(T-2)**. The WWM will monitor the status of critical armament and weapons systems support equipment and testers for serviceability, accountability and status of TCTO modifications. **(T-2)**.

2.7.22. **(AFMC)** 9405 report accuracy will be verified on the HAF Armament SharePoint site no later than the 5th of each month. **(T-2).**

2.7.22.1. The WWM will provide a valid document number and off-base requisition number for all items listed in Awaiting Parts (AWP) status in the remarks column of the report if the item is procured through USAF supply channels. **(T-2)**. If parts are obtained from commercial sources, and purchased using Government Purchase Card, provide source, date ordered, and status in the remarks column.

2.7.22.2. **(Added-AFMC)** 9405 report will include all suspension equipment currently with T-2 modifications, to include original modification date, modification number and anticipated de-modification date, see AFI 63-101/20-101 *Integrated Life Cycle Management*, Chapter 9 Modification Management. **(T-2).**

2.7.22.3. **(Added-AFMC)** Provide a monthly Weapons Loading/Armament Systems activity summary to HQ AFMC/A4/10/A4MW no later than the 5th . Summary will include Tests/Projects conducted in the previous 30 days, forecasted Tests/Projects in the next 30 days, requests for guidance, and any other significant events. **(T-2).** Tests/Projects includes, but is not limited to, work related to munitions, aircraft modifications, support equipment, testers, aircraft systems, and tech data development.

2.7.23. Utilize and involve assigned AFETS and/or contractors in weapons and armament related issues and meetings IAW **Chapter 11** **(T-2)**.

2.7.24. Ensure at least two certified WS personnel are included on TDY where live munitions will be expended and on deployments exceeding 30 days to provide Minimum Required Proficiency Load (MRPL) and recertification capability. **(T-3)**. The WWM is the approval authority for exceptions.

2.7.25. Perform an annual assessment to evaluate programs and technical proficiency of personnel assigned to Weapons Sections, Armament Flights, and AFSC 2W1 personnel assigned to QA. **(T-1)**. The WWM will ensure the assessment incorporates a process to document findings, track corrective actions and store data. **(T-2)**.

2.7.26. Determine when Armament Flight personnel are required to perform load crew duties or related certifiable tasks and gain concurrence from MXG/CC. **(T-3)**.

2.7.27. Determine need for a formal supervisory postload program. **(T-3)**. If negative performance metrics, special missions, warrant a supervisory postload program, WWM will establish procedures and a training program to ensure standardization between units. **(T-3)**. Supervisors (7-skill level minimum, expediters, shift supervisors, section NCOICs) performing such inspections require initial and recurring (not exceeding 15 months interval) qualification training by WS. Training will be documented in either the WLCMT (or equivalent) or MIS, not on Special Certification Roster (SCR). **(T-1)**. Document Supervisory Postload on AF Form 2430, *Specialist Dispatch Control Log* (or equivalent). **(T-3)**.

2.7.28. Ensure requirements for submitting AFTO Form 375, *Selected Support Equipment Repair Cost Estimate*, on all weapons support equipment identified in TO 35-1-24, are accomplished. **(T-1)**. This process provides vital information and source documentation for ALCs to adequately reflect equipment sustainment costs, attrition rates, and to enable timely forecasting for replacement funding.

2.7.29. **(Added-AFMC)** Ensure all Test Technical Data requirements for the use of contractor source data, Preliminary Technical Orders (PTO), and local Technical Data are in

compliance with TO 00-5-1 and AFTCI 63-101_20-101, *Technical Order Writing Procedures*. Technical Data Requirements coordination will be forwarded to HQ AFMC A4/10/A4MW, AFMC Armament Org Box at **HQAFMC.A410A4MW.HQAFMCArmament@us.af.mil** and AFLCMC/EBHMA, Weapons Standard Data Package Org Box at **AFLCMC.EBHMA.StdDataPkgs@us.af.mil** within 5 duty days of receipt/completion. **(T-2).**

2.8. Squadron Commander (SQ/CC) Responsibilities. The SQ/CC will:

2.8.1. Ensure compliance with AFI 90-821, AFI 91-202, *The US Air Force Mishap Prevention Program*, AFMAN 91-203 and other publications necessary to perform the commander functions assigned to the squadron. **(T-1)**.

2.8.2. Establish and administer squadron training programs IAW AFI 36-2650 and AFI 36-2651; monitor upgrade training, Personnel Reliability Program (PRP) status, and qualifications of assigned work center personnel; and, ensure MAJCOM Mandatory Course List requirements are met (if applicable). **(T-1)**.

2.8.3. Ensure upgrade training and maintenance qualification programs emphasize quality and are not primarily focused on meeting minimum upgrade time frames. **(T-1)**.

2.8.3.1. Ensure all maintenance personnel who utilize DoD Information Technology have received appropriate Maintenance Cyber Discipline Training. **(T-1)**.

2.8.4. Monitor all personnel working outside of their primary AFSC to ensure that it does not degrade mission accomplishment. **(T-3)**.

2.8.5. Establish a squadron Vehicle Control Program IAW AFI 24-302, *Vehicle Management*. **(T-1)**.

2.8.6. Establish and manage squadron FCC program IAW **Chapter 11** (if applicable). **(T-1)**.

2.8.7. Protect and secure munitions as outlined in AFI 31-101. **(T-1)**. The SQ/CC will ensure Intrusion Detection Systems requirements are identified when required to store munitions. **(T-1)**.

2.8.8. Appoint equipment custodians to manage the Custodian Authorization/Custody Receipt Listing (CA/CRL) (R14) of assigned equipment IAW AFI 23-101 and AFMAN 23-122, *Materiel Management Procedures*. **(T-1)**.

2.8.9. Ensure personnel and equipment are identified and prepared to deploy for taskings IAW AFI 23-101, AFI 10-403, *Deployment Planning and Execution*, AFI 36-3802, *Force Support Readiness Programs*, and AFMAN 10-409-O, *Support to Adaptive Planning*. **(T-1)**.

2.8.10. Recommend personnel for QA duty positions. **(T-1)**.

2.8.11. Designate Flight CC/Chiefs. **(T-1)**.

2.8.12. Ensure the UMD is consistent with the approved organizational structure. **(T-1)**.

2.8.13. Coordinate support from the local communication squadron or equivalent functional entity to ensure proper eTools configuration (operating system, virus checkers) are maintained. **(T-1)**. The SQ/CC will coordinate with lead TODO/Functional System Administrator to resolve TO requirements that are not being satisfied. **(T-1)**.

2.8.13.1. Ensure licenses, certification, maintenance and security of eTools (hardware and software) is conducted IAW 33/17-series AFIs, TO 31S5-4-ETOOL-1, and **Chapter 8** **(T-1)**.

2.8.14. Ensure members assigned to the DIT are qualified to accurately assess the Maintenance Data Documentation. **(T-1)**.

2.9. Maintenance Supervision Responsibilities. Maintenance Supervision consists of the Operations Officer and Maintenance Superintendent (MX SUPT). Maintenance Supervision advises the SQ/CC on technical matters, leads a mission-focused maintenance effort, and manages resources necessary to accomplish the mission. They provide necessary administration to manage assigned responsibilities and control maintenance through Pro Supers, Flight CC/SUPT, and Section NCOICs/Chiefs. The MX SUPT is responsible to the Operations Officer. Maintenance Supervision will:

2.9.1. Ensure adequate levels of supervision and manning are balanced across all shifts to safely and efficiently accomplish the mission. **(T-1)**.

2.9.2. Ensure timely and accurate engine data is provided to the EM element for all engines IAW **Chapter 14** **(T-3)**.

2.9.3. Enforce procedures to prevent FOD and dropped objects IAW **Chapter 11** **(T-3)**.

2.9.4. Monitor and recommend updates to local IPI requirements and recommendations to QA IAW **Chapter 6** **(T-3)**.

2.9.5. Ensure a sufficient number of personnel are qualified to perform mission critical tasks listed on the SCR **Table 11.1** in **Chapter 11** **(T-3)**. Review and/or recommend individuals for addition to the SCR. **(T-3)**. Approve individuals for addition to the SCR. **(T-3)**. Review and approve individuals for addition to the SCR. **(T-3)**.

2.9.6. Ensure aircraft systems and equipment are available to support unit training objectives. **(T-3)**.

2.9.7. Ensure distribution of maintenance cross-tell messages, QA newsletters, policy announcements, technical notifications, and other important maintenance information to all members of the organization. **(T-3)**.

2.9.8. Review and evaluate management and production effectiveness. **(T-3)**. Maintenance Supervision will analyze personnel and equipment performance history. **(T-3)**. Initiate management actions to meet new workloads or correct reported/perceived deficiencies. **(T-3)**.

2.9.9. Ensure an annual maintenance plan is developed and reconciled with the flying schedule and flying requirements to ensure maintenance can support the annual flying hour/test program. **(T-3)**.

2.9.9.1. Participate in the maintenance planning cycle. **(T-3)**.

2.9.9.2. Utilize the MxCAP2 model or equivalent for the assigned MDS (if available). **(T-1)**.

2.9.9.2. **(AFMC)** See deviation at **paragraph 2.2.4.3**

2.9.10. Ensure a squadron SERENE BYTE or PACER WARE response capability is available to support reprogramming requirements IAW AFI 10-703, *Electronic Warfare Integrated Reprogramming* (if applicable). **(T-1)**.

2.9.11. Ensure a squadron Corrosion Control Program is implemented and managed IAW TO 1-1-8, TO 35-1-3, TO 1-1-691, MDS-specific TOs and MAJCOM instructions. **(T-1)**.

2.9.12. Ensure squadron ASIP responsibilities are accomplished IAW **Chapter 11** and AFI 63-140. **(T-1)**.

2.9.13. Develop written procedures in coordination with the WWM, Weapons Safety Manager, and Airfield Management to establish EOR inspection procedures as required by aircraft specific -6 TO, MAJCOM directed requirements and **Chapter 11** **(T-1)**.

2.9.13.1. Ensures sufficient personnel, equipment, and facilities are assigned, maintained, and available to properly perform EOR inspections IAW **Chapter 11**.

2.9.13.2. Ensure EOR procedures for transient aircraft are developed IAW TO 00-20-1 and MAJCOM directives. **(T-2)**.

2.9.14. Review and support the monthly Weapons Load Training (WLT) schedule. **(T-3)**.

2.9.15. Ensure deferred maintenance, Pilot Reported Discrepancy, and back-ordered parts are properly managed. **(T-1)**.

2.9.16. Review supply products to monitor supply discipline. **(T-2)**.

2.9.16.1. Maintenance Supervision will manage DIFMs IAW AFI 23-101. **(T-2)**.

2.9.16.2. Monitor and reconcile changes in base-level repair capabilities under their supervision as they occur with the LRS/Material Management activities IAW AFI 23-101. **(T-1)**.

2.9.17. Ensure lost, damaged, destroyed or stolen government assets are dispositioned IAW DoD 7000.14-R, *DoD Financial Management Regulation*, Vol 12, **Chapter 7**, Financial Liability for Government Property Lost, Damaged or Destroyed (Formerly Report of Survey). **(T-1)**.

2.9.18. Ensure Special Purpose Recoverable Authorized Maintenance (SPRAM) accounts are established IAW AFI 21-103, **Chapter 9**, and maintained IAW AFI 23-101. **(T-2)**.

2.9.19. Ensure reporting of materiel deficiencies IAW TO 00-35D-54, *USAF-Deficiency Reporting, Investigating, and Resolution*. **(T-1)**.

2.9.20. Monitor requirements for CTK, special tools, and SE and take necessary action to ensure availability, as required IAW **Chapter 8** **(T-1)**.

2.10. Flight Supervision. Flight Supervision consists of the Aircraft Maintenance Unit (AMU) Officer in Charge (OIC)/Superintendent and Flight Commander/Flight Superintendent (Flight CC/Chief). Flight Supervision will:

2.10.1. Provide management and oversight and ensure each section is adequately resourced to efficiently execute their mission. **(T-1)**.

2.10.2. Manage, distribute and adjust the flight's manning to support the maintenance plan across all shifts. **(T-1)**.

2.10.2.1. Distribute all levels of supervision based on manning and workload to supervise all duty periods. **(T-1)**.

2.10.2.2. Identify imbalances between authorizations and the number of personnel assigned, or between authorized and assigned skill levels or grades to SQ/CC and Maintenance Supervision. **(T-1)**.

2.10.2.2.1. Review unit DOC Statements, OPLANs, unit-tasked UTC requirements for personnel and equipment then compare requirements to UMD to identify existing shortfalls. Scrutinize critical AFSCs qualifications and equipment based on their impact on mission generation. Document and report personal and equipment deficiencies through the chain of command and monitor until resolved. **(T-2)**.

2.10.2.3. Manage additional duties, leaves, ancillary training, and rotate/assign manning across shifts to balance the workload and minimize negative impacts on the workforce. **(T-1)**.

2.10.3. Execute the squadron's Mishap Prevention Program for the flight/work center IAW AFI 91-202 and **Chapter 1** **(T-1)**.

2.10.3.1. Ensure all personnel obtain the required safety training, and document it on the AF Form 55, Employee Safety and Health Record, or equivalent IAW AFI 91-202. **(T-1)**.

2.10.4. Coordinate occupational and environmental health risk assessments with Bioenvironmental Engineering IAW AFMAN 48-146, *Occupational & Environmental Health Program Management*, to identify, assess and evaluate process hazards in the workplace and identify controls. **(T-1)**.

2.10.4.1. Monitor and ensure environmental and applicable health requirements, physicals and respirator training, initial and recurring requirements are accomplished when required for assigned personnel IAW AFMAN 48-146; AFI 48-137, *Respiratory Protection Program*; and AFI 48-127, *Occupational Noise and Hearing Conservation Program.* **(T-1)**.

2.10.5. Ensure organizational compliance IAW the installation ESOHMS/EMS Program. **(T-1)**.

2.10.6. Advocate use of the TO improvement program, and ensure work center TO files are maintained IAW TO 00-5-1. **(T-1)**.

2.10.7. Ensure Materiel Potentially Presenting an Explosive Hazard requirements in AFMAN 21-201 and TO 11A-1-60, *General Instructions Inspection of Reusable Munitions Containers and Scrap Material* Generated from Items Exposed to or Containing Explosives, are complied with when certifying items associated with explosives such as: Multiple Ejector Rack, Triple Ejector Rack, pylons, launchers, rafts, bomb racks, ejection seats, fire suppression bottles, and gun systems and components. **(T-1)**.

2.10.7.1. Ensure associated items are explosive free prior to being turned in to LRS or the Defense Logistics Agency Disposition Services (DLADS). **(T-1)**.

2.10.8. Review deferred maintenance in the MIS and coordinate with the Pro Super to schedule and/or validate task accomplishment. **(T-1)**.

2.10.9. Ensure operator inspections and user servicing requirements are accomplished on all assigned support equipment IAW TO 00-20-1. **(T-1)**.

2.10.10. Ensure records of inspection, lubrication, and maintenance of industrial equipment are maintained IAW TO 00-20-1, TO 34-1-3, *Machinery and Shop Equipment*, to include documentation of records maintained in a MIS. **(T-1)**.

2.10.10. **(AFMC)** Paper records (e.g., AFTO244s), scanned copies of paper records, and other electronic records (other than those in the MIS) will be filed in the file plan per the records disposition schedule (RDS). **(T-2).**

2.10.11. Ensure proper calibration, use, care, handling and transportation of Test Measurement and Diagnostic Equipment (TMDE) IAW TO 00-20-14 and AFMAN 21-113, *Air Force Metrology and Calibration (AFMETCAL) Program Management*, and applicable Calibration Measurement Summaries. **(T-1)**.

2.10.12. Evaluate maintenance quality, personnel qualifications, and training of assigned personnel. **(T-1)**.

2.10.13. Review/update flight IPI requirements listing every two years and route through Maintenance Supervision. **(T-1)**.

2.10.14. Ensure only designated personnel identified in the MIS verify MICAPs/Urgency of Need Designator 1A and JA requirements. **(T-1)**.

2.10.15. Select personnel to perform special certification tasks IAW **Chapter 11** and **Table 11.1** of this instruction and forward names to Maintenance Supervision for approval and addition to the SCR. **(T-1)**.

2.10.16. Ensure training requirements are executed to support established training plan and individual AFSC Career Field Education and Training Plans (CFETP) IAW AFI 36-2651 and AFI 36-2650. **(T-1)**.

2.10.17. Ensure Cross Utilization Training requirements are identified as required by the unit mission IAW AFI 36-2650. **(T-1)**.

2.10.17.1. Ensure Cross Utilization Training does not interfere with upgrade/qualification training. **(T-1)**.

2.10.18. Review Maintenance Management Analysis (MMA), QA, and other management reports to determine appropriate management actions to meet new workloads, target deficiencies, and identify and correct root causes. **(T-1)**.

2.10.18. **(AFMC)** Develops and implements a corrective/preventive action process. (e.g., AF CPI Practical Problem Solving Method (PPSM), 5 Whys, etc.).

2.10.19. Develops maintenance and flying schedules, and execute scheduled maintenance plans. **(T-1)**.

2.10.20. Establish flight/AMU-specific emergency action procedures to respond to disaster control and severe weather and forward to MOC. **(T-1)**.

2.10.20.1. Review unit responsibilities pertaining to aircraft/SE movement and personnel evacuation IAW AFI 10-2501. **(T-1)**.

2.10.21. Manage the flight/AMU's participation in the FOD and DOP program IAW **Chapter 11** **(T-1)**.

2.10.22. Oversee the flight/AMU's FCC/Dedicated Crew Chief (DCC) Program (if applicable). **(T-1)**.

2.10.23. Establish and enforce a flight/AMU Precious Metals Recovery Program, as applicable, IAW AFI 23-101 and TO 00-25-113, *Conservation and Segregation of Critical Alloy and Precious Metal Bearing Parts and Scrap*. **(T-1)**.

2.10.24. Assign section supervisors IAW this instruction and the UMD. **(T-1)**.

2.10.25. Ensure proper asset management by reviewing MIS data records, the Repair Cycle Asset Management Listing (D23) and other pertinent products to minimize shortfalls. **(T-1)**.

2.10.25.1. When applicable, ensure warranty items are loaded in MIS according to applicable directives. **(T-1)**.

2.10.25.2. Ensure Deficiency Reports (DR) are accomplished IAW TO 00-35D-54. **(T-1)**.

2.10.26. Ensure repairable/non-repairable parts are promptly processed through repair channels within the required time frame IAW AFI 23-101. **(T-1)**.

2.10.26.1. Team with Decentralized Materiel Support (DMS) Flight Service Center to conduct a quarterly reconciliation of all DIFM assets and follow up on delinquent DIFMs and document action taken to correct identified discrepancies. **(T-1)**.

2.10.26.2. Immediately identify lost, damaged, destroyed or stolen assets that require a financial liability investigation IAW DoD 7000.14-R, Vol 12, **Chapter 7**, *Financial Liability for Government Property Lost, Damaged or Destroyed* (Formerly Report of Survey) and forward to Maintenance Supervision for review and processing. **(T-1)**.

2.10.27. Approve requirements for bench stocks IAW qualification criteria in AFMAN 23-122. **(T-1)**.

2.10.28. Consolidate lists of items received in supply requiring functional check, operational programming, user calibration or corrosion control/painting. **(T-1)**.

2.10.28.1. Submit listing to the LRS Materiel Management Flight IAW TO 00-20-3. **(T-1)**. **Note:** Does not include TMDE IAW TO 00-20-14.

2.10.29. Coordinate all AGE requirements through the AGE Flight Chief to ensure support capability and eliminate unnecessary duplication of equipment. **(T-1)**.

2.10.30. Report cyber threats, incidences, and issues per Wing cyber status reporting procedures. **(T-1)**.

2.10.30.1. Consult airframe Security Classification Guides, TOs, and/or applicable technical manuals, instruction and publication when addressing or reporting cybersecurity threats, incidents and issues. **(T-1)**.

2.10.31. Ensure Nuclear Weapons-Related Materiel (NWRM) is controlled IAW AFI 20-110. **(T-1)**.

2.11. Production Superintendent (Pro Super). Senior NCO responsible for squadron maintenance production. The Pro Super directs the overall maintenance effort of their unit. The

Pro Super will be a SNCO or civilian equivalent. **(T-1)**. Squadron specific Pro Super responsibilities are outlined in **Paragraph 3.5**.

2.12. Section NCOIC/Chief. The Section NCOIC/Chief is responsible to the Flight CC/SUPT or AMU OIC/SUPT for the leadership, supervision, and training of assigned personnel. The Section NCOIC/Chief is a first-line manager and supervisor of maintenance production and is the technical authority and advisor in that area. When sections are subdivided, element leaders perform the appropriate functional responsibilities. The Section NCOIC/Chief will:

2.12.1. Establish a Work Center Safety Program IAW AFI 91-202, AFMAN 91-203 and include any locally prescribed safety requirements (if applicable). **(T-1)**.

2.12.2. Monitor, track, and ensure occupational safety, fire prevention, occupational and environmental health requirements are accomplished for assigned personnel. **(T-1)**.

2.12.2.1. Ensure Job Safety Training is documented IAW AFI 91-202 (AF Form 55 or equivalent) for each assigned individual. **(T-1)**.

2.12.3. Ensure maintenance is performed by personnel who are trained, qualified, and certified, unless under the direct supervision of a trainer or certifier. **(T-1)**.

2.12.4. Advocate use of the TO improvement program and ensure work center TO files are maintained according to TO 00-5-1. **(T-1)**.

2.12.5. Establish procedures and ensure configuration control for all applicable software required for the sections assigned systems. **(T-1)**. Section NCOIC/Chief will:

2.12.5.1. Access Computer Program Identification Number System (CPINS) in ETIMS or equivalent system. **(T-2)**.

2.12.5.2. Ensure technicians check ETIMS/equivalent system for software updates for assigned systems. **(T-2)**.

2.12.5.3. Ensure software configuration control is maintained IAW TO 00-5-16, *Management of Computer Program Identification Number System (CPINS)* and equivalent systems are maintained by use of AF approved and authorized publications. **(T-1)**.

2.12.6. Perform production and supervisory inspections. **(T-1)**.

2.12.7. Validate classified parts/materiel are managed IAW AFI 23-101. **(T-1)**.

2.12.8. On a daily basis, review, monitor and correct, as needed, the work center's scheduled and deferred events in the MIS. **(T-1)**.

2.12.8.1. Close, reschedule, or defer all events beyond their scheduled start date and time (Integrated Maintenance Data System (IMDS)-CDB screen #100/380 and G081 Screen #8035/8069/67150). **(T-1)**.

2.12.9. Review transcribed AFTO Form 781-series forms, work center MIS data entries for the previous day, and all preceding non-duty days, for job accuracy and completeness (IMDS-CDB Screen #100 and G081 Screen #9154). **(T-1)**.

2.12.10. Validate scheduled aircraft document reviews using applicable MIS/records check package and automated aircraft forms IAW **Chapter 14** **(T-1)**.

2.12.11. Develop and manage the Work Center Training Program. **(T-1)**.

2.12.11.1. Evaluate the quality of maintenance, training, and personnel qualifications, track training requirements and ensure training documentation is complete and accurate. **(T-1)**.

2.12.11.2. Conduct On-the-Job training (OJT)/certifying as required. **(T-1)**.

2.12.12. Review and recommend changes for maintenance tasks requiring IPIs to the Flight Supervision. **(T-1)**.

2.12.13. Review, evaluate, and take corrective action based on QA and other inspection reports. **(T-1)**.

2.12.14. Ensure all required work center publications necessary for the work center to meet its functional requirements are current and available for use. **(T-1)**.

2.12.15. Ensure section personnel coordinate all flightline maintenance with the Flightline Expediter. **(T-1)**.

2.12.16. Manage CTK and supply programs (such as, bench stocks, and operating stocks) IAW **Chapter 8** and **Chapter 9** **(T-1)**. Section NCOIC/Chief will:

2.12.16.1. Ensure sections are organized with tools, equipment and materiel as close to the Point of Maintenance as possible, as approved by the Flight Supervision, without jeopardizing accountability and control procedures. **(T-1)**.

2.12.16.2. Ensure the Bench Stock Review Listing (M04) is reviewed monthly and all recommendations are adjudicated to most efficiently meet mission needs. **(T-1)**.

2.12.17. Ensure custodial responsibilities are accomplished on all assigned equipment IAW AFI 23-101, AFI 23-111, *Management of Government Property in the Possession of the Air Force* and AFMAN 23-122. **(T-1)**.

2.12.18. Manage the section's Repair Cycle Program. **(T-1)**. The Section NCOIC/Chief will review the D23 and other pertinent supply products to ensure proper supply discipline daily. **(T-1)**.

2.12.19. Establish procedures to control, store, and manage Alternate Mission Equipment (AME); Maintenance, Safety, and Protective Equipment; and -21 equipment IAW AFI 21-103. **(T-1)**.

2.12.20. Identify items requiring calibration (does not include TMDE calibrated by the Precision Measurement Equipment Laboratory (PMEL)) or operational check before installation and provide a list of these items to the Flight Supervision. **(T-1)**.

2.12.21. Recommend individuals for addition to the SCR to the Flight Supervision. **(T-1)**.

2.12.22. Participate in and enforce the Bad Actor Program IAW TO 00-35D-54. **(T-1)**.

2.12.23. Manage Hazardous Materiel (HAZMAT) and Environment Safety and Occupational Health (ESOH) items IAW AFI 32-70XX-series instructions, and AFI 90-821. **(T-1)**.

2.12.23.1. Ensure HAZMATs are used IAW TOs and conform to indicated Military Specifications (MIL-Spec) and monitor the Qualified Products List/Qualified Product Database for changes to specified HAZMAT. **(T-1)**.

2.12.23.1.1. **(Added-AFMC)** Most, but not all, specifications for chemicals have a Qualified Products List (QPL). The QPL/Qualified Product Database (QPD) for military specifications can be found at **https://quicksearch.dla.mil**. The QPL for SAE/AMS specifications can be found at: **https://www.eauditnet.com**.

2.12.24. Ensure assigned NCE (applies to both nuclear and non-nuclear tasked units) comply with requirements outlined in AFI 63-125 and associated MAJCOM supplements. **(T-1)**.

2.12.25. Ensure Dull Sword reports are submitted for nuclear deficiencies IAW AFMAN 91-221, and AFI 91-204. **(T-1)**.

2.12.26. Ensure aircraft -6 TO system, inspections, TCTOs and aircraft functional checks (except Isochronal (ISO), Phase (PH)/ Hourly Post-flight (HPO)) are accomplished as required to prevent overdue or over flight of equipment. **(T-1)**.

2.12.27. Comply with TCTO performing work center requirements below:

2.12.27.1. Report all deficiencies in technical instructions and applicability to the TCTO managing agency and QA. **(T-1)**.

2.12.27.2. Attend TCTO planning meetings. **(T-1)**. Review the TCTO prior to the meeting and request clarification of any requirements from QA and the appropriate TCTO managing agency during the meeting.

2.12.27.3. Inventory TCTO kits for completeness prior to starting work. **(T-3)**. If a discrepancy exists, contact the TCTO managing agency to resolve shortages.

2.12.27.4. Perform the inspection or modification procedures outlined in the TCTO and document results or findings in the MIS. **(T-1)**.

2.12.27.5. If an inspection TCTO generates a requirement for parts, the performing workcenter will create a new Job Control Number (JCN) and enter the discrepancy in the AFTO Form 781A, Maintenance Discrepancy and Work Document, or applicable equipment record and order the required parts. **(T-3)**. Inspection TCTOs are complete when the inspection is finished.

2.12.27.6. Order and maintain all HAZMAT required to comply with TCTOs and provide document numbers to the TCTO managing agency and supply TCTO monitor. **(T-3)**.

2.12.27.7. Validate technical instructions and data on AFTO Form 82, *TCTO Verification Certificate*, when performing TCTO kit proofing IAW TO 00-5-15, *Air Force Time Compliance Technical Order Process*. **(T-1)**.

Chapter 3

AIRCRAFT MAINTENANCE SQUADRON (AMXS).

3.1. General. The AMXS provides direct MGN support by consolidating and executing on-equipment activities necessary to produce properly configured, mission ready weapon systems to meet contingency or training mission requirements. AMXS personnel service, inspect, maintain, launch, and recover assigned/transient aircraft (if applicable).

3.2. Maintenance Supervision Responsibilities. In addition to common responsibilities outlined in **Chapter 2**, Maintenance Supervision will:

3.2.1. Ensure standardized procedures and organizations among AMUs as applicable to optimize effectiveness. **(T-3)**.

3.2.2. Establish hot brake response procedures in coordination with base support agencies, for example, Fire Emergency Services and CDDAR Team. **(T-1)**.

3.2.3. Monitor the squadron FCC program, if applicable. **(T-1)**.

3.2.4. Ensure personnel use and understand the purpose of the AF Form 2408, *Generation Maintenance Plan*, and the AF Form 2409, *Generation Sequence Action Schedule*, or electronic equivalent. **(T-3)**.

3.2.5. Ensure an explosive safety and chaff/flare academics and loading program is established for units without a 2W1 AFSC assigned (when applicable). **(T-1)**.

3.2.6. Publish procedures covering the storage, control, and handling of starter cartridges (if applicable). **(T-1)**.

3.2.7. Provide input to MMA for the monthly metrics report to MAJCOM. **(T-2)**.

3.2.8. Develops the annual maintenance plan IAW **Chapter 14** **(T-1)**.

3.2.9. **(Added-AFMC)** Supervision will ensure all personnel who are dispatched for any task requiring landing gear handle movement are authorized and qualified to perform landing gear handle movement and are listed on the SCR, by aircraft type and personnel duties; gear retraction supervisor, 7-level team supervisor, gear handle operator (B-1, B-2, B-52, 135 Series, C-17, C-5, 747, CV-22). **(T-2).**

3.2.9.1. **(Added-AFMC)** Specific duties of the gear retraction supervisor are as follows:

3.2.9.1.1. **(Added-AFMC)** During aircraft and equipment maintenance, gear retraction supervisor will ensure no movement of the gear handle from the full down position without 7-level or civilian equivalent authorization and verification that the handle needs to be moved for the task being performed. **(T-2).**

3.3. Aircraft Maintenance Unit (AMU). AMUs may include the following sections: Aircraft, Specialist, Weapons, Debrief, Supply and Support. MAJCOMs may approve additional sections and AFSC make up within existing sections to efficiently meet unique weapon system maintenance support requirements. **Note:** Organization modifications must be approved IAW AFI 38-101.

3.4. AMU OIC/SUPT Responsibilities. Allocates personnel and resources to the production effort. In addition to the common responsibilities in **Chapter 2**, the AMU OIC/SUPT will:

3.4.1. Review Pilot Reported Discrepancies daily and ensure proper maintenance actions are taken. **(T-1)**.

3.4.2. Review all aborts and ensure proper maintenance actions are taken. **(T-1)**.

3.4.3. Monitor aircraft PH/ISO/Periodic (PE)/Home Station Check (HSC) flow. **(T-1)**.

3.4.4. Ensure a sufficient number of personnel are engine run qualified to meet maintenance requirements IAW **Chapter 11** **(T-1)**.

3.5. Production Superintendent (Pro Super). In squadrons with eight or fewer assigned aircraft, Pro Super and Flightline Expediter duties may be combined. The Pro Super will:

3.5.1. Make the final determination on aircraft status after reviewing aircraft forms. **(T-1)**. Additionally, the Pro Super will review the forms after aircrew debrief. **(T-1)**.

3.5.1. **(AFMC)** Make the final determination on aircraft status after reviewing aircraft forms and MIS applicable to specific MDS (e.g. Autonomic Logistics Information System (ALIS), Integrated Maintenance Data System (IMDS), Integrated Maintenance Information System (IMIS), etc.)

3.5.2. Sign the Exceptional Release (ER) IAW TO 00-20-1 when authorized by the MXG/CC IAW **Chapter 11** and **Table 11.1** **(T-1)**.

3.5.3. Participate in developing and executing the monthly and weekly flying and maintenance schedules/plans. **(T-1)**.

3.5.4. Manage the maintenance production effort by assigning priorities to meet the flying and maintenance schedules. **(T-1)**.

3.5.5. Fully understand actions required by the squadron under OPLAN 8010 or contingency plans. **(T-1)**.

3.5.5.1. Develop, ensure currency of, and direct the aircraft generation sequence. **(T-1)**.

3.5.6. Fully understand and be prepared to implement specific disaster control duties and squadron responsibilities pertaining to aircraft/SE movement and personnel evacuation procedures developed IAW AFI 10-2501. **(T-1)**.

3.5.6.1. Pro Super will maintain a current copy of the on-base disaster map with cordon overlay and appropriate functional checklists outlining duties during disaster scenarios. **(T-1)**.

3.5.7. Determine, track, and report aircraft/systems status IAW AFI 21-103. **(T-1)**.

3.5.8. Establish and track Estimated Time In Commission (ETIC). **(T-1)**.

3.5.9. Monitor unit CDDAR Program activities and local procedures designed to protect personnel and prevent further damage to aircraft, equipment, and other resources. **(T-1)**.

3.5.10. Inform MOC of the maintenance effort and coordinate with MOC, Flightline Expediter, and other squadrons for support. **(T-1)**.

3.5.10.1. Pro Super will provide MOC with aircraft/systems status updates as required. **(T-1)**.

3.5.11. Verify aircraft/system is in an authorized status IAW MDS-specific Minimum Essential Subsystem List (MESL) or MDS equivalent and AFI 21-103 prior to verifying MICAP conditions. **(T-1)**.

3.5.12. Verify aircraft weapons/load configurations are authorized IAW AFI 63-104. **(T-1)**.

3.6. Flightline Expediter. The Flightline Expediter ensures maintenance is accomplished and coordinates on all aircraft maintenance actions. Flightline Expediters manage, control and direct resources to accomplish maintenance. Flightline Expediters or equivalent will:

3.6.1. Remain on the flightline when maintenance personnel are performing flightline maintenance and launching/recovering aircraft. **(T-1)**. Flightline Expediters engage in direct sortie generation activities and work directly for the production superintendent. **(T-1)**.

3.6.1.1. Not perform production inspections (such as, sign off "Red Xs" and perform IPIs) unless waived to do so by the MXG. **(T-3)**.

3.6.2. Coordinate with the Weapons Expediter, ensure requirements in AFMAN 21-201 for flightline munitions accountability are strictly followed. **(T-1)**.

3.6.3. Develop and implement disaster control duties and squadron responsibilities pertaining to aircraft/SE movement and personnel evacuation IAW AFI 10-2501. **(T-1)**.

3.6.4. Maintain and have available for immediate use copies of the following as a minimum: flying schedule, emergency action and functional checklists, base grid map with cordon overlay, IPI listings, MESL, Quick Reference List (QRL) (if developed), WUC manual, and tracking device for aircraft status. **(T-1)**.

3.6.4.1. Track, as a minimum, the following aircraft status information: aircraft serial number, location, priority, status and ETIC, configuration, OAP condition codes, fuel load, munitions load, and remarks. Show all limitations against the Full Systems List (FSL) and Basic System List (BSL) column as itemized on the MESL or MDS equivalent. **(T-1)**. Ensure devices depicting aircraft status comply with program security requirements. **(T-1)**.

3.6.5. Follow established CANN procedures and ensure all CANNs are accurately documented in the aircraft/system forms and MIS as described in **Chapter 11** **(T-1)**.

3.6.6. Ensure aircraft OAP sampling is completed IAW **Chapter 11** and applicable technical data. **(T-1)**.

3.6.7. Ensure parts are ordered with appropriate priorities and relay document numbers to the Pro Super, MOC, and appropriate technicians. **(T-1)**.

3.6.7.1. Ensure timely turn in of DIFM items to DMS/supply IAW AFI 23- 101. **(T-1)**.

3.6.8. Request support beyond AMU capability to the MOC. **(T-1)**.

3.6.9. Direct AGE drivers to position AGE as required and notify the driver of AGE on the flightline or sub-pools that require maintenance. **(T-1)**.

3.6.10. Ensure timely and accurate aircraft status (for example, discrepancies, WUC/LCN, ETIC, job completion) and configuration status is reported IAW AFI 21-103 to the Pro Super and MOC. **(T-1)**.

3.6.11. Ensure completed aircraft forms are provided to the debrief function by the end of the flying day if debriefs have been suspended due to surges. **(T-1)**.

3.7. Aircrew and Maintenance Debrief Section. Debrief is conducted at the termination of each sortie/mission or when a sortie/mission is aborted. Aircraft scheduled for turn-around sorties/missions need not be debriefed if returned in landing status Code 1 or 2. However, debriefing is required, regardless of landing status, after the last flight of the day for each aircrew. MAJCOMs operating RPAs will develop and publish debrief procedures for Remote Split Operations in their supplements or addendum for both aircraft and ground control stations to adequately capture all maintenance discrepancies. The Debrief Section will:

3.7.1. Use aircraft fault reporting manuals and include fault codes when documenting discrepancies in the aircraft forms. **(T-1)**. Debrief Section will use automated debrief tools such as the Computerized Fault Reporting System. **(T-2)**.

3.7.1.1. Debrief Section will develop local aircrew debriefing guides when not provided and managed by the Weapon System PM. **(T-1)**. QA will review and approve local aircrew debriefing guides every two years. **(T-1)**.

3.7.1.1. **(AFMC)** Foreign Object (FO)/FOD reporting will be included in debriefing guide. **(T-2).**

3.7.2. Implement procedures for reporting dropped objects, aborts, code 3 flight control malfunctions and engine malfunctions. **(T-1)**.

3.7.3. Use operational utilization update screens in MIS to enter flying time information. **(T-1)**. Debrief Section will ensure flying times and installed engine Event History Recorder (EHR) readings, for both home station and deployed sorties/missions, are updated no later than the next duty day after occurrence. **(T-1)**.

3.7.4. Check AFTO Form 781H, *Aerospace Vehicle Flight Status and Maintenance*, to ensure updates to airframe time and applicable servicing data (in-flight/hot pit refueling) are entered on the AFTO Form 781H or equivalent and/or applicable debrief system during the pilot/aircrew debrief. **(T-1)**.

3.7.5. Input discrepancy verbatim and deviation information, utilization, and applicable flight data (to include landing status, system capability IAW AFI 21-103 and other applicable cause codes) into the MIS. **(T-1)**. Unless using an automated 781 process, do not send AFTO Form 781-series forms to Operations Squadron(s) or to Aviation Resource Management before MIS updates. Use local backup procedures for recording data when the MIS is unavailable.

3.7.6. Utilize MIS to identify and research discrepancies for repeat/recur trends and document them accordingly on the AFTO Form 781A. **(T-1)**. Debrief Section will ensure previously documented discrepancies are reviewed and identified as repeat/recurs. **(T-1)**.

3.7.6.1. Debrief Section will identify repeat/recurs on automated debriefing sortie recaps and on the AFTO Form 781A. **(T-1)**.

3.7.7. Use the appropriate landing status code (**Table 3.1**) and the appropriate system capability code (**Table 3.2**) for the completion of a sortie/mission. **(T-1)**.

3.7.8. Provide the MOC with aircraft identification numbers and system WUCs for each aircraft debriefed with a landing status Code-3 IAW **Table 3.1** using the approved MESL or MDS equivalent IAW AFI 21-103. **(T-1)**.

3.7.9. Enter one of the deviation cause codes (**Table 3.3**) into the MIS. **(T-1)**. Indicate the reason for the deviation and the agency that caused a deviation as referenced in Air Force Computer Systems Manual (AFCSM) 21-574, *Automated Debriefing* **https://ceds.gunter.af.mil/Publications.aspx?AIS=35** or equivalent applicable MIS guidance.

3.7.10. Collect and submit ASIP aircraft usage data IAW the MDS specific TOs, AFI 63-140, and **Chapter 11** of this instruction. **(T-1)**.

3.7.11. If MIS is not available, use blank printouts as manual documentation method. **(T-2)**. If deployed, send documents to home station for data transcribing by the most expeditious means available. Debrief Section will turn in, validate and reconcile all documents with the MIS when it becomes available. **(T-1)**.

Table 3.1. Landing Status Codes.

CODE	STATUS
Code 0	Ground Abort
Code 1	Aircraft Mission Capable (MC) with no additional discrepancies
Code 2	Aircraft or system has minor discrepancies but is capable of further mission assignment.
Code 3	Aircraft or system has major discrepancies in mission essential equipment that may require extensive repair or replacement prior to further mission assignment. The discrepancy may not affect safety-of-flight and the aircraft may be Non-Mission Capable (NMC) flyable.
Code 4	Aircraft or system has suspected or known radiological, chemical, or biological contamination.
Code 5	Aircraft or system has suspected or known battle damage.
Note: Debrief will enter code “8” in MIS for aircraft debriefed as code “4” or “5”. MESL or MDS equivalent requirements determine if aircraft status is NMC or Partially Mission Capable (PMC).	

Table 3.2. System Capability Codes

CODE	STATUS
Code 0	System flown with a known discrepancy, no additional discrepancies noted. System can be used.
Code 1	System used and performed satisfactorily. No maintenance required.
Code 2	System used and performed satisfactorily. A minor malfunction exists, but system is capable of further mission assignment.
Code 3	System performance was unsatisfactory. This system did not cause an abort.
Code 4	System performance was unsatisfactory. This system caused or contributed to an abort.
Code 5	System out-of-commission prior to takeoff.
Code 6	System installed but not used.
Code 7	System not installed.
Code 8	Aircraft or system has suspected or known radiological/biological contamination.

Table 3.3. Deviation Cause Codes

CODE	DEVIATION REASON
ATx	Air Traffic
GAA	Ground Abort, before engine start, maintenance
GAB	Ground Abort, after engine start, before taxi, maintenance
GAC	Ground Abort, after taxi, maintenance
HQT	Higher Headquarters
HQN	Higher Headquarters, NAF
HQP	Higher Headquarters, other

MTx	Maintenance
OPx	Operations
SUx	Supply
SYx	Sympathy
WXx	Weather
OTx	Other
Xxx	MAJCOM/local use
Note: Use x for any character for MAJCOM/local use.	

3.8. Aircraft Section. The Aircraft Section is the primary work center responsible for maintaining assigned aircraft. This section performs tasks to include servicing, scheduled and unscheduled maintenance, pre-flights, thru-flights, basic post-flights, home station checks, special inspections, corrosion control, cleaning, ground handling, launch/recovery of aircraft, troubleshooting and adjustment, on-equipment repairs and component removal/replacement, documenting maintenance actions, and managing aircraft forms. AMUs with 18 or more Primary Aerospace Vehicle (Aircraft) Inventory (PAI) aircraft may have two Aircraft Sections. The Aircraft Section consists of Aircraft Technicians. Refer to **Chapter 11** for FCC responsibilities.

3.8.1. Aircraft Technician Responsibilities. Aircraft Technicians manage and maintain assigned aircraft. Aircraft Technicians will:

3.8.1.1. Perform ground handling, servicing, -6 inspections, alert duties, maintenance ground tests, corrosion control, lubrication and maintenance and modification preparations, as applicable, on the assigned aircraft/system. **(T-1)**.

3.8.1.2. Inventory on-aircraft -21 equipment when this responsibility is not assigned to another function. **(T-1)**.

3.8.1.3. Perform engine operation when qualified and certified. **(T-1)**.

3.8.2. Dedicated Crew Chief (DCC) Program. The DCC program is optional with MXG/CC approval. The objective of a DCC program is to directly assign a maintenance person to each aircraft to provide continuity/accuracy of aircraft forms, aircraft status, scheduled maintenance, and improve aircraft appearance. DCCs manage and supervise maintenance on their aircraft. DCCs are selected on the basis of initiative, management and leadership ability, and technical knowledge. When authorized, ensure the DCC's and Assistant Dedicated Crew Chief name and rank is stenciled or painted on their assigned aircraft. Use only authorized wing paint scheme and marking procedures in TO 1-1-8. In addition to Aircraft Technician responsibilities, DCCs, if assigned, should:

3.8.2.1. Accompany their aircraft through scheduled inspections and assist the Inspection Section NCOIC/Chief as needed.

3.8.2.1.1. Attend pre- and post-dock meetings.

3.8.2.1.2. Assist the Inspection Section NCOIC/Chief with completing the required document review and validation at the end of the inspection.

3.8.2.2. Coordinate with Pro Supers and expediters for downtime to accomplish scheduled and unscheduled maintenance.

3.8.2.3. Manage deferred discrepancies.

3.9. Specialist Section. The Specialist Section is responsible for aircraft systems troubleshooting, on-equipment repairs, component removal and replacement, aircraft avionics systems, classified item management, aircraft ground handling, servicing, and cleaning. The section may include avionics, propulsion, hydraulic, and electro/environmental technicians and other specialties approved through higher headquarters. When used, the Specialist Section Expediter coordinates maintenance priorities with the Pro Supers and Flightline Expediters.

3.9.1. In addition to the common responsibilities in **Chapter 2**, the Specialist Section Chief will:

3.9.1.1. Ensure accurate and timely pod and support equipment status is updated or verified daily in Reliability, Availability, Maintainability, for Pods IAW AFI 21-103 for pods under the control of the Aircraft Maintenance Squadron. **(T-1)**.

3.9.2. Avionics Specialists will:

3.9.2.1. Perform PACER WARE, SERENE BYTE message, or TCTO reprogramming of avionics systems. **(T-1)**.

3.9.3. Electronic Warfare (EW) specialist functions may be combined with the avionics specialists. EW Specialists will:

3.9.3.1. Maintain inventory control of all installed Electronic Counter Measure (ECM) AME and ECM pods. **(T-1)**.

3.9.3.2. Perform reprogramming of avionics/electronic warfare systems (to include electronic attack pods) IAW applicable mission directives, PACER WARE/SERENE BYTE messages, or TCTO requirements. **(T-1)**.

3.9.3.3. Load contingency and training configuration settings in ECM pods, infrared countermeasures systems, and Radar Warning Receiver/Radar Threat Warning systems, unless the equipment is assigned to another section. **(T-1)**.

3.9.4. Propulsion Specialists will:

3.9.4.1. Troubleshoot, repair, and replace aircraft propulsion systems and components. **(T-1)**.

3.9.4.2. Perform engine flightline blade blending. **(T-1)**.

3.9.4.3. Perform flightline engine borescope inspections. **(T-1)**.

3.9.5. Electrical & Environmental (E&E) Specialists will:

3.9.5.1. Troubleshoot, repair and replace aircraft E&E system components including aircraft environmental control, bleed air, vacuum, pneumatic, installed fire extinguishing and suppressant systems, Liquid Oxygen (LOX) and Gaseous Oxygen (GOX) systems, and

On-Board Oxygen Generating Systems (OBOGS), On-Board Inert Gas Generation Systems (OBIGGS) and components. **(T-1)**.

3.9.5.1. **(AFMC)** [e.g.] Molecular Sieve Oxygen Generating System (MSOGS).

3.9.5.2. Remove and install In Flight Refueling (IFR) carts and fire bottle squibs. **(T-1)**. **Note:** Ensure only approved temporary storage locations are used for these components.

3.9.6. Hydraulic Specialists will maintain authorized on-equipment/off-equipment pneumatic and hydraulic systems and components. **(T-1)**.

3.10. Weapons Section. The Weapons Section is responsible for supporting flightline munitions loading/unloading and weapon maintenance operations. The Weapons Section may consist of two elements: Weapons Loading and Weapons Maintenance. Weapons Section personnel are trained and utilized in both functions as needed to maximize both mission capability and develop individual functional expertise. The Weapons Section may be comprised of a Weapons Section NCOIC/Chief, Weapons Expediters, an NCOIC for Weapons Loading, Load Crew personnel and a NCOIC for Weapons Maintenance and Weapons Maintenance personnel. When units are deployed where no AFSC 2W100 is assigned, the senior ranking 2W1 is the WWM. MAJCOMs will determine applicable portions of the Weapons Section responsibilities for contract organizations. Contract units are organized according to their respective contract. Exception: See AFI 21-101 ANG Supplement for details on the Weapons Section organizational structure within ANG.

3.10. (AFMC) Weapons Section. Weapons Section responsibilities for contract organizations will be determined by the contracting office through the multi-functional team (MFT) process. See AFI 63-138.

3.10.1. Weapons Section NCOIC/Chief. In addition to the common section NCOIC responsibilities in **Chapter 2**, the Weapons Section NCOIC/Chief will:

3.10.1. **(AFMC)** Civilian equivalent will be synonymous with Weapons section NCOIC.

3.10.1.1. Assist the WWM in recommending distribution of wing 2W1X1 personnel. **(T-3)**.

3.10.1.2. Review status of weapons **Section 2W1**'s positions on Unit Personnel Management Roster (UPMR) and advise WWM and AMU leadership on personnel concerns. **(T-3)**.

3.10.1.3. Monitor load crew and PRP status (if applicable) and equipment and tester availability. **(T-2)**. The Weapons Section NCOIC/Chief will advise the AMU OIC/SUPT and WWM regarding factors which affect training, weapons loading or maintenance capabilities, personnel actions impacting affecting manning levels (special duty, reassignment) or other key weapons related issues. **(T-2)**.

3.10.1.4. In coordination with the WS Superintendent, identify and select the best qualified personnel to be loading standardization and lead crew members. **(T-2)**.

3.10.1.5. Ensure the minimum UCML/TTML number of load crews are formed, trained and certified to perform the mission. **(T-1)**. Maintain load crew integrity during training and evaluations to the maximum extent possible.

3.10.1.6. Ensure personnel receive a documented supervisory review and complete required prerequisite training before entering initial load crew certification or performing flightline operations (cockpit familiarization, firefighting, AGE). **(T-2)**.

3.10.1.7. Annually review UCML/TTMLs and the unit tasked UTCs (for equipment and personnel) and UMD to identify any disconnects or problems. **(T-1)**.

3.10.1.8. Maintain a visual aid or automated product depicting the current status of assigned load crews and members. **(T-1)**. Printed products are not required if computer systems are networked or modem-interfaced with the WS load crew management system for on-line updates.

3.10.1.9. Ensure weapons load training aircraft requirements in coordination with the WS Superintendent, are developed and included in the weekly and monthly maintenance plans. **(T-2)**.

3.10.1.10. Review and apply the Weapons Standardization Program, integrated loading procedures, cross-loading procedures, dual loading procedures (if applicable), and be familiar with local munition loading/maintenance areas. **(T-1)**. Utilize the WLCMT. **(T-2)**.

3.10.1.11. Review all AF Form 2419, *Routing and Review of Quality Control Reports*, load crew training, certifications, and decertification documentation. **(T-2)**.

3.10.1.12. Ensure overall quantity of load crew CTKs are no less than the minimum number of required load crews, including lead crews, listed on the UCML. **(T-1)**. For bomber units and those that support operational test and evaluations, Remotely Piloted Aircraft (RPA) units, or training operations, coordinate with the WWM in determining the number of required load crew CTKs.

3.10.1.13. Ensure a checklist for each UCML/TTML munition is on hand for each assigned load crew CTK. **(T-1)**. Exception: Not applicable in units using electronic media devices (such as, F-22 PMA, F-35); test units are authorized reduced quantities.

3.10.1.14. Review all TO RCs, or Technical Order Data Change Requests (TODCR) prior to submission. **(T-1)**. The Weapons Section NCOIC/Chief will route all weapons loading related requests, for example, -16, -33 TOs, and F-22 TOD to WS and WWM for review. **(T-2)**.

3.10.1.15. Ensure Locally Manufactured Equipment (LME) and Munitions Materiel Handling Equipment (MMHE) meet requirements outlined in **Chapter 8** **(T-1)**.

3.10.1.16. Ensure Tamper Detection Indicators for nuclear applications are controlled IAW AFI 91-104, Nuclear Surety Tamper Control and Detection Programs. **(T-1)**.

3.10.1.17. Track all assigned AME and Normally Installed Equipment (NIE). **(T-1)**. If installed, track in MIS by aircraft tail number and position. Track uninstalled equipment in either the MIS or another equivalent means approved by the WWM.

3.10.1.18. Ensure positive control/accountability/serviceability for suspension equipment accessories (cables, fittings, adapters). **(T-1)**.

3.10.1.19. Coordinate with WS Superintendent to ensure MRPL and recertification capability exists on TDYs where live munitions will be expended and on deployments exceeding 30 days. **(T-1)**. Exceptions must be approved by the WWM. **(T-3)**.

3.10.1.20. Establish a munitions custody account for dummy test rounds (as applicable, if not tracked by Armament Flight). **(T-3)**.

3.10.1.21. Ensure prior to loading live and inert munitions that all requirements in **Chapter 10** have been met and the WWM is aware of any changes that affect the munitions policy requirements. **(T-1)**.

3.10.1.22. Notify squadron leadership and the WWM within 24 hours of any significant issues such as dropped/hung munitions, aircraft armament system or equipment malfunctions and mishaps. **(T-3)**. Take appropriate follow up actions and provide updates until all corrective actions have been taken. Monitor actions taken by supporting agencies on dispensers, suspension equipment, training munitions, which were involved with specific system malfunctions.

3.10.1.23. Report weapons release reliability and gun fire-out rates; along with corrective actions, if required, to the WWM by the first of each month for the previous month. **(T-3)**.

3.10.1.23. **(AFMC)** Will report weapons release reliability, gun fire-out rates, hung munitions, inadvertent releases, gun malfunctions, and armament-related dropped objects daily using the 9405 report on the HAF Armament SharePoint site. **(T-2).**

3.10.1.24. Provide WWM status on authorized/on-hand quantities and serviceability of AME/NIE/WRM, armament testers, support equipment, and personnel assigned (to include physical profiles/security status, and mal-assigned if applicable) by the first of each month. **(T-3)**.

3.10.1.24. **(AFMC)** For AME/NIE/WRM, armament testers and support equipment, units will provide daily updates using the 9405 report on the HAF Armament SharePoint site. **(T-2).**

3.10.1.25. Ensure requirements for submitting AFTO Form 375 on all weapons support equipment identified in TO 35-1-24, are accomplished. **(T-3)**.

3.10.1.26. Establish, monitor, and verify supervisory inspections on elements assigned with equipment and CTK's are completed. **(T-3)**.

3.10.1.27. **(Added-AFMC)** Maintain current copy of task assignment listing (TAL) for assigned aircraft. Ensure individuals review TAL and applicable -16/-33 series TOs prior to reporting for initial and recurring weapons load training. **(T-2).**

3.10.1.28. **(Added-AFMC)** Establish a SPRAM account to track encoder/decoders and power supplies (as applicable, if not tracked by Armament Systems Flight). **(T-2).**

3.10.1.29. **(Added-AFMC)** Establish a SPRAM account to track ruggedized nuclear remote interface units (as applicable, if not tracked by Armament Systems Flight). **(T-2).**

3.10.2. Weapons Expediter. The Weapons Expediter reports to the Weapons Section NCOIC/Chief and is responsible for managing all munitions loading and armament systems maintenance operations. The Weapons Expediter must be, as a minimum, a 2W171, knowledgeable of the assigned MDS maintenance and loading tasks and has completed the

Weapons Expediter Course provided by WS. **(T-1)**. The Weapons Expediter coordinates maintenance priorities with the Pro Super and Flightline Expediters. The Weapons Expediter will:

3.10.2.1. Remain on the flightline during all munitions loading/unloading. **(T-3)**.

3.10.2.2. Remain on the flightline to the maximum extent possible, when maintenance operations are being performed and during launch and recovery of aircraft. **(T-3)**. The Weapons Expediter will:

3.10.2.2.1. Monitor the safety of flightline weapons operations. **(T-1)**.

3.10.2.2.2. Supervise and provide technical guidance to individuals during weapons release system fault isolation, troubleshooting, and maintenance actions as needed. **(T-3)**.

3.10.2.2.3. Conduct weapons production and supervisory inspections. **(T-2)**.

3.10.2.3. Maintain copies of the following items in the Weapons Expediter's vehicle (if assigned): flying schedule, emergency action checklists, base grid map with cordon overlay identifying flightline Live Ordnance Loading Area, IPI listings, MESL or MDS equivalent, QRL (if developed) and/or WUC manual. **(T-3)**.

3.10.2.4. Track status and configuration of aircraft, suspension equipment, and weapons. **(T-1)**. Ensure 100 percent documented accountability of in use AME/NIE by location and status, whether installed or stored.

3.10.2.5. Maintain a separate daily AF Form 2430, or locally produced standardized form with WWM approval, for each shift. **(T-1)**. The Weapons Expediter will ensure all required documentation is complete and accurate. **(T-1)**. As a minimum, the following fields of the AF Form 2430 will be completed: "AS OF" (date), "JOB CONTROL" (filled out for maintenance actions that have a JCN, such as, 18-month inspections, Pilot Reported Discrepancies), not required for weapons loading tasks, Aircraft "(ACFT)/TRAINER"(MDS), "SERIAL" (tail number/serial number of component), "TIME" (("Required" = start time, "Dispatched" = time completed, "Completed" = status code, (C/W, C/F, CANX)), "SPECIALIST(S) DISPATCHED" (load/maintenance crew number/ name), "DISCREPANCY & REMARKS" (discrepancy/task performed). **(T-1)**. Transcribe any actions not complied with or cancelled to the next shift's AF Form 2430.

3.10.2.5.1. Units may maintain one single AF Form 2430 (or equivalent) for weekly scheduled maintenance, in addition to the daily shift AF Form 2430 (or equivalent). Transcribe any actions not complied with or cancelled to the next week's scheduled maintenance AF Form 2430 (or equivalent).

3.10.2.5.2. **(Added-AFMC)** Retain copies of completed AF Form 2430s (or equivalent) on file for six months. **(T-2).**

3.10.2.6. Manage munitions assets expenditures as follows:

3.10.2.6.1. Fill out an AF Form 2434, *Munitions Configuration and Expenditure Document*, or locally produced form, on all aircraft configured with munitions (includes impulse cartridges and chaff/flare). **(T-1)**. Record by serial number and location or position all armament related AME, NIE, or support equipment from which

munitions items are expended. **Note:** Record NIE serial numbers only when munitions are loaded directly on the NIE versus the AME. Exception: Nuclear units are not required to fill out AF Form 2434 during nuclear generations.

3.10.2.6.2. Comply with flightline munitions accountability requirements outlined in AFMAN 21-201. **(T-1)**. The Weapons Expediter will provide copies of final expenditure documents to PS&D, the Munitions Flight and Armament Flight. **(T-1)**.

3.10.2.7. Coordinate with the MOC or Munitions Control for the delivery and pick-up of munitions items. **(T-3)**.

3.10.2.8. Inspect at least 25 percent of conventional loaded aircraft to meet scheduled front-lines (and spares) to validate safety/security of aircraft prior to flight; document inspection on AF Form 2430 (or equivalent). **(T-1)**. If negative trends are apparent, identify the trend and inspect remaining flyers prior to flight. Inform Weapons Section NCOIC/Chief on the negative trend that is identified during inspection.

3.10.2.9. Ensure inspection requirements are carried forward/documented for all items that have specific periodic inspections (such as, Electronic Control Units, Gun System Control Panel). **(T-1)**. Inform PS&D when actions affect the aircraft inspection schedule.

3.10.2.10. Ensure aircraft and equipment forms and MIS documentation is complete, accurate and accomplished. **(T-1)**.

3.10.2.11. Coordinate accomplishment of all scheduled and unscheduled maintenance and inspections with the Pro Super/Expediter. **(T-3)**. Inform the Pro Super/Expediter of all start and stop times, status changes, delays and extensions.

3.10.2.12. Ensure all mission specific safing gear is controlled and accounted for to preclude loss and potential FOD. **(T-1)**.

3.10.2.13. Ensure Captive Air Training Munitions missile devices are managed IAW the munitions policy requirements outlined in **Chapter 10** (if applicable). **(T-1)**.

3.10.2.14. Track acceleration monitor assemblies by serial number, showing aircraft tail number and installed position. **(T-3)**.

3.10.2.15. **(Added-AFMC)** Ensure AME and SPRAM accountability and control requirements are met IAW AFI 21-103. **(T-2).**

3.10.3. Weapons Loading Element. The Weapons Loading Element is responsible for munitions loading and unloading during daily aircraft training, operational test and evaluations, and contingency operations. If a Weapons Maintenance Element is not formed, the Weapons Loading Element is responsible to perform all on-equipment armament system maintenance. The Weapons Loading Element consists of an NCOIC and Weapons Load Crews, (Weapons Load Team Chief and load crew members).

3.10.3.1. Weapons Loading Element NCOIC. The Weapons Loading Element NCOIC is responsible to the Weapons Section NCOIC/Chief. If an NCOIC of loading is not designated, the requirements below will be the responsibility of the Weapons Section NCOIC/Chief. The Weapons Loading Element NCOIC will:

3.10.3.1.1. Advise Weapons Section NCOIC/Chief on load crew status and load crew member concerns and issues related, but not limited to training, certification, qualification, and load crew personnel issues. **(T-3)**.

3.10.3.1.2. Review and become familiarized with the Weapons Standardization Program, integrated loading procedures, cross-loading procedures, dual loading procedures (if applicable), and local munition loading and maintenance areas. **(T-3)**.

3.10.3.1.3. Review AF Form 2419 on load crew training, certifications, and decertification documents. **(T-3)**.

3.10.3.1.4. For nuclear tasked units, ensure all loading supervisors and load crew members are trained to perform weapon system fault isolations and troubleshooting IAW AFI 91-107, *Design, Evaluation, Troubleshooting, and Maintenance Criteria for Nuclear Weapon Systems*. **(T-1)**.

3.10.3.2. Weapons Load Team Chief. The Weapons Load Team Chief is responsible to the Weapons Expediter for munitions loading and armament systems maintenance (if applicable). Weapons Load Team Chiefs are typically NCOs; however, Senior Airmen may perform conventional munition load team chief duties with concurrence of the WWM in writing. **(T-1)**. The Weapons Load Team Chief will:

3.10.3.2.1. Supervise the loading and/or unloading of only one aircraft at a time. **(T-1)**. Exception: unless operating within an approved cross-loading program.

3.10.3.2.2. Control all actions during the munitions load/unload operations environment and ensure the number of personnel in the area during explosives handling operations are kept to a minimum. **(T-1)**. The Weapons Load Team Chief may authorize other individuals to work on the aircraft provided they are briefed on emergency procedures, perform no maintenance or inspections which may jeopardize safety, hamper munition loading operations, or violate technical data. Access to the cockpit and/or applying power to the aircraft by other than the load crew during loading operations is prohibited unless coordinated through and approved by the Weapons Load Team Chief. Exception: During simultaneous loading/unloading and refueling during Concurrent Servicing Operations (CSOs), the Concurrent Servicing Supervisor is in charge and should still coordinate any aircraft activity with the Weapons Load Team Chief (See **Chapter 11** for Concurrent Servicing Operations guidance).

3.10.3.2.3. Ensure compliance with AFI 91-101 and AFI 91-107 when responding to maintenance actions on nuclear loaded aircraft. **(T-1)**.

3.10.3.3. Certified weapons loading personnel will load and unload munitions in support of aircraft operations. **(T-1)**.

3.10.3.3.1. Certified weapons loading personnel may be task qualified to perform on-equipment armament maintenance, per direction of Weapons Section Chief.

3.10.4. Weapons Maintenance Element. The Weapons Maintenance Element is responsible for all on-equipment weapons maintenance, to include fault isolation and troubleshooting. The Weapons Maintenance Element may be required to perform munition loading/unloading operations as determined by Weapons Section NCOIC/Chief. **Note:** If the Weapons Maintenance Element is not formed, these tasks are performed by loading personnel.

3.10.4.1. Weapons Maintenance Element NCOIC. The Weapons Maintenance Element NCOIC is responsible to the Weapons Section NCOIC/Chief. The Weapons Maintenance Element NCOIC will:

3.10.4.1.1. Advise Weapons Section NCOIC/Chief on all maintenance personnel issues (training, certification, qualification, and personal). **(T-3)**.

3.10.4.2. Weapons maintenance personnel are responsible to the Weapons Expediter for all armament systems maintenance and munition loading (if applicable). **Note:** Weapons maintenance personnel may be certified as load crew members, per direction of Weapons Section NCOIC/Chief. Weapons maintenance personnel will:

3.10.4.2.1. Install and remove armament related suspension equipment, launchers, adapters, on assigned aircraft to support configuration requirements for daily and contingency operations. **(T-1)**.

3.10.4.2.2. Install and remove all armament AME and NIE to FOM or for repair action. **(T-3)**.

3.10.4.2.3. Maintain equipment historical records (AFTO Form 95) for AME, and weapons system NIE, if equipment is not assigned to Armament Flight. **(T-3)**.

3.10.5. Non-Standard Weapons Sections. (For example, F-35, CV-22/Helicopter/RPAs). Nonstandard units will organize into a consolidated Weapons Section, which will be a composite of both the Weapons Section and Armament Flight. **(T-3)**. Contract units are organized according to their respective contract. The Weapons Section NCOIC/Chief must also comply with the applicable requirements of the section chief responsibilities of **Chapter 2**, to include **Paragraph 3.10** Weapons Section and **Paragraph 4.6** Armament Flight responsibilities. **(T-3)**. **Note:** When no WWM or WS Superintendent is assigned, the Weapons Section NCOIC/Chief will perform the duties of the WWM and WS Superintendent.

3.10.5.1. Personnel will be formed into maintenance/load crews and will be qualified to perform on/off equipment maintenance. **(T-1)**.

3.10.5.2. Coordinate with WWM to ensure sufficient quantities of qualified WS personnel are included on TDYs where live munitions will be expended and on deployments exceeding 30 days to provide qualification capability.

3.10.5.3. When Weapon Expediter manpower authorizations do not exist, the WWM will coordinate with the Squadron or equivalent to select and appoint a 2W171 individual(s) to perform weapons expediter duties within **Paragraph 3.10.2** **(T-3)**.

3.10.5.4. Weapons Section personnel will be qualified to perform on/off- equipment maintenance and munitions loading. **(T-3)**.

3.10.5.4.1. Personnel may perform rescue/guillotine hoist arm and de-arm procedures.

3.10.5.5. Weapons Section will track and issue small arms for armory security, maintenance security and courier operations for assigned and qualified weapons personnel only when required by unit commander authorization. **(T-2)**.

3.10.5.5.1. Weapons Section NCOIC/Chief will ensure personnel are trained to perform required security of high risk weapons at home station and deployed locations.

(T-3). Training will as a minimum include armory, anti-robbery, theft, recovery and resource protection procedures IAW AFI 31-101. **(T-3)**.

3.10.5.6. Weapons Section does not repair, maintain, or issue aircrew/mobility small arms weapons, for example, M9 and M16. **(T-2)**.

3.10.5.7. Personnel will not load ammunition on weapons systems where the flight engineer or aerial gunner performs this task (such as, CV-22 and Helicopters). **(T-3)**.

3.10.5.8. Geographically-Separated Weapons Sections. If a Weapons Section is geographically separated (determined locally) from the squadron support section, then items listed in **Paragraph 4.6.4** (Armament Support Section) must be available to support the geographically separated Weapons Section. **(T-3)**.

3.11. Support Section. The Support Section may include the following elements/functions to support AMU flightline maintenance activities; support (CTKs/special tools, eTools, test equipment, TOs, bench stock), -21 equipment, AME, mobility equipment and DMS. Personnel will be assigned to the Support Section for a minimum of 12 months. **(T-3)**. 2W1X1 personnel may be required to maintain task qualification and certification. Support Sections must standardize procedures across the AMXS for security, control, and accountability of equipment. **(T-1)**. Materiel support procedures in this section do not apply to aircraft supported by Contractor Operated and Maintained Base Supply. The Support Section will:

3.11.1. Maintain TOs IAW TO 00-5-1. **(T-1)**.

3.11.2. Maintain bench, shop and operating stocks IAW AFI 23-101, and **Chapter 9** **(T-1)**.

3.11.3. Ensure maintenance, control and storage of assigned AME, -21 equipment, and Maintenance, Safety, and Protective Equipment IAW AFI 21-103. **(T-1)**.

3.11.3.1. Support Section will develop local procedures to control and store other equipment not identified as -21 equipment (such as, aircraft galley items, U-2 pod panels, aircraft pylon attachment cover panels, aircraft covers/plugs) using AFI 21-103 guidelines. **(T-1)**.

3.11.4. Ensure proper calibration, use, care, handling and transportation of TMDE IAW TO 00-20-14, AFMAN 21-113, and applicable Calibration Measurement Summaries. **(T-1)**.

3.11.5. Maintain and manage squadron Land Mobile Radio (LMR) IAW **Chapter 11** (as applicable). **(T-1)**.

3.11.6. Monitor the status of critical support equipment and testers for serviceability, accountability and status of TCTO modifications. **(T-1)**. Support Section will provide monthly critical support equipment status update to Maintenance Supervision. **(T-3)**.

3.11.7. Maintain tools/CTKs IAW **Chapter (T-1)**.

3.12. AMU Decentralized Materiel Support (DMS). In addition to the responsibilities in **Chapter 9** for DMS procedures, AMU DMS personnel will:

3.12.1. Requisition parts and use supply management products. Initiate follow-up action when necessary. **(T-1)**.

3.12.2. Notify the Flightline Expediter of all back-ordered parts. **(T-1)**.

3.12.3. Develop and maintain a QRL as needed and provide it to technicians. **(T-2)**.

3.12.4. Track and process DIFM assets, to include warranty parts IAW AFI 23-101. **(T-1)**.

3.12.4.1. AMU DMS personnel will notify AMU leadership when DIFM asset turn-in times exceed requirements outlined in AFI 23-101. **(T-1)**.

3.12.5. Manage reusable containers IAW AFI 24-602V2, *Cargo Movement*, and TO 00-20-3. **(T-1)**.

3.12.6. Control and manage aircraft TNB if stored within the Support Section. **(T-1)**. When FOM assets are collocated with TNB, the items must be similarly controlled and managed. **(T-1)**.

3.12.7. Coordinate with the Pro Super and Flightline Expediter(s) for "mark for" changes. **(T-1)**.

3.12.8. Manage the AMU's CANN program supply transactions and the associated documentation. **(T-1)**.

3.13. (Added-AFMC) Global Hawk (GH) In-Flight Maintenance Procedures and Documentation.

3.13.1. **(Added-AFMC)** GH Remotely Piloted Vehicle (RPV) Documentation. GH RPV reporting will use standard Air Force landing status codes. Mission Crew Element (MCE) and Launch and Recovery Element (LRE) status will be reported separately from aircraft status (i.e., Aircraft Code 1, MCE Code 1, LRE Code 1). Aircraft, MCE and LRE will retain separate 781 forms binders. Mission capable status will also be tracked separately. Discrepancies discovered during flight will not be documented on the AF Form 781As or entered into IMDS for any asset directly involved with the mission while the aircraft is airborne. Units will develop a manual debrief data sheet which is maintained and controlled by the debrief section by mission number. This debrief data sheet will be used to annotate in-flight maintenance and pilot reported discrepancies. Continuation sheets will be annotated as #2, #3, etc., of XX pages. Once the mission ends and the post-mission debrief is completed, the 781 forms, IMDS and mission capable status will be annotated. **(T-2).**

3.13.2. **(Added-AFMC)** GH RPV Ground Station In-flight Maintenance procedures. The pilot in control of the system during the mission will always be the final authority as to what, when and for how long maintenance actions will be performed during flight. UAS Ground Station In-flight Maintenance is intended to provide repair of maintenance discrepancies while allowing the mission to continue. Discrepancies discovered during flight will not be documented on the AF Form 781As or entered into IMDS until after the mission is ended. Upon notification from the pilot, maintenance technicians will be dispatched to the MCE/LRE. Maintainers will respond with the debrief data sheet, provided by the debrief section. The pilot will document the discrepancy and provide written release for maintenance on the debrief data sheet. Maintenance will not be performed until the pilot releases the MCE/LRE for maintenance. The maintainer will return the debrief data sheet (with maintenance actions annotated) to the debrief section for inclusion into the final mission debrief. If additional maintenance actions are responded to during the same mission, the same debrief data sheet will be used. Use continuation sheets as required. **(T-2).**

Chapter 4

MAINTENANCE SQUADRON (MXS)

4.1. General. The MXS supports MGN operations by providing centralized back shop support to perform on and off equipment maintenance tasks that are assigned to a specific back shop function. The MXS provides both organizational and intermediate level maintenance described in the "Maintenance Concept" section in **Chapter 1**. Bases with permanently assigned Centralized Repair Facilities (CRF), which support enterprise RN functions, will develop and document the division of responsibilities between the MGN and RN, as outlined in **Chapter 13**, to ensure both local and enterprise mission requirements are met. **(T-1)**. IAW AFI 38- 101, the MXS may consist of personnel from various AFSCs organized into flights: Propulsion Flight, Avionics Flight, TMDE Flight, Accessories Flight, AGE Flight, Fabrication Flight, Armament Flight, Maintenance Flight, and Munitions Flight. The MXS maintains AGE, munitions, off-equipment aircraft and support equipment components; performs on-equipment maintenance of aircraft and fabrication of parts; and provides repair and calibration of TMDE. **Note:** For purpose of this instruction, MXS represents MXS, Equipment Maintenance Squadron (EMS), and Component Maintenance Squadron (CMS).

4.1. (AFMC) [DEV] General. The 412 MXS is organized into seven flights versus nine.

4.1.1. **(Added-AFMC)** [DEV] The 412 MXS/MXMA, Component Repair Flight, consolidates Avionics Flight, Armament Flight, and the Electro- Environmental, Battery Shop and Egress functions of the Accessory Flight in addition to the Tow Targets Section.

4.1.2. **(Added-AFMC)** [DEV] The 412 MXS/MXMX, Maintenance Flight, consolidates the functions of the Maintenance Flight and the pneudraulic and fuels functions of the Accessories Flight.

4.1.3. **(Added-AFMC)** [DEV] The 412 MXS/MXMW, Munitions Flight is responsible for the Armament (MXMR) function for Bomber aircraft only due to the geographic location/separation at Edwards AFB, South Base.

4.2. Maintenance Supervision Responsibilities. Maintenance Supervision may consist of an Operations Officer and Superintendent and is responsible to the SQ/CC for maintenance production. Maintenance Supervision manages the resources to accomplish the workload. In addition to general responsibilities in **Chapter 2**, Maintenance Supervision will:

4.2.1. Review and consolidate monthly maintenance plan inputs from flights/sections and forward to Maintenance Operations PS&D. **(T-1)**.

4.2.2. Optimize local repair capability by ensuring base level repair constraints (for example, lack of equipment, manpower, parts) are elevated to the Repair Network Manager (RNM) and applicable stakeholder(s) in accordance with AFI 20-117, TO 00-20-3, and **Paragraph 1.3.2**, and MAJCOM supplements to keep repair at the lowest level. **(T-1)**.

4.2.3. Ensure EOR procedures for transient aircraft are developed IAW TO 00-20-1 and MAJCOM supplements. **(T-1)**.

4.2.4. Ensure the MXS and WS develop procedures for required weapons loading actions on transient aircraft, storage of transient aircraft impulse cartridges, and requisition and maintenance of weapons safing equipment for common transient types of aircraft. **(T-1)**.

4.2.5. Ensure local manufacture capability and fabrication process is controlled IAW this instruction. **(T-1)**.

4.2.6. Ensure MXS personnel utilize Engineering Technical Service (ETS) personnel and the Joint Engineering Data Management Information and Control System (JEDMICS) **https://jedmics.af.mil/webjedmics/index.jsp** to obtain information and specifications when the information in TOs does not provide enough detail. **(T-1)**. **Note:** For drawings not available electronically, contact the appropriate JEDMICS help desk.

4.2.7. Appoint in writing MXS Pro Super(s) (if applicable). **(T-2)**.

4.3. MXS Production Superintendent (Pro Super). The MXS Pro Super will:

4.3.1. Monitor backshop production and flightline operations and coordinate support and priority with other squadron Pro Supers and MOC. **(T-1)**. MXS Pro Super will focus overall maintenance efforts toward MXG maintenance priorities. **(T-1)**.

4.3.2. Identify production requirements and shortfalls to Maintenance Supervision. **(T-1)**.

4.4. Accessories Flight. The Accessories Flight normally consists of four sections; Electrical and Environmental (E&E), Egress, Fuels, and Hydraulics and is responsible for performing on/off-equipment maintenance of systems and equipment.

4.4. (AFMC) [DEV] Accessories Flight. The 412 MXS does not have an accessories flight. The below responsibilities will be accomplished by the appropriate flight listed in section 4.1. **(T-2).**

4.4.1. Accessories Flight CC/Chief Responsibilities. In addition to the common responsibilities in **Chapter 2**, the Accessories Flight CC/Chief will:

4.4.1.1. Ensure an egress training program is established IAW this instruction. **(T-1)**.

4.4.1.2. Coordinate with squadron superintendents to ensure E&E and hydro personnel rotation plans are established to comply with core task upgrade requirements. **(T-1)**.

4.4.1.3. Ensure explosives are controlled and stored in approved storage areas/containers. **(T-1)**.

4.4.2. Electrical and Environmental (E&E) Section. The E&E Section performs authorized local manufacture, repair, overhaul, testing, modification, and inspection of aircraft and SE electrical components, wiring harnesses, batteries, and charging units. The E&E Section will:

4.4.2.1. Ensure battery disposal procedures meet applicable environmental standards and batteries are controlled for accountability purposes. **(T-0)**.

4.4.2.2. Perform on/off-equipment maintenance on aircraft electrical and environmental systems and components. **(T-1)**.

4.4.2.3. Repair LOX/GOX/Liquid Nitrogen servicing units/carts. **(T-1)**. **Note:** AGE performs chassis, enclosure, and trailer maintenance on gaseous and cryogenic servicing units and all maintenance on Self-Generating Nitrogen Servicing Carts.

4.4.2.4. Perform off-equipment maintenance for aircraft and aircrew Carbon Dioxide cylinders. **(T-1)**.

4.4.2.5. Perform off-equipment maintenance on type MA-1 portable breathing oxygen cylinders (portable walk around bottles) and regulators, to include removing/replacing the regulator and purging the bottle. **(T-1)**. **Note:** Ownership and storage of these cylinders remain with the appropriate support section.

4.4.3. Egress Section. The Egress Section maintains aircraft egress systems, components, and trainers (such as, aircraft ejection seats, extraction and escape systems, egress components of jettisonable canopies, explosive components of escape hatches/doors) and stores egress explosive components that are removed to FOM. Wings will identify the base level organization responsible for locating inadvertent beacon activations on the flightline and configuring survival kit personnel locator beacons (on-aircraft). **(T-1)**.

4.4.3.1. The Egress Section will:

4.4.3.1.1. Perform all off-equipment ejection seat maintenance in the egress maintenance facility. **(T-1)**.

4.4.3.1.2. Ensure all personnel use the Demand Response Team during any task requiring the removal/installation of explosive components, and during egress final inspections. **(T-1)**.

4.4.3.1.2.1. Demand Response Teams will be comprised of individuals who are certified to perform egress maintenance. **(T-1)**. At least one team member must be a certified egress journeyman. **(T-1)**.

4.4.3.1.2.1.1. **(Added-AFMC)** Egress augmentees may be utilized as part of an egress maintenance team to perform on-equipment maintenance, such as ejection seat and canopy removals or installations and egress final inspections. Do not use augmentees to perform egress off-equipment maintenance actions. **(T-2). Note:** Ejection seats undergoing periodic maintenance are exempt from the demand-response concept once explosive components have been removed.

4.4.3.1.3. Coordinate with PS&D and monitor the weekly maintenance schedule to identify egress items requiring removal for scheduled time changes/maintenance. **(T-1)**.

4.4.3.1.4. Utilize a facility that meets the requirements of AFMAN 32-1084, *Facility Requirements*. **(T-1)**. Locations are established IAW AFMAN 91-201 to store explosive components and ensure they are properly licensed.

4.4.3.1.4. **(AFMC)** Egress facilities will have limited access to ensure system integrity. **(T-2).**

4.4.3.1.4.1. Egress Section will ensure licensed explosive area will not exceed the licensed Net Explosive Weight capacity for each Hazard Class Division (HC/D) without approval from Wing Safety. **(T-1)**. See AFMAN 91-201 for additional restrictions.

4.4.3.1.4.1. **(AFMC)** Only egress section personnel will be authorized unescorted entrance to the egress licensed explosive location. **(T-2).**

4.4.3.2. The Egress Section NCOIC/Chief will:

4.4.3.2.1. Ensure ejection systems are “safed” IAW with 00-80G-series technical orders and AFMAN 91-201 prior to an aircraft being placed on static display. **(T-1)**.

4.4.3.2.2. Ensure egress systems on training aircraft are de-armed/“safed” IAW MDS specific TOs when an aircraft is used for Fire Emergency Services and/or aircrew extraction training. **(T-1)**.

4.4.3.2.3. Ensure aircraft (to include GITA) are "safed” IAW 00-80-series TOs. **(T-1)**.

4.4.3.2.4. Ensure all permanently decommissioned static display aircraft explosive devices are removed and turned in to munitions inspections IAW AFMAN 21-201. **(T-1)**. Egress Section will sign the appropriate block on the AF Form 3580, *USAF Heritage Program Aerospace Vehicle Static Display Egress and Safety Certificate*, which is retained by the Historical Property Custodian(s). **(T-1)**.

4.4.3.2.5. Request assistance from Explosive Ordnance Disposal (EOD) when egress explosive devices are damaged or suspected to be unsafe. **(T-1)**.

4.4.3.2.5.1. **(Added-AFMC)** When requesting changes or updates to the need-date of any cartridge actuated device/propellant actuated device (CAD/PAD) item, coordinate with PS&D and Munitions Accountable System Officer (MASO) in sufficient time to preclude emergency issue requests. Refer to AFMAN 21-201, *Munitions Management*, for emergency issue and contingency issue requests.

4.4.3.2.6. Establish egress training program requirements and conduct reviews IAW AFI 36-2650. **(T-1)**.

4.4.3.2.6. **(AFMC)** Classification training of Egress personnel will meet mandatory training requirements contained in AFI 36-2650, AFI 91-202, this AFI, and the CFETP. **(T-2).**

4.4.3.2.6.1. As a minimum, the program will include: a master training plan, explosive safety certification requirements, and MIS time change documentation qualification minimums. **(T-1)**.

4.4.3.2.6.1.1. **(Added-AFMC)** Civil service and contractor egress maintenance personnel who possess, as a minimum, one year of experience within the last three years performing egress intermediate- and organizational-level maintenance, repair, inspections, etc., may be considered for a waiver of classification training requirements. Waiver requests will be submitted to the applicable 2A6X3 MAJCOM functional manager for review then forwarded to the 2A6X3 Career Field Manager for final approval/disapproval. If waiver is disapproved, individuals must complete classification training. **(T-2).**

4.4.3.2.6.2. Certification requirements:

4.4.3.2.6.2.1. Egress personnel must successfully complete an Air Education and Training Command (AETC) Egress Technician Course for the specific aircraft to be maintained. **(T-1)**. Exception: ACES II-trained and certified egress SSgt 5-levels and above being reassigned to another base or unit maintaining ACES II-equipped aircraft are not required to complete the Organizational Maintenance (on-equipment) egress technician course unless required by the Egress Section NCOIC/Chief.

4.4.3.2.6.2.1.1. **(Added-AFMC)** Personnel are certified to perform egress systems maintenance by demonstrating adequate proficiency to a designated certifying official in the egress systems work center. Certification pass/fail criteria will be established by the egress work center supervisor. **(T-2).** Document certification in accordance with AFI 36-2650. Retrain any individual who fails the practical evaluation until the individual demonstrates adequate proficiency or withdraw the individual from training. If egress personnel are withdrawn from training, retrain in accordance with AFI 36-2650.

4.4.3.2.6.2.1.2. **(Added-AFMC)** Initial Certification of Non-Egress who augment egress technicians or perform Quality Assurance Evaluations of Egress Systems: Non-egress personnel must successfully complete an AETC egress technician course for the specific aircraft to be maintained. **(T-2)**. **Exception:** AFE personnel do not have to complete the technician course unless they are to be employed as egress augmentees.

4.4.3.2.6.2.1.3. **(Added-AFMC)** After completing the AETC technician course, non-egress personnel will be initially certified in accordance with **paragraph 4.4.3.2.6**. Non-egress personnel will also be recertified in accordance with **paragraph 4.4.3.2.6.4.2.2** **(T-2)**.

4.4.3.2.6.3. Decertification requirements:

4.4.3.2.6.3.1. Decertify egress personnel after not having performed egress maintenance for more than 18 months. **(T-1)**. Instructing and inspecting egress maintenance is not considered performing maintenance.

4.4.3.2.6.3.2. Document decertification in accordance with AFI 36-2651. **(T-1)**.

4.4.3.2.6.4. Recertification requirements:

4.4.3.2.6.4.1. Recertify egress personnel who have not performed egress maintenance for 18 months. **(T-1)**.

4.4.3.2.6.4.2. Recertification must be accomplished by a 2A673 trainer and certifier. **(T-1)**.

4.4.3.2.6.4.2.1. **(Added-AFMC)** The purpose of recertification is to ensure personnel still maintain the required knowledge and skills to safely maintain and/or inspect egress systems.

4.4.3.2.6.4.2.2. **(Added-AFMC)** Recertify non-egress personnel at least every 180 days. **(T-2).**

4.4.3.2.6.4.2.3. **(Added-AFMC)** COR/QAE personnel exclusively performing contract surveillance do not have to be recertified. If these personnel are performing egress maintenance, they must be recertified. **(T-2).**

4.4.3.2.6.4.2.4. **(Added-AFMC)** Recertification procedures are identical to initial certification procedures and will be accomplished in accordance with **paragraph 4.4.3.2.6** **(T-2).** Document recertification in accordance with AFI

36-2650.

4.4.3.2.7. Review and validate all egress familiarization training documents at least every 24 months. **(T-1)**.

4.4.3.2.8. Ensure the egress Time Change Item (TCI) data in the MIS is accurate. **(T-1)**.

4.4.3.2.8.1. Ensure automated data products will be updated whenever an egress item is replaced to ensure the annual TCI forecast is correct. **(T-1)**.

4.4.3.2.8.2. Ensure separate databases are not used to manage the egress TCI program. **(T-1)**.

4.4.3.2.8.3. Ensure component background information is provided to PS&D to include a list of all components having multiple part numbers with a different service life. **(T-1)**.

4.4.3.2.9. Reconcile and verify each aircraft's egress data annually with PS&D. **(T-1)**.

4.4.3.2.9.1. Document the annual verification on the AF Form 2411, *Inspection Document* maintained in the aircraft jacket file. **(T-1)**.

4.4.3.2.10. Establish egress systems inspection and documentation requirements. **(T-1)**.

4.4.3.2.10.1. Egress Section will maintain an egress tail number binder for each assigned aircraft. **(T-1)**. **Note:** This binder should not to be confused with the aircraft jacket file of historical records maintained by PS&D, but serves to standardize the format for maintaining egress documentation requirements across AF egress shops. As a minimum the binder will include:

4.4.3.2.10.1.1. Binder Spine - Aircraft assigned Serial Number. **(T-2)**.

4.4.3.2.10.1.2. Front Cover - Delayed Discrepancies. **(T-2)**.

4.4.3.2.10.1.3. Tab A - PRA or 5th Gen equivalent (Cross reference sheet stating digital location of data). **(T-2)**.

4.4.3.2.10.1.4. Tab B - Completed In-Shop Maintenance Flow Sheet(s). **(T-2)**.

4.4.3.2.10.1.5. Tab C - Completed Major Inspection Flow sheet(s) (for example, 36 month), or equivalent (if Mission Design Series applicable). **(T-2)**.

4.4.3.2.10.1.5.1. Annotate pull check/inspection results on the flow sheet. **(T-2)**.

4.4.3.2.10.1.6. Tab D - Egress Configuration Screen (IMDS 257 or 5th Generation equivalent), current manual Cartridge Actuated Device/Propellant Actuated Device (CAD/PAD) collection sheets. **(T-2)**.

4.4.3.2.10.1.7. Tab E - Completed Time Change Item Replacement Sheets, for example, locally generated or equivalent. **(T-2)**.

4.4.3.2.10.1.8. Tab F - Significant Historical Data (AFTO 95 or equivalent (cross reference to MIS maybe used), Depot/Program Depot Maintenance (PDM) package, -107 Technical Assistance Request or Engineering Assistance

Request Responses). **(T-2)**.

4.4.3.2.10.1.9. Tab G - Misc. (example, PAIR, Extension Letters). **(T-2)**.

4.4.3.2.10.1.10. Tab H AF Form 2411, *Inspection Document*. **(T-2)**.

4.4.3.2.11. A certified egress production inspector (for example, Red X, IPI certified and tracked on the SCR IAW **Table 11.1**) will inspect any integral part of the egress system when any maintenance other than a visual inspection is performed. **(T-1)**.

4.4.3.2.11. **(AFMC)** Newly assigned uncertified egress personnel who have completed Classification Training may assist in performing egress systems maintenance. These personnel will never clear (sign off) AFTO Form 781-series entries, MIS or condition tags. **(T-2)**

4.4.3.2.11.1. The inspection must be an egress final inspection unless another inspection is prescribed by technical data. **(T-1)**.

4.4.3.2.11.2. Egress personnel will conduct an egress final every 30 days on ejection seats that have integrated personnel/recovery parachutes and/or survival kits as part of the seat if prescribed by technical data. **(T-1)**.

4.4.3.2.12. Egress Sections may store spare parachutes and survival kits for use in responding to Red Ball and unscheduled maintenance events.

4.4.4. Fuel Systems Section. The Fuel Systems Section repairs, functionally checks, and inspects aircraft fuel systems, fuel tanks, hydrazine systems, in-flight refueling receptacle systems, and related components. This section also performs maintenance on AME external fuel tanks, Conformal Fuel Tanks, and Weapons Bay Tanks and provides temporary storage for Conformal Fuel Tanks, and Weapons Bay Tanks.

4.4.4.1. The Fuels Systems Section will:

4.4.4.1.1. Maintain serial number inventory accountability for all removable external fuel tanks IAW AFI 21-103. **(T-1)**.

4.4.4.1.2. Purge and preserve fuel tanks for storage and shipment. **(T-1)**. **Note:** LRS is responsible for the storage, delivery, and shipment of fuel tanks in their possession.

4.4.4.1.3. Establish a local Memorandum of Agreement (MOA) or Memorandum of Understanding (MOU) (MXS with AMXS or equivalents) governing the storage, issue, receipt, and inventory control of in-use removable external fuel tanks. **(T-1)**.

4.4.4.1.3. **(AFMC)** Within the MOA/MOU, local units with approval from MXG/CC (or equivalent) will designate which squadron(s) is responsible for management of external fuel tanks and conformal fuel tanks. **(T-2).**

4.4.4.1.4. Perform all maintenance and inspections on WRM fuel tanks. **(T-1)**.

4.4.4.1.4.1. Meet quarterly with installation War Reserve Materiel Officer/WRM Non-Commissioned Officer (NCO) and LRS representatives to review inspection criteria for stored WRM tanks, schedule tank inspections and maintenance, and report discrepancies identified during WRM monthly walk-through inspections. **(T-1)**.

4.4.4.1.4.1.1. **(Added-AFMC)** Establish notification procedures to inform the base fire department when open fuel tank maintenance is in progress and when maintenance is complete. **(T-2).**

4.4.4.2. In addition to the common responsibilities outlined in **Chapter 2**, the Fuel Systems Section NCOIC/Chief will:

4.4.4.2.1. Establish controls to prevent unauthorized entry into fuel cell and hydrazine repair areas. **(T-1)**.

4.4.4.2.2. Provide required qualification training to all personnel who enter aircraft fuel tanks and/or open fuel tank areas to perform maintenance or to provide assistance. **(T-1)**.

4.4.4.2.3. When required, ensure Hydrazine Response Teams are formed with only team members/supervisors possessing AFSC 2A6X4. **(T-1)**. Refer to TO 00-25-172, *Ground Servicing of Aircraft and Static Grounding/Bonding*, TO 00-105E-9, *Aerospace Emergency Rescue and Mishap Response Information*, TO 42B1-1-18, *General Procedures for Handling of H-70*, and review MDS-specific TOs and MAJCOM/Lead Command directives for additional information on hydrazine hazards and management. For Air Demonstration Squadron (Thunderbirds) only the Hydrazine Response Team Supervisor must possess AFSC 2A6X4. **(T-1)**.

4.4.4.2.3.1. Ensure initial and refresher hydrazine safety training is completed for all hydrazine response team members IAW TO 42B1-1-18. **(T-1)**.

4.4.4.2.3.2. Integrate Hydrazine Response Team responsibilities into the CDDAR Program and local In-Flight Emergency (IFE) functional checklists (as applicable). **(T-1)**.

4.4.4.2.4. Perform safety inspections on facilities to ensure open tank repair areas, and equipment used for open fuel tank or hydrazine maintenance meet MDS-specific TOs, TO 42B1-1-18 and TO 1-1-3, *Inspection and Repair of Aircraft Integral Tanks and Fuel Cells* requirements. **(T-1)**.

4.4.4.2.5. Establish a Confined Space Entry Program IAW TO 1-1-3 and AFMAN 91-203. **(T-1)**.

4.4.4.2.6. Establish a Respiratory Protection Program IAW AFI 48-137. **(T-1)**.

4.4.4.2.6.1. All respiratory training requirements are documented on AF Form 55 or equivalent IAW AFI 91-202.

4.4.4.2.7. **(Added-AFMC)** Monthly review IMDS to schedule external fuel tanks for inspection or TCTOs. **(T-3).**

4.4.4.2.8. **(Added-AFMC)** Coordinate with AMXS or equivalents to schedule aircraft with non-grounding fuel leaks through the fuel systems repair facility to prevent further deterioration. **(T-3).**

4.4.4.3. **(Added-AFMC)** Nestable Fuel Tank Build Up (NFTBU) Team Members and Training. The fuel systems section NCOIC identifies 2A6X4 personnel as NFTBU cadre members and establishes a training program. **(T-2).** The NFTBU team will be augmented

by non-2A6X4 personnel in the wing during build up operations. **(T-3).** NFTBU Cadre team members will:

4.4.4.3.1. **(Added-AFMC)** Attend initial NFTBU training at an Air Education and Training Command (AETC) Training Detachment (TD). **(T-2).**

4.4.4.3.2. **(Added-AFMC)** Conduct annual refresher NFTBU training for all fuel systems section personnel tasked for any UTC and document completed training in the MIS. **(T-2).**

4.4.4.3.3. **(Added-AFMC)** Reviews UTC MISCAP statement as it applies to the unit's tasking and ensures availability of trained fuel systems personnel and serviceable equipment/tools to support requirements. **(T-2).** (Units are no longer required to maintain ready-trained augmentees. Commanders must provide NFTBU augmentees to fill UTC requirements at the time of tasking). **(T-2).**

4.4.5. Hydraulic Section. The Hydraulic Section performs on- and off-equipment maintenance on pneumatic and hydraulic systems, components (except environmental and egress systems) and provides maintenance support for SE and test equipment. The Hydraulic Section also maintains hydraulic test stands, pumping units, and associated components.

4.4.5.1. The Hydraulic Section will:

4.4.5.1.1. Perform maintenance on munitions loading and handling equipment with discrepancies that exceed the munitions flight repair capabilities. **(T-1)**.

4.4.5.1.2. Maintain and inspect refueling drogues, booms, and refueling receptacle systems for large aircraft. **(T-1)**.

4.4.5.1.2. **(AFMC)** [DEV] AMUs will inspect refueling drogues, booms, and refueling receptacle systems for 412 TW aircraft.

4.4.5.1.3. Repairs, overhauls, and bench checks flight control, landing gear, and hydraulic power system components (such as, brakes, struts, accumulators, reservoirs, actuators). **(T-1)**.

4.5. Aerospace Ground Equipment (AGE) Flight. The AGE Flight is normally organized as a consolidated maintenance unit (repair, inspection, and servicing sections) or, at MAJCOM discretion, may be organized into teams for concentrated support efforts. The AGE Flight is responsible for providing powered and Non-Powered AGE (NPA) as defined in TO 00-20-1 to support both aircraft and non-aircraft weapon systems.

4.5. (AFMC) Aerospace Ground Equipment (AGE) Flight. The AGE Flight may be organized in any manner, deemed necessary by the MXS commander or equivalent, to best support and execute local aircraft sortie generation and aircraft maintenance.

4.5.1. The AGE Flight will:

4.5.1.1. Maintain and inspect AGE, IAW TO 00-20-1, and equipment specific TOs in support of sortie production and back shop maintenance activities. **(T-1)**.

4.5.1.2. Pick up, service, deliver, repair, and perform approved modifications, TCTOs, inspect assigned AGE and perform corrosion control tasks. **(T-1)**.

4.5.1.3. Utilize AF Form 864, *Daily Requirement and Dispatch Record*, or MAJCOM-approved electronic product to record all equipment pickup and delivery. **(T-1)**.

4.5.1.3. **(AFMC)** Electronic form equivalents may be used.

4.5.1.4. Perform chassis, enclosure, and trailer maintenance on gaseous and cryogenic servicing units. **(T-1)**.

4.5.1.5. Manage maintenance and inspection scheduling activities for flight maintained equipment. **(T-1)**. **Note:** Maintain oversight of additional requirements for assigned Nuclear Certified Equipment IAW AFI 63-125.

4.5.1.6. Safeguard any Item Unique Identification (IUID) marks during maintenance activities to the extent possible. **(T-1)**. In the event the Unique Item Identifier (UII) is damaged during maintenance activities, the AGE Flight will notify the responsible Equipment Custodian and/or Equipment Accountability Element (EAE) to replace the mark with the same UII. **(T-1)**.

4.5.1.7. **(Added-AFMC)** Manage AGE readyline to provide serviceable equipment to users.

4.5.2. AGE Flight Chief Responsibilities. In addition to the applicable Flight CC/Chief responsibilities in **Chapter 2**, the AGE Flight Chief will:

4.5.2.1. Review and coordinate the AGE MEL annually with applicable Maintenance Supervision. **(T-1)**. The MXG/CC approves the identified types and quantities of AGE for the MEL.

4.5.2.1.1. AGE Flight Chief will provide copies of the approved MEL to the MOC. **(T-1)**.

4.5.2.2. Ensure AGE status/scheduling is tracked daily using the MIS. **(T-1)**.

4.5.2.2.1. Provide status and ETIC information to the MOC when it falls below MEL. **(T-1)**.

4.5.2.3. Ensure newly assigned AGE receives acceptance inspections IAW TO 00-20-1. **(T-1)**.

4.5.2.4. Control fuel dispensed from issue tanks IAW AFI 23-204, *Organizational Fuel Tanks*. **(T-1)**.

4.5.2.5. Ensure the Uniform Repair and Replacement Criteria Program is implemented IAW TO 00-25-240 and TO 35-1-24. **(T-1)**.

4.5.2.6. Coordinate welding requirements with the Fabrication Flight Chief. **(T-1)**.

4.5.2.7. Manage AGE CANN actions IAW **Chapter 9** and **Chapter 11** **(T-1)**.

4.5.2.8. Establish and monitor the AGE Operator Training Program and assist in the development of course control documents in conjunction with Maintenance Training (MT). **(T-1)**.

4.5.2.9. Ensure an AGE Corrosion Control and Prevention Program is maintained and a field number system is established IAW TO 35-1-3, TO 1-1-8, TO 1-1-691, MAJCOM instructions, and equipment specific TOs. **(T-1)**.

4.5.2.10. Develop and implement a tracking system to prioritize complete repainting for AGE equipment based on a "worst is first" principle. **(T-1)**.

4.5.2.10.1. AGE Flight Chief will coordinate with Fabrication Flight Chief for work beyond the AGE work center capability. **(T-1)**.

4.5.2.10.2. **(Added-AFMC)** AGE Pro Super will coordinate with Fabrication Pro Super for work beyond the AGE work center capability. **(T-3).**

4.5.2.11. Ensure equipment is prepared for storage or shipment IAW TO 35-1-4, *Processing and Inspection of Support Equipment for Storage and Shipment*, and applicable end item TOs. **(T-1)**.

4.5.2.12. Ensure annual transient aircraft landing data is submitted to the respective MAJCOM AGE functional manager by 1 February. **(T-1)**. Data will reflect previous year's TA aircraft landings by aircraft MDS and is obtained from local Transient Alert managing office. **(T-1)**.

4.5.2.13. Establish AGE sub-pools, as needed, in coordination with OSS's Airfield Operations Flight. **(T-1)**.

4.5.2.14. Ensure AGE tow vehicles are two-way radio equipped, permanent or hand-held, to expedite AGE deliveries. **(T-1)**. AGE Flight Chief will ensure any permanent installation of radios are accomplished IAW AFI 24-302. **(T-1)**.

4.5.3. AGE Pro Super Responsibilities (if not assigned, the AGE Flight Chief will fulfill these responsibilities). The AGE Pro Super will:

4.5.3.1. Monitor the production of AGE Flight and recommend equipment/personnel adjustments to the AGE Flight Chief as required. **(T-1)**.

4.5.3.2. Monitor adherence to AGE Flight's safety, training, and CTK programs. **(T-1)**.

4.5.3.3. Monitor serviceability status of equipment parked in sub-pools. **(T-1)**.

4.5.3.4. Monitor distribution, control, and condition of AGE Flight's assigned vehicles. **(T-1)**.

4.5.3.5. Monitor shop equipment for condition and documentation. **(T-1)**.

4.5.4. AGE Production Support Section. The AGE Production Support Section provides administration and ancillary services for TO file maintenance, supply support, and fuels management. A full-time Materiel Management Journeyman/craftsman (AFSC 2S0X1) should be assigned to the AGE Production Support Section when the workload warrants. In addition to the applicable Section NCOIC/Chief responsibilities outlined in **Chapter 2**, the AGE Production Support Section NCOIC/Chief will:

4.5.4.1. Manage the AGE Flight's TO libraries IAW TO 00-5-1. **(T-1)**.

4.5.4.2. Manage the AGE Flight's tool storage and issue areas IAW **Chapter 8** **(T-1)**.

4.5.4.3. Manage the AGE Flight's TMDE program IAW TO 00-20-14 and AFMAN 21-113. **(T-1)**.

4.5.4.4. Manage the AGE Flight's materiel management function IAW **Chapter 9** and AFI 23-101. **(T-1).**

4.5.4.4.1. Pre-assembled part kits are authorized; if required, assemble from bench stock in minimum quantities necessary to support workload requirements.

4.5.4.5. Coordinate the AGE Flight's scheduling function with PS&D. **(T-1)**. The AGE Production Support Section NCOIC/Chief will:

4.5.4.5.1. Maintain AGE historical records. **(T-1)**.

4.5.4.5.2. Prepare an AGE scheduled maintenance plan and maintain a current equipment scheduling report for all assigned equipment. **(T-1)**.

4.5.4.5.3. **(Added-AFMC)** In coordination with PS&D, ensure all inspections, TCTOs, time changes, maintenance and repair actions are scheduled and performed. **(T-2).**

4.5.4.6. Manage the AGE Flight's organizational fuel tank(s) IAW AFI 23-204. **(T-1)**.

4.5.4.7. Manage the AGE Flight's HAZMAT/ESOH programs IAW AFI 90-8XX series ESOH instructions and the AFI 32-70XX series environmental instructions. **(T-1)**.

4.6. Armament Flight. The Armament Flight, when formed, will be part of either MXS, EMS or Munitions Squadron (MUNS), and performs off-equipment maintenance for assigned aircraft armament systems, guns, pylons, racks, launchers and adapters. **(T-1)**. An AFSC 2S0X1 Materiel Management journeyman/craftsman may be assigned to the flight if mission dictates and respective SQ/CC and MXG/CC concurs. The Armament Flight normally consists of three sections: Armament Maintenance Section, AME Section, and Support Section. The WWM, with MXG/CC concurrence, determines when armament systems personnel are required to perform load crew duties or related certifiable tasks.

4.6. (AFMC) [DEV] Armament Flight. Within the 412 MXS, Armament flight duties are performed in the Component Repair Flight for fighter and trainer aircraft. Armament functions for bomber aircraft are aligned under the Munitions Flight due to geographic location and system complexity. These flights will provide oversight to all responsibilities and duties called out for these sections in AFI 21-101.

4.6.1. Armament Flight Chief Responsibilities. In addition to common Flight CC/Chief responsibilities outlined in **Chapter 2**, the Armament Flight Chief will:

4.6.1.1. Assist the WWM in recommending distribution of AFSC 2W1X1 personnel to satisfy on-and off-equipment weapons release and gun system maintenance. **(T-1)**.

4.6.1.2. Advise the Operations Officer/MX SUPT and the WWM regarding factors which affect training, or maintenance capabilities, personnel actions affecting manning levels (cross-training, special duty, reassignment) equipment shortfalls and other key weapons related issues. **(T-1)**.

4.6.1.3. Establish and monitor gunroom security IAW AFI 31-101. **(T-1)**.

4.6.1.4. Ensure AME and SPRAM accountability and control requirements are met IAW AFI 21-103. **(T-1)**.

4.6.1.5. If applicable, support WRM rack, adapter, pylon, launcher and gun maintenance requirements IAW AFI 25-101, *Air Force War Reserve Materiel (WRM)*. **(T-1)**.

4.6.1.6. Provide the WWM monthly status on authorized/on-hand quantities and serviceability of AME/NIE/WRM, critical armament testers, and support equipment by the first of each month, for the previous month. **(T-3)**.

4.6.1.7. Ensure requirements for submitting AFTO Form 375 on all weapons support equipment identified in TO 35-1-24, are accomplished. **(T-1)**. This process provides vital information and source documentation for the Product Group Manager to adequately reflect equipment sustainment costs, attrition rates, and to enable timely forecasting for replacement funding.

4.6.1.8. Establish procedures to ensure items requiring explosive-free certification IAW TO 11A-1-60 are properly inspected, marked and certified prior to shipment. **(T-1)**.

4.6.2. Armament Maintenance Section: The Armament Maintenance Section performs TCTOs, inspections and maintenance on assigned armament systems, guns, pylons, racks, launchers, and adapters. In addition to the applicable Section NCOIC/Chief responsibilities outlined in **Chapter 2**, the Armament Maintenance Section NCOIC/Chief will:

4.6.2.1. In coordination with PS&D, ensure all inspections, TCTOs, time changes, maintenance and repair actions for aircraft armament systems suspension and release components and AME, including AME items preloaded with munitions for contingencies are scheduled and performed. **(T-3)**.

4.6.2.2. Ensure the off-equipment portion of major inspections is performed. **(T-1)**. In bomber and special mission aircraft units, the AME Section NCOIC/Chief will facilitate assistance with the on-equipment portion of major aircraft inspections that pertain to the armament system. **(T-1)**.

4.6.2.3. Ensure WRM assets are maintained (if applicable). **(T-1)**.

4.6.2.4. Ensure equipment historical records (AFTO Form 95) for AME, aircraft guns and weapons system NIE are maintained. **(T-1)**.

4.6.2.5. Ensure ammunition loading assemblies and systems are maintained and inspected. **(T-1)**. **Note:** The Munitions Flight maintains the chassis portion.

4.6.3. Alternate Mission Equipment (AME) Section. The AME Section accounts for, stores and controls AME. If not formed, the responsibilities detailed in this section will be accomplished by the Armament Maintenance Section. **(T-2)**. In addition to the applicable Section NCOIC/Chief responsibilities outlined in **Chapter 2**, the AME Section NCOIC/Chief will:

4.6.3.1. Develop procedures governing accountability and control of AME, in coordination with Weapons Section NCOIC/Chief and WWM. **(T-1)**.

4.6.3.2. Ensure all weapons assigned, non-load box/tester-configured (bomber aircraft), F-2/utility type trailers are maintained. **(T-1)**.

4.6.3.3. Ensure SPRAM accounts are maintained IAW AFI 21-103 and AFI 23-101. **(T-1)**.

4.6.4. Support Section: The Support Section stores and maintains tools/equipment and manages the supply and bench stock functions for Armament Flight. The Support Section will:

4.6.4.1. Ensure tools and equipment are managed IAW **Chapter 8** **(T-1)**.

4.6.4.2. Ensure maintenance materiel management support is managed IAW **Chapter 9** **(T-1)**.

4.7. Avionics Flight. The Avionics Flight normally consists of some combination of; a Communication-Navigation Section, an Radio Frequency (RF) Multiplexing Section, an Instrument and Flight Control Systems (IFCS) section, a Weapons Control System Section, a Sensors Section, an Electronic Warfare System (EWS) Section, an Avionics Intermediate Section, a Computer Section, a Surveillance Radar Section, a Combat Systems Section, a Cryptographic Section, an Offensive Avionics Section, and a Cyber/Information Security Section. **Note:** Do not authorize additional manpower positions to form sections resulting from local management decisions.

4.7. (AFMC) [DEV] Avionics Flight. Within the 412 MXS, the Component Repair Flight will perform this function and will provide oversight to all responsibilities and duties called out for these sections in AFI 21-101. There are no additional mission support requirements for AFMC.

4.7.1. Sections within the Flight are responsible for maintaining avionics systems and components and the associated test/support equipment. They perform authorized equipment repairs, TCTOs, component programming/reprogramming, troubleshooting, CND/BCS screening of line replaceable units (LRUs), sub-component removal and replacement, management, programming and status reporting for assigned pods and SE, and in-work classified avionics systems component management. They are authorized to perform the following maintenance actions if the required support equipment is authorized and on-hand. Repairs above and beyond those listed require approval from the appropriate approval authority (Lead Command, depot). MAJCOMs will identify any additional mission support requirements in their supplements and addendums.

4.7.1. **(AFMC)** , see **paragraph 4.7**. [DEV] Avionics Flight.

4.7.2. Avionics Flight CC/Chief Responsibilities. In addition to the applicable Flight CC/Chief responsibilities listed in **Chapter 2**, the Avionics Flight CC/Chief will:

4.7.2.1. Support Wing EW system programming. **(T-1)**.

4.7.2.2. Ensure control and storage of assigned AME IAW AFI 21-103. Develop local procedures for control and storage of items not specified in -21 TOs. **(T-1)**.

4.7.2.3. Ensure accurate and timely pod and SE status is updated or verified daily in RAMPOD IAW AFI 21-103. **(T-1)**.

4.7.2.4. Ensure personnel do not make unauthorized or false transmissions on international distress frequencies IAW TO 31R2-1-251, *General Instructions-Transmission of False Distress Signals on Emergency Frequencies*. **(T-1)**.

4.7.2.5. Ensure cryptography components are controlled and maintained IAW National Security Agency publications and directive for the functions preformed. **(T-1)**.

4.7.2.6. When applicable, determine maintenance responsibility for aircraft adapter group equipment. **(T-2)**.

4.7.3. Section NCOICs will maintain AFTO Form 95, or equivalent on selected, significantly repairable, serialized components for which historical failure data will enhance repair. **(T-1)**.

Historical records are mandatory for SPRAM LRUs, and items asterisked in weapons system -6 TOs. Historical records will be maintained IAW TO 00-20-1. **(T-1)**.

4.7.3.1. The record will remain with the component anytime it is undergoing maintenance. **(T-1)**. **Note:** Data is provided from these records, upon request, to the analysis function to aid in defining avionics maintenance problems and recommended solutions.

4.7.4. Avionics Flight's within established Repair Networks shall collaborate with the Repair Network Manager (RNM) for maintenance constraint resolution. If the SMR code in the 4th position is "F" (I-Level Repair) will require RNM and all applicable stakeholders to determine next step or appropriate Action Taken Code to use when resolving the maintenance constraint.

4.7.5. Implement the "Bad Actor" program IAW TO 00-35D-54. **(T-1)**. The purpose of the Air Force Bad Actor Program is to identify serial-numbered items that enter the repair cycle at an abnormally high rate when compared to the total population of like assets and to repair them or remove them from the exhibit holding activity.

4.7.6. Repair Monitor Responsibilities. Monitors the status of items processed into the section for repair. Each shift may have a repair monitor assigned. Maintain records used by the repair monitor according to AFMAN 33-363. Each Repair Monitor will:

4.7.6.1. Process items into and out of the section, ensuring all documentation is accurate and complete. **(T-2)**.

4.7.6.2. Advise the section NCOICs and Pro Supers of item status. **(T-2)**.

4.7.6.3. Assist the section NCOICs in managing the DIFM program by complying with MAJCOM instructions to ensure ordered and received parts are documented; and uses, maintains and files, management and computer records. **(T-1)**. Repair Monitors will maintain and update a working copy of the D-23, *Repair Cycle Asset Management Listing*, sorted by location and detail number. **(T-1)**.

4.7.6.4. Designate and maintain an AWP area, ensure accurate documentation, and submit supply assistance requests, as required. **(T-1)**.

4.7.6.5. Track and monitor MICAP status for all assigned DIFM and parts affecting section repair capabilities using automated Integrated Logistics System -Supply (ILS-S) reports. **(T-1)**.

4.7.6.6. Ensure the MIS is updated with current supply data, location changes and DIFM status changes. **(T-1)**.

4.8. Fabrication Flight. The Fabrication Flight may consists of four sections; Aircraft Structural Maintenance (ASM), Metals Technology, Nondestructive Inspection (NDI), and Low Observable Aircraft Structural Maintenance (LOASM) and is responsible for performing on/off-equipment maintenance of systems and equipment.

4.8.1. Fabrication Flight CC/Chief Responsibilities. In addition to the applicable Flight CC/Chief responsibilities outlined in **Chapter 2**, the Fabrication Flight CC/Chief will:

4.8.1.1. Provide local manufacture capability to meet mission requirements and monitor all local manufacture work order requests. **(T-1)**.

4.8.1.2. Coordinate AGE welding requirements with the AGE Flight Chief. **(T-1)**.

4.8.1.3. Ensure corrosion prevention and control requirements, wash rack procedures, and established paint schemes are accomplished IAW TO 1-1-691, TO 1-1-8, TO 35-1-3, MAJCOM/Lead Command instructions, and MDS-specific TOs. **(T-1)**.

4.8.2. Aircraft Structural Maintenance (ASM) Section. Manages structural repair, corrosion control, Low Observable, inspection, damage evaluation, repair, manufacture, and/or modification of metallic, composite, fiberglass, plastic components, and related hardware associated with aircraft and SE. In addition to applicable Section NCOIC/Chief responsibilities in **Chapter 2**, the ASM Section NCOIC/Chief will:

4.8.2.1. Ensure appropriate resources are available to all personnel to chemically or mechanically inspect, remove, and treat corrosion on aircraft, engines, AGE, and components. **(T-1)**.

4.8.2.2. Monitor the aircraft wash and corrosion inspection schedule in the weekly and monthly maintenance plans. **(T-1)**.

4.8.2.3. Provide training and assistance to sections managing their own corrosion programs to include cleaning operations, corrosion prevention, inspection, removal and treatment techniques. **(T-1)**.

4.8.2.4. Develop maintenance procedures IAW **Chapter 11**, AFMAN 91-203, and ensure assigned ASM personnel are trained and qualified on aircraft intake maintenance. **(T-1)**.

4.8.2.5. Review the Qualified Product List/Qualified Product Database for changes to cleaners that must conform to a MIL-Spec as specified in applicable TOs for aircraft wash rack. **(T-1)**.

4.8.2.6. Stock supplies and equipment necessary to support aircraft and equipment washing, inspection, and treatment. **(T-1)**.

4.8.3. Metals Technology Section. Inspects, repairs, services, manufactures, fabricates, performs heat treating, cleans, welds, and tests aircraft and equipment, components, and tools. In addition to responsibilities outlined in **Chapter 2**, the metals technology section NCOIC will:

4.8.3.1. Ensure assigned welders are certified in all base metal groups prescribed by the MAJCOM Fabrication functional manager (or equivalent) IAW TO 00-25-252, *Aeronautical Equipment Welding*. **(T-1)**.

4.8.3.1.1. Ensure assigned welders conducting Gas Tungsten Arc Welding, Gas Metal Arc Welding, or Shielded Metal Arc Welding repairs on support equipment are certified IAW TO 00-25-252. **(T-1)**.

4.8.3.1.2. Ensure welding proficiency is documented IAW TO 00-25-252. **(T-1)**.

4.8.3.2. Provide safety briefings stressing Arc radiation hazards. **(T-1)**.

4.8.3.3. Ensure special tools, jigs, and fixtures are designed, fabricated, protected and properly stored. **(T-1)**.

4.8.4. Nondestructive Inspection (NDI) Section. Performs NDI of aircraft, engines, AGE, other equipment and manages the Oil Analysis Program (OAP). Inspection findings are limited to a description of the size, location, and type of any defect discovered. NDI personnel do not

make serviceability determinations except for "inspect only" TCTOs and if NDI actions constitute a completed maintenance action. In addition to the applicable Section NCOIC/Chief responsibilities in **Chapter 2**, the NDI Section NCOIC/Chief will:

4.8.4.1. Ensure OAP requirements are accomplished (if applicable to assigned MDS) IAW AFI 21-131, Joint Oil Analysis Program and **Chapter 11** **(T-1)**.

4.8.4.1.1. If the NDI laboratory providing OAP support is not located on the same base as the supported unit, or the supported unit does not have NDI/OAP personnel assigned, assign the OAP responsibilities to the owning organization IAW TO 33-1-37-1, *Joint Oil Analysis Program Volume II* and TO 33-1-37-3, *Joint Oil Analysis Program Laboratory Manual, Volume III*, TO 33-1-37-4, *Joint Analysis Program Manual, Volume IV*. The owning organization provides samples in an expeditious manner to the supporting OAP laboratory.

4.8.4.1.1.1. The owning organization will establish collection points and procedures to receive and forward OAP samples to the supporting laboratory, monitor sample collection, assign control numbers, and provide blocks of sample control numbers for use in other squadrons. **(T-1)**.

4.8.4.2. Advise Maintenance Supervision, MOC and the owning work center of abnormal OAP trends. **(T-1)**.

4.8.4.3. Ensure capability exists to perform optical, dye-penetrant, magnetic particle, ultrasonic, eddy current, radiographic and special inspections as required. **(T-1)**.

4.8.4.4. Ensure process control procedures IAW TO 33B-1-2, *Nondestructive Inspection General Procedures and Process Controls* are completed at the required or established frequency. **(T-1)**.

4.8.4.5. Establish technique files using AFTO Form 242, *Nondestructive Inspection Data*, and TO 33B-1-1, *Nondestructive Inspection Methods Basic Theory*. **(T-1)**. **Note:** Locally developed inspection techniques for use on aircraft and their components will be approved by the responsible ALC NDI manager prior to use. **(T-1)**. All other non-aircraft related AFTO Form 242 established techniques may be approved by the lab Chief.

4.8.4.6. Maintain coordination with the base medical service that provides occupational physicals, emergency treatments, film badge services, and acts as radiographic advisors IAW AFMAN 48-125, *Personnel Ionizing Radiation Dosimetry*, and TO 33B-1-1. **(T-1)**.

4.8.4.7. Ensure a Radiation Safety Program is established IAW TO 33B-1-1. **(T-1)**.

4.8.4.8. Control and dispose of radiographic silver-bearing materiel IAW AFI 23-101. **(T-1)**.

4.8.4.9. Ensure radiographic film files and computed radiography files contain, as a minimum:

4.8.4.9.1. The last complete set of radiographs taken by owning organization, for each assigned aircraft and engine by serial number or identification number. **(T-1)**.

4.8.4.9.2. The name of the person who interpreted the radiography. **(T-1)**. **Note:** Radiography identification procedures will be followed IAW TO 33B-1-1. **(T-1)**.

4.8.4.9.2.1. Ensure the person interpreting the film also initials the set of radiographs or a locally developed interpretation worksheet, as applicable. **(T-1)**.

4.8.4.9.3. All NDI radiographic film exposures, to include paper, will be filed and maintained for all One Time Inspection (OTI), TCTO, -6 TO, -9 TO, and -36 TO inspection requirements. **(T-1)**. The NDI Section NCOIC/Chief will ensure disposition of radiographic film IAW Air Force Records Disposition Schedule located at **https://www.my.af.mil/gcss-af61a/afrims/afrims/rims.cfm. (T-1)**.

4.8.4.10. Ensure all NDI technicians are certified IAW TO 33B-1-1. **(T-1)**.

4.8.5. Low Observable (LO) Aircraft Structural Maintenance Section. LO ASM Section manages structural repair, corrosion control, composite repair, LO coatings. **Note:** The Fabrication Flight CC/Chief will determine which tasks listed in **Paragraph 4.8.2** (ASM Section) will be applicable to this section based on flight configuration. In addition to applicable Section NCOIC/Chief responsibilities in **Chapter 2**, the LO ASM Section NCOIC/Chief will:

4.8.5.1. Provide inspection, damage evaluation, repair, manufacture, and/or modification of LO components, and related hardware associated with aircraft. **(T-1)**.

4.8.5.2. Ensure appropriate resources are available to perform all LO related tasks. **(T-1)**.

4.8.5.3. Stock supplies and equipment necessary to support aircraft inspection, and treatment. **(T-1)**.

4.8.5.4. Monitor the inspection schedule in the weekly and monthly maintenance plans. **(T-1)**.

4.8.5.5. Ensure protective/LO coatings are applied to aircraft, AGE, applicable munitions, and components IAW applicable TOs. **(T-1)**. Ensure protective/LO coatings are applied IAW local, state and federal environmental directives. **(T-0)**.

4.8.5.6. Provide training and assistance to sections managing their own LO programs. **(T-1)**.

4.9. Maintenance Flight. May consist of Repair and Reclamation, Wheel and Tire, Inspection, and TA Sections.

4.9. (AFMC) [DEV] Maintenance Flight. Within the 412 MXS, the Maintenance Flight will include Hydraulic and Aircraft Fuels System Sections and will provide oversight to all responsibilities and duties called out for these sections in AFI 21-101.

4.9.1. The Maintenance Flight CC/Chief will comply with the common Flight CC/Chief responsibilities in **Chapter 2** and locally established management requirements. **(T-1)**.

4.9.2. Repair and Reclamation Section. When established, removes, replaces, and rigs flight control surfaces/systems on assigned aircraft. Troubleshoots, rigs, and replaces landing gears, actuated doors, canopies and associated equipment requiring component maintenance beyond the capability of other activities. MAJCOM or MXG/CC may identify delineation of complex tasks to optimize maintenance capability in supplements or addendums to this AFI as required.

4.9.2.1. Repair and Reclamation Section, when established, will remove, install, and repair towed-targets and airborne reel pods. **(T-1)**.

4.9.2.1. **(AFMC)** [DEV] The 412 MXS Component Repair Flight/AIS will remove, install, and repair towed-targets and airborne reel pods.

4.9.3. Wheel and Tire Section. Manages the build-up, repair, test, and storage of wheel and tire assemblies and components. Wheel and Tire Section will:

4.9.3.1. Degrease and disassemble wheel components for NDI inspection IAW TO 4W-1-61, *Maintenance and Overhaul Instruction - All Types Aircraft Wheels*, prior to processing through the ASM and NDI Sections. **(T-1)**.

4.9.3.2. Clean, inspect, and properly store (do not co-mingle) wheel bearings. **(T-1)**.

4.9.4. Aircraft Inspection Section. Performs aircraft PH, PE, ISO or letter check inspections. **Note:** Section may be divided into separate elements for each type aircraft maintained. In addition to the applicable Section NCOIC/Chief responsibilities in **Chapter 2**, the Inspection Section NCOIC/Chief will:

4.9.4.1. Ensure assigned non-powered SE (such as, dock stands) is maintained. **(T-1)**.

4.9.4.2. Review inspection schedules and ensure dock teams are available to meet inspection needs. **(T-1)**.

4.9.4.3. Develop standardized inspection flow plan to aid in managing the inspection progress and to control dock personnel and support specialists. **(T-1)**.

4.9.4.3.1. Units may use an Automated Data System instead of the inspection flow plan to request specialist support.

4.9.4.3.2. Inspection Section NCOIC/Chief will ensure flow plan data remains current with -6 TO requirements. **(T-1)**.

4.9.4.4. Inform the MOC and owning agency of all MICAP parts. **(T-1)**.

4.9.4.5. Provide PS&D with an inspection document record upon completion of the inspection. **(T-1)**.

4.9.4.6. Ensure components are tagged with an AFTO Form 350, *Reparable Item Processing Tag*, IAW TO 00-20-2. **(T-1)**.

4.9.4.6.1. Ensure serially-controlled components are reinstalled on the same aircraft and position from which they were removed. **(T-1)**. Exception: If it is absolutely necessary to install serially-controlled components in a different position, the Inspection Section NCOIC/Chief will notify PS&D to update the records. **(T-2)**.

4.9.5. Transient Aircraft (TA) Section. Recovers, services, inspects, maintains, and launches transient aircraft. Transient aircraft are those aircraft not assigned to a base that are enroute from one location to another that may require routine servicing. Aircraft are not considered transient aircraft when deploying to, staging from or departing from any location for the purpose of flying sorties or conducting training, either with or without the necessary maintenance support from the aircraft's home base. MOC coordinates specialist support for transient aircraft through appropriate squadrons. For off-station recovery procedures refer to owning MAJCOM instructions and command-to-command agreements. In addition to the applicable Section NCOIC/Chief responsibilities outlined in **Chapter 2**, the TA Section NCOIC/Chief will:

4.9.5.1. Recover and deliver all deceleration chutes for assigned, transient, and tenant aircraft to the AFE. **(T-1)**.

4.9.5.2. Complete reimbursement documentation. **(T-1)**.

4.9.5.2.1. AFTO Form 726, T*ransient Aircraft Service Record*, may be used for documenting maintenance servicing requirements and necessary billing information and is prescribe in TO 00-20-1.

4.9.5.3. Record arrivals and departures of transient aircraft on AF Form 861, *Base/Transient Job Control Number* Register or locally-approved form if it captures all AF Form 861 fields. **(T-1)**. TA Section NCOIC/Chief (or equivalent) will:

4.9.5.3.1. Assign each aircraft a single Event Identification Description (EID) for all support general work performed by TA. **(T-3)**.

4.9.5.3.2. Enter, as a minimum, "P" for park, "I" for inspect, "S" for service, "L" for launch, and "E" for EOR in the job description/remarks block. **(T-1)**.

4.9.5.3.3. Forward completed AF Form 861 for contracted TA activities to the COR monthly. **(T-2)**. The COR forwards completed forms to the applicable contracting officer managing the TA contract for inclusion in the contract file.

4.9.5.3.4. Route the AF Form 861 for non-contracted TA activities to the Maintenance Flight CC/Chief for review. **(T-1)**.

4.9.5.3.4.1. After review, the TA Section NCOIC/Chief will file AF Form 861 for a minimum of 1 year. **(T-2)**.

4.9.5.3.4.2. AF Form 861 may be used as a reference to quantify tasked performed to validate manpower and equipment requirements against current AF standards.

4.9.5.4. Close out support general EIDs daily. **(T-1)**.

4.9.5.4.1. Use the same last four digits on subsequent days for the same aircraft.

4.9.5.4.2. Use a separate EID for each discrepancy that is not support general.

4.9.5.5. Ensure that when a FCF is required on transient aircraft, QA at the transient base serves as the focal point and ensures all FCF requirements are completed. **(T-1)**.

4.9.5.5.1. The TA Section NCOIC/Chief will coordinate all required FCF requirements through owning MXG/CC, off-station TA and off-station QA sections. **(T-1)**.

4.9.5.5.2. If no off-station agencies exist, owning MXG/CC and owning OG/CC will issue guidance directly to the aircraft commander and off-station maintenance personnel. **(T-1)**.

4.9.5.6. Supervise maintenance performed by assigned personnel on transient aircraft. **(T-1)**.

4.9.5.7. Maintain the appropriate TOs for aircraft that can be expected to transit the function on a regular basis. **(T-1)**.

4.9.5.8. Ensure personnel are trained and strictly adhere to oil sample requirements specified in the respective -6 TO. **(T-1)**.

4.9.5.9. Ensure personnel authorized to run engines are qualified IAW **Chapter 11** **(T-1)**.

4.9.5.9.1. Request the aircrew to run engines if TA or maintenance personnel are not authorized.

4.9.5.9.2. If qualified aircrew members are not available, contact MOC to request assistance from the home station.

4.9.5.10. Ensure transient aircraft status changes are reported to MOC. **(T-1)**. If support is required, the MOC notifies the home station for support.

4.9.5.11. Ensure EOR procedures for transient aircraft are developed IAW TO 00-20-1. **(T-1)**.

4.9.5.12. Ensure procedures exist for required weapons loading actions on transient aircraft, transient aircraft impulse cartridge tracking and storage, and weapons "safing" equipment requisition and maintenance for frequently transiting aircraft. **(T-1)**.

4.9.5.12.1. Arming, de-arming and munitions unloading/loading operations on transient aircraft will be performed by a weapons load crew certified/qualified on the munitions and aircraft. **(T-1)**.

4.9.5.12.2. The MXG/CC may direct the WS Personnel to arm, de-arm, and unload an aircraft on which they are not certified and/or qualified, if appropriate technical data and support equipment is available.

4.9.5.12.2.1. In such cases, the aircrew shall be available for consultation on aircraft peculiarities. **(T-2)**.

4.9.5.12.2.2. If these criteria cannot be met, request assistance from higher headquarters.

4.9.5.13. Ensure checklists exist to ask pilots about explosive egress systems pertaining to unfamiliar aircraft that do not normally transit their base. **(T-1)**.

4.9.5.13.1. Aircrew members remove and install flight status safety pins on aircraft when transient maintenance personnel are not qualified.

4.9.5.13.1.1. The host MXG/CC or authorized representative may delegate this responsibility to the transient aircraft commander/pilot if the aerospace vehicle is a new or experimental aerospace vehicle with which base maintenance personnel are not familiar, or when personnel qualified to provide the required services accompany the aerospace vehicle. In such cases, the host unit will provide assistance within their capability. **(T-3)**.

4.9.5.13.1.2. If TA cannot accomplish the required inspections, servicing, or repairs because of a lack of qualified personnel, facilities, or materiel (or there is no TA support available), and the transient aircraft commander does not wish to continue the flight without accomplishment of these items, the transient aircraft commander is responsible for requesting assistance through the appropriate external organizations.

4.10. Munitions Flight. Controls, accounts for, stores, ships, receives, inspects, maintains, assembles, and delivers conventional, precision guided and nuclear munitions. Manages and

maintains all assigned tools, test and munitions handling equipment. Refer to AFI 21-2XX series instructions for specific guidance. **Note:** Munitions may be part of the MXS or established in a Munitions Squadron IAW AFMAN 21-200.

4.10. (AFMC) [DEV] Munitions Flight. The 412 MXS/MXMW, Munitions Flight is also responsible for the Armament function for Bomber aircraft due to the geographic location/separation at Edwards AFB, South Base.

4.11. Propulsion Flight. Maintains aircraft engine propulsion units, propulsion components, and propellers. Performs engine/module/accessory disassembly, inspection, assembly, test, and repair. Responsible for Jet Engine Intermediate Maintenance (JEIM); Engine Test Stands (ETS) and Noise Suppression Systems (NSS); accessory and Quick Engine Change (QEC) repair; small gas turbine; module/accessory repair section; support equipment; and turbo-prop/turbo-shaft repair, engine PH/ISO inspections, as required. Sections may be combined or grouped at the discretion of the squadron commander. When an engine CRF is co-located with an operational wing, a MOA or MOU may be developed to clarify mutual support responsibilities. In addition, the flight will be the focal point for common propulsion support equipment, for example, flexible borescopes, engine trailers and download equipment.

4.11. (AFMC) [DEV] Propulsion Flight. In addition to the normal propulsion flight responsibilities, the 412 MXS Propulsion Flight Business Unit will perform duties and responsibilities of Engine Management (EM) Section listed in **Chapter 5** and **Chapter 14**.

4.11.1. In addition to the applicable Flight CC/Chief responsibilities in **Chapter 2**, the Propulsion Flight CC/Chief will:

4.11.1.1. Perform as the wing focal point for propulsion maintenance programs, focusing on continuity, compliance and standardization, provide advice to wing leadership on propulsion issues and monitor all aspects of wing propulsion maintenance program. **(T-1)**.

4.11.1.2. Act as the wing 2A6X1 AFSC functional manager and provide technical guidance to maintain propulsion systems to support the wing mission. **(T-2)**.

4.11.1.3. Coordinate with Engine Manager (EM) and organization leadership to support War Readiness Engine (WRE) requirements. **(T-1)**.

4.11.1.3.1. Propulsion Flight CC/Chief will track the status of ready spare engines using a visual display or automated product showing: serial number, configuration (type and position, if applicable), time remaining until next scheduled engine removal, overhaul or reconditioning, preservation date, type accomplished, re-preservation due date, OAP code (if applicable), and remarks. **(T-1)**.

4.11.1.4. Review production data to ensure propulsion units and components processed through the flight are repaired and functionally checked IAW TO 2-1-18, *Aircraft Engine Operating Limits and Factors*, including QEC configuration when applicable. **(T-1)**.

4.11.1.5. Coordinate with the EM to ensure accurate engine and equipment status reporting IAW AFI 21-103, AFMAN 20-116, AFPAM 63-129 and TO 00-25-254-1 and **Chapter 14** **(T-1)**.

4.11.1.6. Develop guidelines to comply with AF and wing OAP requirements IAW 33-series TOs and **Chapter 11** **(T-1)**.

4.11.1.7. Review/analyze all unscheduled engine or module removals and ETS rejects. **(T-1)**.

4.11.1.7.1. Review/analyze major component failure trends. **(T-1)**.

4.11.1.8. Ensure in-shop CANN actions are accomplished IAW local procedures, **Chapter 9** and **Chapter 11** and TO 00-20-2. **(T-1)**.

4.11.1.8.1. Ensure local procedures are coordinated with Engine Management (EM) to ensure sufficient time remains on TCIs prior to CANN action approval. **(T-1)**.

4.11.1.9. Coordinate with base civil engineering to provide maintenance on NSS and ETS supporting structures that are categorized as real property. **(T-1)**. If the wing or squadron is a tenant, incorporate this maintenance requirement into the host-tenant support agreement. **(T-1)**.

4.11.1.9.1. Ensure NSS and/or ETS repair discrepancies that exceed the base repair capability are reported in Web Applications Software Product (WASP). **(T-1)**. **Note:** Entering repair requirements into WASP establishes official repair request and ensures visibility to MAJCOM and SE Product Group Manager at WR-ALC.

4.11.1.9.1. **(AFMC)** Edward's brick and mortar facility does not fall under the WR-ALC Support Equipment PGM and therefore WASP tracking is not required for the facility.

4.11.1.10. Ensure an uninstalled engine run qualification and certification program is established IAW **Chapter 11** **(T-1)**.

4.11.1.11. Ensure specialized and long life shipping devices and containers are accounted for and maintained in a serviceable condition IAW AFI 23-101 and TO 00-85-20, *Engine Shipping Instructions*. **(T-1)**.

4.11.1.12. Ensure engines and engine components removed from crash damaged aircraft are correctly dispositioned for termination IAW 21-103 and disposed of IAW AFI 23-101. **(T-1)**.

4.11.1.13. Ensure an engine flexible borescope certification and blade-blending certification program, for each Type, Model, Series (TMS) possessed, is established IAW **Chapter 11** **(T-1)**.

4.11.1.14. Monitor scheduled and unscheduled engine removals to balance Propulsion Flight workload with production capability and coordinate with EM section to program engine removals for the weekly and monthly maintenance plans. **(T-1)**.

4.11.1.14.1. Coordinate with EM to develop a 6-month plan to smooth surges in the engine maintenance workload. **(T-1)**.

4.11.1.14.1.1. Use automated methods to develop the 6-month plan and include scheduled engine removals for TCIs, PE, TCTOs and a projected unscheduled removals factor.

4.11.1.14.1.2. Ensure Reliability-Centered Maintenance principles IAW AFMAN 20-116 are followed. **(T-1)**.

4.11.1.15. Ensure Engine Automated Work Package (EAWP) user permissions mirror current training and certification authorizations. **(T-1)**.

4.11.1.15.1. Ensure EAWP users use the EAWP program in lieu of a work folder to meet minimum requirements of this AFI.

4.11.1.16. Coordinate with the OAP laboratory to obtain maximum benefits from OAP data when abnormal wear-metal trends are indicated. **(T-1)**.

4.11.1.16.1. Ensure all OAP responsibilities are performed IAW **Chapter 11** **(T-1)**.

4.11.1.16.2. Establish procedures to monitor OAP trends. **(T-1)**.

4.11.1.16.3. Ensure personnel are trained to identify and respond to wear metal limits for assigned and maintained engines and are trained to perform sampling procedures IAW TO 33-1-37-2. **(T-1)**.

4.11.1.16.4. Ensure oil samples taken at the ETS are promptly delivered to the OAP laboratory. **(T-1)**.

4.11.1.16.5. Act as a central point-of-contact for all abnormal OAP laboratory results. **(T-1)**.

4.11.1.16.6. Forward information to the OAP laboratory concerning actions taken as a result of OAP recommendations. **(T-1)**.

4.11.1.16.7. Review OAP response time (from sampling to receipt at the laboratory and return to the unit) to ensure processing time meets mission needs. **(T-1)**.

4.11.1.17. **(Added-AFMC)** [DEV] The 412 MXS Propulsion Flight Chief is responsible for management of the Engine Blade Blending Training and Certification Program and will ensure all related responsibilities contained in AFI 21-101 are adhered to.

4.11.2. Support Section. The Support Section manages the flight's HAZMAT program and operates tool storage areas. DMS or designated personnel process supply requests to facilitate the issue request, tracks MICAP due-outs, monitors bench stock, conducts bench stock/adjusted stock level reviews IAW AFMAN 23-122. **(T-1)**. In addition to the applicable Section NCOIC/Chief responsibilities outlined in **Chapter 2**, the Support Section NCOIC/Chief will:

4.11.2.1. Ensure a flight due-out release point and holding bins are established, and Urgency of Need Designator "A" and Urgency Justification Code BQ requirements are verified. **(T-1)**.

4.11.3. Jet, Turboprop, Turbo-shaft Engine Intermediate Maintenance (JEIM) section. Stores, builds up, tears down, inspects, modifies, and repairs engines, QEC kits, and tests components. In addition to the applicable Section NCOIC/Chief responsibilities in **Chapter 2**, the JEIM Section NCOIC/Chief will:

4.11.3.1. Plan and monitor the progress of propulsion system maintenance production, ensuring maintenance schedules are met by anticipating materiel required and managing delays to prevent schedule disruptions to support operational requirements and maintain required WRE levels. **(T-1)**.

4.11.3.1.1. Report production to Propulsion Flight CC/Chief and immediately inform EM of engine status changes.

4.11.3.2. Ensure personnel prepare propulsion units and components for shipment and properly identify units to be returned to depot. **(T-1)**.

4.11.3.2.1. Attach CEMS and/or MIS paper products to life-limited components IAW 00-20-series TOs if required by the source of repair. **(T-1)**.

4.11.3.3. Ensure documentation of TCTO compliance IAW 00-20-series TOs. **(T-1)**.

4.11.3.4. Ensure CEMS and/or MIS products obtained from EM are used for all assigned engines. **(T-1)**.

4.11.3.4.1. CEMS and/or MIS products will list all parts and serial numbers installed on the engine. **(T-1)**.

4.11.3.5. Establish procedures to ensure all parts and serial numbers are inventoried when an engine is received or released by the section. **(T-1)**.

4.11.3.5.1. The JEIM Section NCOIC will notify EM when a different serial numbered part is installed or changed so the automated record is updated. **(T-1)**.

4.11.3.5.2. EAE is the change correction authority on Part Number/Serial Number Record updates in EAWP. **(T-1)**.

4.11.3.6. Ensure an engine work folder is established for each engine during PE, reconditioning, or other maintenance. **(T-1)**.

4.11.3.6.1. One work order is initiated in MIS for an entire job.

4.11.3.6.1.1. MIS work orders are completed during inspection, reconditioning or maintenance.

4.11.3.6.1.2. Separate JCN/Work Center Event (WCE)/Work Event Separator are initiated for discrepancies found during the look phase of an inspection, subsequent to repair or when maintenance is required beyond the scope of the JEIM induction JCN.

4.11.3.6.2. Establish engine work folders on all possessed engines and EM or JEIM will maintain the folders until the engine is transferred. **(T-1)**. As a minimum, engine work folders will contain the following:

4.11.3.6.2.1. List of all parts, TCTOs and TCI requirements for the engine. **(T-1)**.

4.11.3.6.2.2. Engine/Module/Accessories Information Worksheet. **(T-1)**. This document is used to provide a quick synopsis of maintenance accomplished. Minimum requirements will include: engine serial number, type, position (if applicable), engine operating time, date started work, date turned serviceable, job control number, maintenance required, reason for removal, list of time change and TCTO requirements. **(T-1)**.

4.11.3.6.2.2.1. A supervisory review of signature blocks (Crew Chief, Support Section, EM Section) to verify all repair requirements have been accomplished and are correctly documented in the work folder. **(T-1)**.

4.11.3.6.2.2.2. Validation that a JCN was created by the JEIM/Module/Accessories Section or EM section and used to account for maintenance events completed in the process of repairing the engine and modules. **(T-1)**. This procedure ensures all maintenance data is documented against one JCN and engine failure information is connected to the in-shop action.

4.11.3.6.2.3. Receiving Inspection Worksheet. **(T-1)**. The worksheet is used for documenting items to be accomplished by JEIM prior to engine repair. Minimum requirements will include: FOD check of engine inlet and exhaust, inspection of engine for general condition and fluid leakage, EHR/Turbine Engine Monitoring System data (if applicable), ET&D (if applicable), borescope inspection (if applicable), a check with OAP lab for possible problems, and a list of unique or problem areas to be checked prior to engine disassembly or maintenance. **(T-1)**.

4.11.3.6.2.4. Serially-Controlled/Time-Tracked Item Replacement Record. **(T-1)**. This document shows a list of components replaced by nomenclature, old and new part number (if applicable), and serial number.

4.11.3.6.2.5. Daily Summary Record. **(T-1)**. This document provides a synopsis of maintenance performed during each shift.

4.11.3.6.2.5.1. Each entry in the Daily Summary Record includes the Employee Number of the person who accomplished the maintenance action. For EAWP users, this process may be automated.

4.11.3.6.2.5.2. Include a sufficient reference in the summary block (such as, work package, TO) used to perform the task or determine the work performed (subordinate work packages are not required to be listed if the work package for the primary task identifies all required work packages for the task).

4.11.3.6.2.5.3. At the end of each shift, the crew chief who verified the entries listed in the Daily Summary Record will annotate their shift, rank, last name, and employee number. **(T-1)**. Units may use a general purpose or MAJCOM/locally approved form.

4.11.3.6.2.6. IPI Worksheet. **(T-1)**. This form includes the WUC, nomenclature, specific step required for the IPI, and space for employee numbers and signatures of technicians and inspectors performing maintenance. **Note:** Organizations using digital systems may file a printed report in lieu of signatures (such as, Interactive Electronic Technical Manual (IETM)).

4.11.3.6.2.7. Parts Requisition Record. **(T-1)**. This document is used to list all parts (including TCIs) on order. As a minimum, this document will include the following headings: Engine/ Module/Accessory, TMS, Engine/Module/Accessory Serial Number, Nomenclature, Part Number, National Stock Number (NSN), Requisition Number, Priority, Status, and DIFM Clear with “Yes” and “No” sections. **(T-1)**.

4.11.3.6.2.8. JEIM ETS Preparation Worksheet. **(T-1)**. This worksheet contains a list of items/tasks to be accomplished by JEIM prior to sending an engine to the ETS. As a minimum, document the following:

4.11.3.6.2.8.1. Inlet and exhaust FOD inspection; any pre-run servicing required (such as, cap open lines, cannon plugs, engine intake and exhaust inspection). **(T-1)**.

4.11.3.6.2.8.2. A thorough tool inventory and an inspection for loose hardware. **(T-1)**.

4.11.3.6.2.8.3. The section supervisor will document a review of the work folder to ensure maintenance performed or required actions are documented. **(T-1)**.

4.11.3.6.2.9. ETS Pre-run Worksheet. **(T-1)**. ETS personnel will complete this document prior to an engine run. **(T-1)**.

4.11.3.6.2.9.1. As a minimum, this document will include the following headings: Engine TMS; Engine Serial Number; Engine Operating Time (EOT)/Cycles; JCN; Remarks; Pre-run Emergency Briefing Accomplished with run Supervisor's Name, Signature and Date sections; and Inspection with Area, Employee Number, and Date sections. **(T-1)**.

4.11.3.6.2.9.2. As a minimum, area inspections will include: Inlet FOD/Foreign Object (FO); Exhaust FOD/FO; Engine Exterior and FO; General Engine Serviceability; Test Stand/Thrust Bed/Test Equipment for FO; CTK Inventory Complied With (C/W); Engine Servicing Check; all preliminary engine installation and run requirements C/W; and, serviceable fire extinguisher on hand. **(T-1)**.

4.11.3.6.2.9.2.1. Each area inspection will have the performing technician's employee number and date accomplished annotated. **(T-1)**.

4.11.3.6.2.10. ETS Post Run Worksheet. **(T-1)**. This document is used to document items/tasks accomplished by ETS personnel after engine run.

4.11.3.6.2.10.1. As a minimum, this document will include the following headings: Engine TMS; Engine Serial Number; EOT/Cycles; JCN; Maintenance Actions Performed; ETS Supervisors Post-run Review with Name, Signature and Date; and Area Inspections, Employee Number and Date. **(T-1)**.

4.11.3.6.2.10.2. As a minimum, area inspection will include: Inlet FOD/FO; Exhaust FOD/ FO; CTK Inventory C/W; Post-Run OAP Samples C/W (if applicable); AFTO Form 350 or AFTO Form 20, *Caution and Inspection Record*, annotate: Engine Preservation Type and Date; Throttle Secured to Off Position (if applicable) and Tagged; Cap Open Lines/Cannon Plugs; Install Intake/Exhaust Covers; Servicing Amount; ETS Discrepancies Cleared; 7-Level Inspection of Components Replaced or Disconnected; and Final Leak Check. **(T-1)**.

4.11.3.6.2.10.3. ETS personnel will leak-check items not accessible with the engine installed in or on the aircraft prior to leaving ETS. **(T-1)**.

4.11.3.6.2.10.4. Each area inspection will have the performing technician's employee number and date accomplished annotated. **(T-1)**.

4.11.3.6.2.11. Final Inspection Worksheet. **(T-1)**. This document is used to document JEIM requirements after repair or testing has been completed.

4.11.3.6.2.11.1. As a minimum, this worksheet will include: FOD inspection of intake, exhaust, and external engine; borescope engine (if applicable); ensuring throttle is secured and tagged to "off" position (if applicable); capping, plugging and covering fittings and lines; attaching AFTO Form 350 to lines, fittings or plugs that require "leak check" when installed in aircraft (items not accessible in aircraft must be leak checked on ETS); attaching AFTO Form 350 and/or serviceable tag to engine, ensure supply accounts and MIS entries have been cleared. **(T-1)**.

4.11.3.6.2.12. Borescope Worksheets. **(T-1)**. Borescope inspection worksheets will be used for engines requiring borescope documentation. **(T-1)**.

4.11.3.6.2.13. Uninstalled Engine/Module Blade Blending/FOD Damage Worksheet. **(T-1)**. This worksheet is used to document blade blending/FOD damage for uninstalled engines/modules. As a minimum, this worksheet will include: Engine/Module Serial Number, Date, Discrepancy, Stage and Corrective Action including number of blades blended, depth of damage before and after blend, area of damage and Employee Number. **(T-1)**.

4.11.3.6.2.14. Reliability Centered Maintenance Worksheets (if applicable). **(T-2)**.

4.11.3.6.2.14.1. For JEIM engine builds, a copy of the "Reliability Centered Maintenance Build Options" and "Reliability Centered Maintenance Calculator Summary" worksheets are maintained in the engine work folder or EAWP for documenting life-limited component engine build recommendations.

4.11.3.6.2.14.1.1. Utilize Reliability Centered Maintenance calculator software accessed through CEMS prior to engine build.

4.11.3.6.2.14.1.2. The sheets are required only if life-limited components (excluding LRU) are removed and replaced during the JEIM engine build and the TMS engine is available in the Reliability Centered Maintenance Calculator. The calculator is not used for engines which do not have the calculator developed.

4.11.3.6.2.15. Worksheets that document engine historical information, critical maintenance management stages, and employee numbers of technicians and supervisors completing maintenance and inspections.

4.11.3.6.2.15.1. Supplement work folders and worksheets to fit unit needs.

4.11.3.6.2.15.2. Flights may use computer-generated products, provided they include all required information. If TMS has an established EAWP, it will be utilized. **(T-1)**.

4.11.3.6.2.15.2.1. EAWP users will ensure all maintenance discrepancies are documented in the system's appropriate discrepancy block. **(T-1)**.

4.11.3.7. Ensure MICAPs are processed in Enterprise Solution-Supply; ensure all pertinent data is included. **(T-1)**.

4.11.3.7. **(AFMC)** Ensure MICAPs are processed in Integrated Logistics Systems-Supply; ensure all pertinent data is included.

4.11.3.8. Upgrade, downgrade and cancel MICAP requirements. **(T-1)**.

4.11.4. Noise Suppression Systems (NSS) and Engine Test Stands (ETS) Section. Tests engines to evaluate the quality of maintenance, engine performance, and accomplish engine preservation including engines installed on aircraft in coordination with owning squadron. In addition to the applicable Section NCOIC/Chief responsibilities outlined in **Chapter 2**, the NSS and ETS Section NCOIC/Chief will:

4.11.4.1. Assign primary and alternate WASP custodians to perform -107 engineering support request and status updates in WASP for WR-ALC-managed NSSs and ETSs. **(T-1)**.

4.11.4.2. Monitor repair activity and ensure reporting and status updates are timely, accurate and kept current in WASP. **(T-1)**.

4.11.4.3. Ensure NSS and ETS personnel accomplish minor maintenance, make adjustments to engines, and document engine condition. **(T-1)**.

4.11.4.3.1. Ensures ETS components are calibrated on site, if practical. **(T-1)**.

4.11.4.4. Brief maintenance personnel on NSS/ETS operating/emergency procedures. **(T-1)**.

4.11.4.5. Handle and report halon releases IAW AFMAN 32-7002. **(T-1)**.

4.11.5. Module/Accessory Repair Section. Repairs, stores, and maintains fuel nozzles, fuel manifolds, oil pumps, accessory housings, afterburners, thrust reversers, augmentors, engine components, time change modules, and shop replaceable units. Operates and maintains the bearing room IAW TO 44B-1-15, *General Instructions - Jet Engine Anti-friction Bearing Handling, Removal, Cleaning, Inspecting, and Installation at Jet Engine Base Maintenance Facilities* (if applicable).

4.11.6. Small Gas Turbine Engine Section. Repairs and maintains small gas turbines used in aircraft. In addition to applicable Section NCOIC/Chief responsibilities outlined in **Chapter 2**, the Small Gas Turbine Engine Section NCOIC/Chief will ensure personnel are qualified to operate small gas turbine engines and test stands. **(T-1)**.

4.11.7. Engine Equipment Maintenance Section. Maintains, manages, and stores engine support and removal/installation/transportation equipment and trailers. The Engine Equipment Maintenance Section NCOIC/Chief will:

4.11.7.1. Ensure engine removal/installation/transportation trailers and adapters status is properly reported IAW AFI 21-103 and MAJCOM supplements. **(T-1)**.

4.11.7.2. Track and schedule all inspections and maintenance, removal, installation, transportation trailers and adapters in the MIS. **(T-1).**

4.11.7.3. Ensure equipment forms and MIS documentation are complete, accurate, and accomplished for all maintenance and scheduled inspections. **(T-1)**.

4.11.7.4. Ensure status is accurately reflected in both the maintenance forms and the MIS. **(T-1)**.

4.11.8. Propeller Section. Repairs, builds up, tears down, inspects, tests, and modifies propellers, valve housings, pump housings, and associated components.

4.11.9. Quick Engine Change (QEC) Kit Management. QEC kit removals and installations are coordinated with the SRAN EM and loaded in MIS as a part number-serial number item, reflecting where the kit is installed or spared.

4.11.9.1. In addition to repair cycle procedures outlined in **Chapter 9**, the technician removing a QEC kit item from an engine will complete an AFTO Form 350, enters the reason for removal in Block 14, and annotates the QEC kit inventory for each repairable item. **(T-1)**.

4.11.9.1. **(AFMC)** [DEV] QEC kits removed to facilitate other engine maintenance, but will be reinstalled on the original engine and remain with that engine during shipment are required only to be tagged by an AFTO 350 or similar method when removed, and no inventory action is required.

4.11.9.2. Technicians will complete the AF Form 596, *Quick Engine Change Kit Inventory* for on repair cycle items and QEC kit unique items, when an engine enters the section for tear down. **(T-1)**.

4.11.9.2. **(AFMC)** [DEV] QEC kits removed to facilitate other engine maintenance, to include teardown, but will remain with the original engine require no inventory to be accomplished.

4.11.9.2.1. If TO requirements restrict reuse of items, the technician will mark the AF Form 596 with an asterisk to show a demand has been placed on supply. **(T-1)**.

4.12. Test, Measurement, and Diagnostic Equipment (TMDE) Flight. Maintains, calibrates, and certifies TMDE, traceable through the AF Primary Standards Laboratory (AFPSL) to the National Institute of Standards and Technology (NIST), or other AF Metrology and Calibration (AFMETCAL)-approved source. Provides base-level support of aircraft, precision-guided munitions, ground systems, and other equipment assigned to the base or GSU. TMDE Flight ensures Calibration, certification and maintenance of TMDE is accomplished IAW AFMAN 21-113, TO 00-20-14, TO 33K-1-100-1, *Calibration Procedure for Maintenance Data Collection Codes and Calibration Measurement Summaries*. A Rapid Assistance Support for Calibration may also be assigned.

4.12.1. In addition to applicable Flight CC/Chief responsibilities in **Chapter 2**, the TMDE Flight Chief (referred to as "PMEL Manager" in AFMAN 21-113 and TO 00-20-14) will:

4.12.1.1. Establish a PMEL Quality Assurance Section IAW AFMAN 21-113 and TO 00-20-14. **(T-1)**.

4.12.1.2. Publish a monthly PMEL Activity Summary and route it through the Operations Officer/MX SUPT to the SQ/CC (or organizational equivalent). **(T-2)**.

4.12.1.2.1. The report format shall comply with TO 00-20-14 and meet local requirements. **(T-2)**.

4.12.1.3. Ensure all Groups with TMDE Flights assigned include the TMDE Quality Program Activity Summary in the QA monthly summary IAW **Chapter 6** **(T-2)**.

4.12.2. Establish a Production Control Section IAW AFMAN 21-113. **(T-1)**. The Production Control Section will:

4.12.2.1. Ensure TMDE monitors are properly trained and maintain a database or log to track training events (dates, names, organizations). **(T-3)**.

4.12.2.2. TMDE will be scheduled using one of the three following categories:

4.12.2.2.1. EMERGENCY Calibration or Repair: TMDE that is inoperable or due calibration and for which a critical job is at a work stoppage.

4.12.2.2.1.1. A letter of justification signed by the Owning Work Center (OWC) Maintenance Operations Officer /Maintenance Superintendent must accompany the TMDE. **(T-3)**. The letter may be handwritten to prevent delay. Telephone verification between the OWC and PMEL is encouraged.

4.12.2.2.1.2. PMEL must accept emergency TMDE at any time. **(T-2)**. Immediate and continuous repair action is required until repair/calibration is completed or status of the item changes (such as, AWP, deferred for lack of standards or technical data).

4.12.2.2.2. MISSION ESSENTIAL Calibration or Repair: TMDE that is part of a unit's deployment package, is critical to daily peacetime operations, or TMDE assets falling below critical availability levels.

4.12.2.2.2.1. A letter of justification signed by the OWC Flight CC/Chief or equivalent will accompany the TMDE unless pre-identified by OWC Flight CC/Chief and approved by TMDE Flight Chief or delegated approval authority. **(T-3)**.

4.12.2.2.2.2. PMEL must accept mission essential TMDE any time during duty hours and schedule it with sufficient priority to ensure the calibration/repair is complete by the date and time specified by the customer. **(T-3)**.

4.12.2.2.3. Routine Calibration or Repair: TMDE not categorized as emergency or mission essential. PMEL must accept routine TMDE during normal turn-in and pick-up hours. **(T-3)**.

Chapter 5

MAINTENANCE OPERATIONS (MXO).

5.1. General. MXO is directly responsible to the MXG/CC for the administration, analysis, training management of assigned personnel, and programs and resources necessary to support the group's production effort. MXO is comprised of the following sections: EM, PS&D, MMA, MOC, MT, and Programs and Resources (P&R). In missile organizations, MXO will be organized as a Maintenance Operations Squadron, as applicable. For the purposes of this instruction, the term MXO is equivalent with Maintenance Operations Flight for ANG units.

5.1. (AFMC) [DEV] General. Within the 412 MXG, the 412 MXS Propulsion Flight Business Unit will perform duties and responsibilities of Engine Management (EM) Section listed in AFI 21-101.

5.2. Maintenance Operations. MXO is the central agency for monitoring and developing long-range strategies of fleet management to sustain the health of the fleet. Fleet management is defined as the effective utilization of available resources to accomplish the aircraft support cycle from planned maintenance events to operations schedule execution. It is a disciplined and prioritized scheduling effort that optimizes support to aircraft requirements such as flying/operational events, ground training events, scheduled maintenance inspections, aircraft/system configuration control, aircraft/system modification schedules and aircraft/system recovery maintenance. Effective fleet management results in consistent availability of quality aircraft/systems to meet operational requirements. The Maintenance Operations Superintendent position will be filled by SNCO 2RXXX personnel. **(T-2)**.

5.2. (AFMC) Maintenance Operations. Maintenance Operations Superintendent position can be filled by civilian equivalent.

5.2.1. Maintenance Operations Officer-in-Charge/Superintendent (OIC/SUPT). In addition to the applicable Flight CC/SUPT responsibilities in **Chapter 2**, the MXO OIC/SUPT will:

5.2.1.1. Develop and publish the wing operations/maintenance schedule in coordination with other squadrons and submit to both the OG/CC and MXG/CC for approval. **(T-1)**.

5.2.1.2. Determine long-range fleet health maintenance priorities. **(T-1)**.

5.2.1.3. Manage the data collection process, review data and verify analysis for maintenance data collection requirements. **(T-1)**.

5.2.1.4. Evaluate and provide trend analysis information to the MXG/CC and SQ/CCs. **(T-1)**.

5.2.1.5. Ensure aircraft status is properly reported and maintained IAW AFI 21-103. **(T-1)**.

5.2.1.5.1. Coordinate with the PS&D Aerospace Vehicle Distribution Officer (AVDO) to ensure all assignment and possession changes are accurately reported to the MAJCOM AVDO IAW AFI 21-103 and AFI 16-402, *Aerospace Vehicle Programming, Assignment, Distribution, Accounting, and Termination*. **(T-1)**.

5.2.1.5.1. **(AFMC)** Include the AFMC AVDO (AFMC/A4M) and the AFMC Aerospace Vehicle Fleet Manager (AFMC/A3F) in coordination for all proposed

assignment/possession changes. This is regardless of the scale of the aerospace vehicle and regardless of the MIS or Accountable Property System of Record (APSR) being used. **(T-2).**

5.2.1.6. Initiate, review, and validate special analysis studies. **(T-1)**. MXO OIC/SUPT will:

5.2.1.6.1. Determine planning factors for the next year's flying hour program. **(T-1)**.

5.2.1.6.2. Ensure the MxCAP2 model or equivalent is utilized for the assigned MDS, if available. **(T-1).**

5.2.1.6.2. **(AFMC)** See deviation at **paragraph 2.2.4.3** [DEV]**.**

5.2.1.6.3. **(Added-AFMC)** Ensure data is valid and submitted to meet MAJCOM reporting suspense requirements. Before submission, reconciliation and coordination with squadron and group leadership is required to ensure comments fully explain causes of the data. Comments should focus on mission requirements, improving equipment performance, identifying emerging support problems, and projecting current trends. Also, when operational requirements are not achieved, determine and explain the root causes behind it. **(T-2).**

5.2.1.7. Develop procedures to update Geographical Location (GEOLOC) codes for all on and off-station possessed aircraft and ensure GEOLOC codes are updated/correct in the MIS "Location Subsystem" (G081 units are exempt as long as a HHQ agency accomplishes this requirement). **(T-1)**.

5.2.1.8. IMDS units will use code "XXXX," and G081 units will use "CCCC" for classified locations. **(T-1)**.

5.2.1.8.1. The MXO OIC/SUPT will ensure any deploying unit loads all equipment into the IMDS-CDB Aerospace Expeditionary Force subsystem (G081 units are exempt). **(T-1)**.

5.2.1.9. Host DFTs/CFTs, provide in-briefs on unit-specific maintenance and tool-control requirements, review plans, coordinate/monitor status of aircraft and progress of repair work. **(T-1)**.

5.2.1.10. Participate in the review of base level repair capability IAW TO 00-20-3, AFREP in **Chapter 11**, and supplements. **(T-1)**.

5.2.1.11. Publish wing notification requirements for munitions-loaded or unloaded aircraft. **(T-2)**.

5.2.1.12. Establish/sustain local radio call signs for maintenance LMR networks IAW AFI 17-210, Radio Management. **(T-1)**.

5.2.1.13. Develop a training plan for individuals assigned to QA that will inspect MXO functions. Minimum training requirements will include, MIS (G081/IMDS/or equivalent) online and background products for inspections, time changes, TCTOs, and aircraft configuration management. **(T-1)**. For units with IMDS, the QA inspector will be trained on the use of DS Maintenance Scheduling Module (MSM) to provide the capability for a qualified QA inspectors to evaluate and report PS&D compliance with functional

requirements. **(T-2)**. The senior 2R in the MOC will provide assistance to the inspector as required. **(T-2)**.

5.2.1.13. **(AFMC)** Ensure processes and procedures are in place and personnel are designated to support accomplishment of Flying Hour Program tracking and reconciling IAW intent of AFI 21-103, *Equipment Inventory, Status and Utilization Reporting* **(T-2).**

5.2.1.14. Ensure MAJCOM Master Course Listing includes 2R weapon system familiarization courses requirements. **(T-1)**.

5.2.1.14.1. As a minimum, the course will include weapon system/communications electronics familiarization, flightline and shop operations, organizational structure and roles of each group, squadron, and flight. **(T-1)**.

5.2.1.14.2. Analysts will attend the course within 6 months of assignment to the unit. **(T-1)**.

5.2.1.14.2. **(AFMC)** [DEV] Not required if local familiarization course does not exist for civilian personnel previously qualified.

5.2.1.14.3. For remote assignments, analysts will attend within 1 month of assignment. **(T-1)**.

5.2.1.14.4. For ARC, analysts will attend the course within 6 months of assignment to the unit. **(T-1)**.

5.2.2. Maintenance Operations Center (MOC). The MOC monitors and coordinates sortie generation, maintenance production, and execution of the operations and maintenance schedules while maintaining visibility of fleet health indicators. Through coordination with maintenance units, the MOC communicates priorities for competing limited resources (such as, fuel or calibration docks, wash racks, and dispatched specialists from the maintenance squadron(s) (for example, egress) based on daily operations schedule and maintenance priorities. The exchange of information between squadrons and the MOC must be in sufficient detail to allow the MOC to comply with reporting requirements and to identify potential problems. **(T-1)**.

5.2.2.1. The MOC will:

5.2.2.1.1. Monitor the status of aircraft/systems, as directed, (through the use of electronic or manual visual aids) including ETIC, progress of FCFs, and location of each aircraft on station. **(T-1)**.

5.2.2.1.2. Track contingency and exercise aircraft generation activities. **(T-1)**.

5.2.2.1.2.1. Maintain and update aircraft generation line up and display aircraft status using AF Form 2408, *Generation Maintenance Plan* and AF Form 2409, *Generation Sequence Action Schedule* or locally computer generated equivalents. **(T-2)**. **Note:** If the tail number, mission number or specifically tasked no-later-than times are linked, this form becomes classified. See AFI 16-1404.

5.2.2.1.2.2. Monitor and report aircraft generation progress with a minimum of the following information: ETIC, location of each aircraft, status of generation actions, progress against timeline necessary to meet mission requirements. **(T-2)**. **Note:** The display format should be compatible with OPLANS and command post displays.

5.2.2.1.3. Utilize the Enhanced Maintenance Operations Center. **(T-1)**.

5.2.2.1.4. Track aircraft maintained or supported by the unit but not on station. (Aircraft cross-country). **(T-1)**.

5.2.2.1.5. Coordinate maintenance on the alert force, if applicable. **(T-1)**.

5.2.2.1.6. Ensure status boards depict aircraft status and location comply with Security Program guidelines. **(T-1)**.

5.2.2.1.7. Monitor the status and ETIC of MEL-designated AGE if it falls below critical levels. **(T-1)**.

5.2.2.1.8. Monitor the status of ECM and sensor pods IAW AFI 10-201, *Force Readiness Reporting*. **(T-1)**.

5.2.2.1.8.1. When MC pod availability falls below requirements per the DOC or OPLAN, the MOC will track/monitor the following information: pod serial number, status (AWP/Awaiting Maintenance (AWM)), MICAP NSN, off-base requisition numbers, and ETIC. **(T-1)**.

5.2.2.1.9. Classify information IAW AFI17-130, *Cybersecurity Program Management.*

5.2.2.1.10. Verify aircraft status and ETICs with the Pro Super(s) and ensure they are properly documented in the MIS IAW AFI 21-103, **(T-1)**. Reference AFCSM, 21-564, Vol 2, *Status and Inventory Reporting Software User Manual* or equivalent MIS guidance.

5.2.2.1.10.1. When the Production Superintendent (Pro-Super) or equivalent notifies the Maintenance Operations Center (MOC) that an aircraft is "Crew Ready" the MOC will review the Maintenance Information Systems (MIS) for each Crew Ready aircraft to ensure there are no open Red Xs. **(T-1)**. If open Red X(s) are present in the MIS, the MOC will notify the Pro-super or equivalent for action. **(T-1)**.

5.2.2.1.11. The MOC will verify aircraft status using the MIS and ETIC before reporting it. **(T-1)**.

5.2.2.1.12. Inform affected activities of changes in priorities, plans, and schedules. **(T-1)**.

5.2.2.1.13. Coordinate on changes to the operations schedule with applicable agencies by use of AF Form 2407. **(T-1)**.

5.2.2.1.14. Ensure all deviations to the daily operations schedule are reviewed and accurately reported. **(T-1)**.

5.2.2.1.14.1. Forward a copy of each AF Form 2407 and the daily flying schedule, with all annotated deviations, to MMA. **(T-1)**.

5.2.2.1.15. Request support services outside the scope of the MXG (such as, standby firefighting capability, aircraft water, snow removal, fueling and defueling service, civil engineer support, or control tower clearances for ground movement of aircraft and equipment). **(T-1)**.

5.2.2.1.15.1. Coordinate on all aircraft engine runs and all aircraft ground movements conducted by maintenance personnel prior to execution. **(T-1)**.

5.2.2.1.16. Develop, coordinate, implement, and maintain functional and emergency action checklists. **(T-1)**.

5.2.2.1.16.1. Functional checklists are required for use during actions such as nuclear mass loads, Broken Arrow, Dull Swords, Bent Spear, aircraft crash/mishap/incident, aircraft FOD, aircraft damage, flightline fire, severe weather warning or evacuation, runway closure, hazardous chemical release (example, Hydrazine, Broken Pod Glass release of Thorium Fluoride or Americium), Quick Reaction Checklists, injuries resulting from aircraft maintenance and any other unusual circumstances deemed necessary.

5.2.2.1.16.2. For OPLAN 8010 notification, use the plan implementation checklists.

5.2.2.1.16.3. Use unit OPLANs as a guide in developing these checklists.

5.2.2.1.16.4. Checklists contain those actions required to be taken by functional area(s).

5.2.2.1.16.5. The MOC will maintain checklists that implement all approved MAJCOM and local requirements. **(T-2)**.

5.2.2.1.16.6. Establish a command/contingency focal point to coordinate ABDR and or Joint Combat Assessment Team (JCAT) response requests with AFMC. **(T-1)**. **Note:** If data collection forms are required forms will be forwarded to the Aircraft Battle Damage Repair (ABDR) Technical Support Office (TSO) and JCAT. **(T-1)**. For ABDR TSO, CLASSIFIED messages must be sent to: **usaf.wright-patt.afsc-lg.mbx.afsc-lgpm-abdr-tso@mail.smil.mil** and UNCLASSIFIED messages must be sent to NIPR: **afsc.lgpm.abdrtso@us.af.mil** for filing in the historical archives. For JCAT, CLASSIFIED data must be submitted via the Intellopedia Secret Internet Protocol Router Network (SIPRNET) link **https://www.intellipedia.intelink.sgov.gov/wiki/Portal:Joint_Combat_Assessment_Team**. UNCLASSIFIED data can sent to: JCAT (**JCAT@us.af.mil**).

5.2.2.1.17. Coordinate munitions delivery priorities with flying units and munitions maintenance activities, and control when tasked. **(T-1)**.

5.2.2.1.17.1. Maintain a contact list and notify the base Fire Emergency Services and all applicable agencies that require notification of munitions-loaded or unloaded aircraft. **(T-2)**.

5.2.2.1.17.1.1. The MOC will provide agencies with the aircraft type, tail number, location, type of explosives, and arming status. **(T-1)**.

5.2.2.1.18. Upon notification of deployments, ensure all deploying equipment is identified and loaded into the IMDS-CDB, Aerospace Expeditionary Force subsystem or designated MIS equivalent for the duration of the deployment. **(T-1)**.

5.2.2.1.19. Monitor and manage reporting of Hangar Queen aircraft/systems IAW **Chapter 11** **(T-1)**.

5.2.2.1.19. **(AFMC)** Ensure aircraft boards are visibly marked to show Hangar Queen Status, date of last flight, ETIC, expected fly date and identify the Hangar Queen Manager. **(T-2).**

5.2.2.1.20. Notify Flightline Expediters of OAP code "C" and "E" conditions. **(T-1)**.

5.2.2.1.20. **(AFMC)** Notify Flightline Expediters of all OAP code conditions through MOC.

5.2.2.1.21. Ensure facilities and visual aids meet the following minimum standards:

5.2.2.1.21.1. A completely enclosed room with air conditioning and heating. **(T-1)**. An observation room is permitted.

5.2.2.1.21.1.1. Doors to the MOC and the observation room will be either mechanically or electrically locked to control access. **(T-1)**.

5.2.2.1.21.2. Isolate MOC electrical power circuits and provide a standby power source and emergency lighting. **(T-1)**.

5.2.2.1.21.2.1. The MOC will establish procedures to operate standby power sources. **(T-1)**.

5.2.2.1.22. Maintain the status and location of all transient aircraft. **(T-1)**.

5.2.2.1.22.1. Post the priority of each transient aircraft on the status board, based on the maintenance priorities listed in **Table 1.2** **(T-1)**.

5.2.2.1.22.2. Coordinate with the appropriate agency for aircraft maintenance support. **(T-1)**.

5.2.2.1.22.3. Contact WS for arming or de-arming of transient aircraft IAW **Chapter 11** **(T-1)**.

5.2.2.2. MOC Maintenance Communications. Reliable, redundant and effective communications systems are essential for efficient operation. Communications equipment will be operated and managed IAW AFI 17-210, AFI 17-220, *Spectrum Management*, and AFI 17-130. The MOC NCOIC/SUPT will:

5.2.2.2.1. Establish a procedure to process requests for specific radio equipment to support MXG maintenance activities IAW AFMAN 23-122. **(T-1)**.

5.2.2.2.1.1. Specific radio allowances are stated in Allowance Standard 660 at **https://earms.wpafb.af.mil/SITES/ASRS/HOME.ASP**.

5.2.2.2.2. Ensure a Very High Frequency (VHF)/Ultra High Frequency (UHF)/ High Frequency (HF) radio is authorized and available to provide communications between aircraft and maintenance. **(T-1)**.

5.2.2.2.3. Ensure the MOC has a hotline on the secondary crash phone net. **(T-1)**.

5.2.2.2.3.1. When required, direct communications lines will be provided to QA, Munitions Control, EOD, airfield operations, base fire department, NDI, control tower and the central security control. **(T-1)**.

5.2.2.2.4. Develop and exercise comm-out procedures to include loss of radios, Local Area Network (LAN) and phone. **(T-2)**.

5.2.2.2.5. Ensure MOC personnel receive initial radio operating training before assuming duties involving radio operations IAW AFI 17-210 and **Chapter 11** **(T-1)**.

5.2.3. Engine Management. EM manages unit efforts to maintain adequate engine support for mission requirements by monitoring engine removals and replacements, component tracking, engine TCTOs and TCIs, engine records in the MIS and CEMS; and perform Engine Manager duties. Functions supporting EM shall be combined within the wing and physically co-locate with the Propulsion Flight. **(T-2)**. The SRAN Engine Manager works and is co-located with the EM section. **(T-2)**.

5.2.3. **(AFMC)** [DEV] Engine Management. Within the 412 MXG, the 412 MXS Propulsion Flight Business Unit will perform duties and responsibilities of Engine Management (EM) Section listed in AFI 21-101.

5.2.3.1. Specific EM responsibilities are detailed AFMAN 20-116, AFPAM 63-129, TO 00-25-254-1, -2 and **Chapter 14**.

5.2.4. Plans, Scheduling, and Documentation (PS&D). PS&D is responsible for coordinating aircraft maintenance requirements and utilization scheduling between maintenance, operations, and external agencies. PS&D oversees the entire maintenance scheduling effort throughout the wing and notifies applicable senior managers of scheduling process discrepancies and recommended courses of action.

5.2.4.1. Specific PS&D responsibilities are detailed in **Chapter 14**.

5.2.5. Maintenance Management Analysis (MMA). MMA tracks, analyzes, and presents information to help senior leadership assess the health of the units' weapon systems and equipment. MMA acts as the group POC for MIS issues and performs analyses to assess and improve unit performance (such as, effectiveness and efficiency of unit resources and logistical support processes). The MIS provides the main source of information used by analysts to assess unit performance and capability.

5.2.5. **(AFMC)** Maintenance Management Analysis (MMA). The senior 2R0 or civilian equivalent member is the unit functional manager and monitors and controls analysis resources for the unit. All issues relating to MIS database management, and training should be directed to the unit functional manager first. The unit functional manager will elevate issues beyond the unit control to the wing's analysis functional manager. **(T-2).** This includes allocations of AETC and AFMC/SSG formal school quotas.

5.2.5.1. MMA will:

5.2.5.1.1. Be centrally organized but may locate analysts in the squadron to enable maximum responsiveness and effectiveness. **(T-2)**.

5.2.5.1.1.1. When analysts are located in the squadron, they will still work directly for the MMA Section NCOIC/Chief who will provide their training and monitor the quality/relevancy of their workload. **(T-2)**.

5.2.5.1.2. Provide information on analysis services and capabilities to units and supervision. **(T-1)**.

5.2.5.1.2.1. Work with MTS and/or FTD for opportunities to provide training on analysis services and capabilities (example, Mx Orientation, DCC Course). **(T-2)**.

5.2.5.1.2.2. Conduct and document quarterly visits to maintenance work centers and provide information on analysis services and capabilities IAW MAJCOM guidance. **(T-2)**.

5.2.5.1.3. Calculate maintenance metrics and compare unit performance against MAJCOM and locally developed goals (if applicable). **(T-1)**.

5.2.5.1.4. Develop products to track, monitor and identify seasonal and cyclical trends at the group, squadron and AMU/HMU level for:

5.2.5.1.4.1. MAJCOM reportable leading and lagging indicators. **(T-2)**.

5.2.5.1.4.2. MAJCOM reportable indicators at the WUC/LCN system level (such as, break rate for landing gear system). **(T-2)**.

5.2.5.1.5. Review data for anomalies, variations and trends to identify areas requiring further study. **(T-1)**.

5.2.5.1.5.1. When significant seasonal or cyclical trends are identified in leading or lagging indicators or their systems, accomplish and document further analysis. **(T-2)**.

5.2.5.1.5.1.1. Provide presentations, reports, studies/analyses and briefings as requested or deemed appropriate. **(T-2)**.

5.2.5.1.5.2. Units with AMU/HMUs that have like MDSs will compare and contrast metrics to identify significant variation. **(T-2)**.

5.2.5.1.5.2.1. When significant variation is identified, accomplish and document further analysis. **(T-2)**.

5.2.5.1.5.2.2. Provide presentations, reports, studies, analyses and briefings as requested or deemed appropriate. **(T-2)**.

5.2.5.1.6. Monitor wing, group, squadron, and AMU/HMU utilization rates. **(T-2)**.

5.2.5.1.6.1. When operational requirements are not achieved, perform and document an investigation to determine if assignable causes are present. Recommend corrective actions or measures when necessary. **(T-2)**.

5.2.5.1.7. Assist unit leaders with the application and interpretation of maintenance data. **(T-1)**.

5.2.5.1.8. Coordinate with PS&D and unit's Maintenance Supervision to provide monthly airframe, facility and personnel capabilities (as required), attrition, and spare factors for use in planning the annual FHP. **(T-1)**.

5.2.5.1.8.1. MAJCOMs will publish attrition and spare factors computations in a supplement to this instruction reference TO 00-20-2.

5.2.5.1.8.1. **(AFMC)** Instructions are noted in **Attachment 8**.

5.2.5.1.8.1.1. MMA will use MAJCOM supplement guidance to calculate attrition and spare factor computations. **(T-1)**.

5.2.5.1.8.1.2. MMA will provide required data to populate the MxCAP2 model, when used. **(T-1)**.

5.2.5.1.8.1.2. **(AFMC)** See deviation at **paragraph 2.2.4.3**

5.2.5.1.9. Analyze equipment performance trends to identify problems affecting the unit mission and, whenever possible, provide predictive analytical information with recommendations to unit's Maintenance Supervision. **(T-1)**.

5.2.5.1.10. Verify accuracy of Job Data Documentation (JDD), flying schedule deviations, aircraft status and utilization within the MIS. **(T-2)**.

5.2.5.1.10.1. Validate data entered into the MIS as part of daily analysis duties and inform affected agencies of discrepancies. **(T-1)**.

5.2.5.1.10.2. Identify erroneous or missing data to the responsible agency for correction or completion. **(T-1)**.

5.2.5.1.11. Control the assignment of unit work center and mnemonic codes. **(T-1)**.

5.2.5.1.11.1. Coordinate with P&R, MTS or responsible agency on the assignment of alphanumeric and work center codes. **(T-1)**.

5.2.5.1.11.2. Publish written guidance to control these codes when not provided by higher headquarters. Multiple mnemonic codes may be used within a work center code to accommodate different AFSCs assigned. **(T-1)**.

5.2.5.1.11.3. Coordinate new or revised mnemonic codes with affected activities for planning purposes. **(T-1)**.

5.2.5.1.12. Be responsible for MIS database management. **(T-1)**.

5.2.5.1.13. Assists MIS users in developing procedures for collecting information from deployments and exercises where the MIS is not available. **(T-1)**.

5.2.5.2. In addition to the applicable Section NCOIC/Chief responsibilities outlined in **Chapter 2**, the MMA Section NCOIC/Supervisor will:

5.2.5.2.1. Ensure growth of analysis personnel by developing and maintaining a plan to rotate personnel through different sections within MMA. Allow sufficient time for them to become proficient and provide continuity. **(T-2)**.

5.2.5.2.2. Define the daily, weekly, monthly and annual roles and responsibilities for each function within MMA. Can be delegated to the function NCOIC. **(T-2)**.

5.2.5.2.3. Ensure the CFM approved AFSC duty titles are utilized for all MMA personnel. **(T-1)**.

5.2.5.2.4. **(Added-AFMC)** IMDS-CDB/G081 Users Group. Establish an IMDS-CDB/G081 Users Group to identify user problems, provide on the spot training to correct user documentation problems, and to discuss other issues relating to operation of the system. MMA will conduct meetings in conjunction with the monthly DIT meeting. **(T-2).** An agenda (pre-meeting) and meeting minutes (post-meeting) will be published and sent to all work centers. The use of electronic means (telecon, Defense Collaboration Services (DCS), etc.) for the meeting is authorized.

5.2.5.2.5. **(Added-AFMC)** Set priorities and resolve conflicts on all automated maintenance systems priorities.

5.2.5.2.6. **(Added-AFMC)** Coordinate with wing plans personnel to develop planning data and inputs.

5.2.5.2.7. **(Added-AFMC)** Ensure timely submission of data to meet MAJCOM reporting suspense's and validity of data submissions. **(T-2).** Work with the senior maintainers on all comments written to explain the meaning of the data presented.

5.2.5.2.8. **(Added-AFMC)** Ensure database managers (DBMs) can be reached during off duty hours to support processing requirements for IMDS-CDB. **(T-3)**.

5.2.5.2.9. **(Added-AFMC)** MMA Team Concept. MMA teams identify problem areas for additional study using MIS data gathering, research, and investigation. Deficiency Analysis/QA assists by providing in-depth technical expertise. The MMA team will present MXG leadership with completed studies focusing on the cause and effect of problem areas, and include recommendations for course(s) of action as appropriate. **(T-2).**

5.2.5.3. Maintenance Information Systems (MIS). For management of IMDS-CDB, G081, and Reliability and Maintainability Information System (REMIS), follow AFCSM 21-556, Vol 2, *Intro to IMDS CDB*, MAJCOM/Lead Command guidance, unit procedures, and REMIS user manuals. Personal computers and software used as "stand-alone" systems are not considered MIS.

5.2.5.3. **(AFMC)** The command functional manager at HQ AFMC/A4MM (**AFMC.A4MM@us.af.mil**) is responsible for all issues related to MIS. They will provide technical advice to units on problems beyond their expertise.

5.2.5.3.1. Request to modify/create new functionality within IMDS-CDB IAW AFCSM 21-556V2. **(T-1)**. G081 units will submit a System Change Request for any new requirements or corrections to existing features. **(T-1)**.

5.2.5.3.2. Database Manager (DBM) will identify functions that require subsystem monitors and provide applicable training to those responsible for ensuring the accuracy/sustainment of their subsystem. **(T-2)**.

5.2.5.3.2.1. Subsystem monitors will be appointed by the Section Chief of subsystem functions (such as, PS&D Section Chief appoints and signs appointment letter for configuration management). **(T-2)**.

5.2.5.3.2.2. MMA is responsible for the overall management of the JDD subsystem. **(T-2)**.

5.2.5.3.3. MAJCOMs will provide guidance describing the management of the MIS assigned to wings within their command. **(T-1)**.

5.2.5.3.3. **(AFMC)** No further guidance required. All requirements listed meet MAJCOM requirements.

5.2.5.3.4. At a minimum, the MMA MIS/Host DBM will ensure:

5.2.5.3.4.1. MAJCOM coordination occurs when problems exist that are beyond

the scope of responsibilities of Host DBMs. **(T-2)**.

5.2.5.3.4.2. IMDS-CDB/G081 security is maintained IAW AFI 17-130, *Cybersecurity Program Management*. **(T-2)**.

5.2.5.3.4.2.1. MMA personnel coordinate MIS access permission requirements to enable MDD on non-possessed aircraft. **(T-2)**.

5.2.5.3.4.3. MMA personnel provide expertise on IMDS-CDB/G081 for resolution of problems beyond the work center and sub-system monitors' control. **(T-2)**.

5.2.5.3.4.4. Support is provided to tenant organizations and users. **(T-2)**.

5.2.5.3.4.5. Coordination with the Defense Enterprise Computing Center or AF Network Control Center on all matters concerning IMDS-CDB. **(T-2)**.

5.2.5.3.4.6. The Defense Enterprise Computing Center supports all requirements concerning the operation and maintenance of IMDS-CDB. **(T-2)**.

5.2.5.3.4.7. Scheduled MIS downtime is published for users. **(T-2)**.

5.2.5.3.4.8. MMA personnel control and monitor submissions of IMDS-CDB Difficulty Report(s). **(T-2)**.

5.2.5.3.4.9. Coordination occurs on matters pertaining to the interface of other automated systems with IMDS-CDB. **(T-2)**.

5.2.5.3.4.10. Development of a functional checklist to establish timelines and MIS data capture requirements for use in the event of a weapon system mishap. **(T-2)**.

5.2.5.3.4.10.1. The checklist must require immediate capture and isolation of the historical data for the mishap weapon system regardless of the time or day of week. **(T-2)**. Contact the Host DBM to immediately put the IMDS-CDB in File Update Mode (when required) until the functional checklist can be completed. G081 equipment records will be locked using screen 9012 (Lock/Unlock Aircraft/Data Records). **(T-2)**.

5.2.5.3.4.11. Support of the Communications-Electronics maintenance community referring to AFI 21-103 and TO 00-33A-1001, *General Cyberspace Support Activities Management Procedures and Practice Requirements* for maintenance analysis and host DBM responsibilities. **(T-2)**.

5.2.5.3.4.12. Control of access to specific IMDS-CDB programs and subsystems by utilizing Transaction Identification Codes (TRICs) security profiles or screen 9057 (program access) for G081. **(T-2)**.

5.2.5.3.4.12.1. Audit permissions to IMDS security profiles and G081 access keys annually. Take appropriate measures when a compromise is suspected or reported. **(T-2)**.

5.2.5.3.4.12.2. Semi-annually audit IMDS ELC access. **(T-2)**.

5.2.5.3.4.13. IMDS-CDB subsystem managers are informed of the status of applicable TRICs prior to turning the TRIC on or off. **(T-2)**.

5.2.5.3.5. MMA provides overall management and control of the maintenance deferred code listing. **(T-1)**.

5.2.5.3.5.1. Changes to the table will be coordinated with PS&D. **(T-1)**.

5.2.5.3.6. Data Integrity. MMA is the OPR for the Data Integrity Team (DIT). All maintenance units will participate in the DIT program. **(T-1)**.

5.2.5.3.6.1. The purposes of the DIT include: (1) ensuring the unit has complete and accurate data in the MIS and aircraft forms, (2) identifying and quantifying problems within the unit preventing complete and accurate documentation, and (3) identifying and correcting the root causes for poor data integrity. The DIT is established to evaluate/isolate/eliminate documentation problems in IMDS-CDB/G081. MMA will ensure that all assigned DIT members are trained in the use of MIS applicable programs for the data integrity review/correction process. **(T-2)**. Errors identified by the DIT team will be reconciled IAW **Paragraph 5.2.5.3.6.5** **(T-1)**.

5.2.5.3.6.2. The DIT will include, at a minimum, one representative from each squadron under the MXG. It will include participation from PS&D, MOC, DMS, EM, Debrief Section, and QA as determined by MMA. **(T-2)**.

5.2.5.3.6.3. MAJCOMs will determine the frequency of DIT meetings.

5.2.5.3.6.3. **(AFMC)** DIT meetings will be held monthly. **(T-2).**

5.2.5.3.6.4. Representatives will be at least a SrA that possesses a 5-skill level and is familiar with the unit's assigned weapon system(s). **(T-2)**.

5.2.5.3.6.5. As a minimum, the following functions will be performed by the DIT:

5.2.5.3.6.5.1. Educate group, squadron and AMU leadership on the importance of data integrity including the impacts of erroneous data.

5.2.5.3.6.5.2. Ensure MIS accurately reflects AFTO Form 781-series forms entries.

5.2.5.3.6.5.3. Run maintenance action review background reports for all work accomplished by squadrons and work centers.

5.2.5.3.6.5.3.1. Audit the report by JCN/WCE (Work Event Separator for G081) to identify suspected errors.

5.2.5.3.6.5.3.2. Responsibility for correcting errors belongs to the performing work center.

5.2.5.3.6.5.3.2.1. The use of general WUCs/LCNs when a component level WUC/LCN exists will be counted as an error. **(T-2)**.

5.2.5.3.6.5.3.3. Use of automated processes is authorized.

5.2.5.3.6.5.3.4. **(Added-AFMC)** Do not limit scope of DIT to JDD. **(T-2).**

5.2.5.3.6.5.3.5. **(Added-AFMC)** Provide feedback to users via users' meetings, periodic memorandums, letters, etc. **(T-2).**

5.2.5.3.6.5.3.6. **(Added-AFMC)** When the operational requirements are not

achieved, MMA will perform an investigation to determine the cause. **(T-2)**. As a minimum the following areas will be considered:

5.2.5.3.6.5.3.6.1. **(Added-AFMC)** Are operational requirements realistically based on availability of equipment? **(T-2).**

5.2.5.3.6.5.3.6.2. **(Added-AFMC)** What are the causes for flying schedule deviations (cancellations, aborts, additions or early/ late takeoffs)? **(T-2).**

5.2.5.3.6.5.3.6.3. **(Added-AFMC)** Are specific aircraft, equipment, systems, or subsystems contributing to a disproportionate share of deviations/turbulence? **(T-2).**

5.2.5.3.6.5.3.6.4. **(Added-AFMC)** Is specific equipment failing to perform as scheduled? Does this equipment require more or less maintenance than others? **(T-2).**

5.2.5.3.6.5.3.6.5. **(Added-AFMC)** Are there enough people to meet mission needs? Are certain work centers documenting significant overtime or show consistently high utilization rates? **(T-2).**

5.2.5.3.6.5.3.6.6. **(Added-AFMC)** Is there a good balance of skills within AFSCs and between the units? **(T-2).**

5.2.5.3.6.5.3.6.7. **(Added-AFMC)** Do higher rates for repeat/recur discrepancies indicate training/experience shortfalls? **(T-2).**

5.2.5.3.6.5.3.6.8. **(Added-AFMC)** Is there sufficient time to schedule and work maintenance problems? **(T-2).**

5.2.5.3.6.5.3.6.9. **(Added-AFMC)** Are trends significant? Are the trends short term (6 months or less) or long term? Where will the unit likely be in 6-12 months? **(T-2).**

5.2.5.3.6.5.3.6.10. **(Added-AFMC)** Are there seasonal or cyclical variations? Are current variations outliers? **(T-2).**

5.2.5.3.6.5.4. Audit for Weapons System status, flying schedule deviation and utilization errors. **(T-2)**.

5.2.5.3.6.5.4.1. The use of general WUCs/LCNs when a component level WUC/LCN exists will be counted as an error. **(T-2)**.

5.2.5.3.6.5.5. Develop a system to track, measure and report data integrity errors by work center, AMU and squadron. **(T-2)**.

5.2.5.3.6.5.6. Implement training programs that are geared toward correcting data integrity trends. **(T-2)**.

5.2.5.4. **(Added-AFMC)** Analytical Process. The analytical process consists of identifying contributory factors, manipulating raw data into meaningful formats, computing management indicators, performing statistical measurements, and creating accurate, complete, and easy to understand presentations.

5.2.5.4.1. **(Added-AFMC)** Management Contributions to the Analytical Process. Maintenance managers have a significant impact on the usefulness of the MMA to the unit. Managers should constantly review how information is being organized and presented.

5.2.5.4.2. **(Added-AFMC)** Analytical Studies. MMA will provide results of investigations, analyses, or studies to work centers. **(T-2).** The most effective study is one that goes beyond superficial conclusions. It helps solve a problem relative to mission performance. Specific studies are provided to the requester, and a file copy is retained for future reference. Disseminate the study by electronic means or include it in a monthly maintenance summary. The study should state assumptions up front, and should be summarized to state how the significance is measured.

5.2.5.4.3. **(Added-AFMC)** Maintenance Analysis Referrals. A referral is a procedure used to identify, investigate, and propose corrective action for management problems. These are highly effective tools to make agencies aware of common problems.

5.2.5.4.4. **(Added-AFMC)** Dedicated AMU Analysis (where applicable). The AMU analysis function is intended to provide dedicated analytical support for the AMU. The MMA section NCOIC may dedicate an analyst to each AMU. The dedicated AMU analyst works for the MMA section NCOIC. Accomplishing AMU tasks are the dedicated analyst's primary responsibility. The MMA section NCOIC is responsible for the overall effectiveness of the AMU analysis program. As a minimum, the AMU analyst will: **(T-2).**

5.2.5.4.4.1. **(Added-AFMC)** Review maintenance debriefing data to track in-flight discrepancies and deviations on each aircraft. Review aircraft status inputs from the MOC for WUC accuracy. Closely monitor fix time on Code 3 discrepancies and report results to AMU supervision daily. Brief problem aircraft and systems to AMU supervision daily. **(T-2).**

5.2.5.4.4.2. **(Added-AFMC)** Brief comparative AMU data weekly and monthly as required by the MXG/CC. **(T-2).**

5.2.5.4.4.3. **(Added-AFMC)** Validate CANN documentation in IMDS-CDB at least weekly, with AMU supply and inform AMU supervision of its accuracy. If errors exist, a more frequent validation may be required. Advise AMU supervision of recurring problems. **(T-2).**

5.2.5.4.4.4. **(Added-AFMC)** Monitor the UTE rate for the AMU. **(T-2).**

5.2.5.4.4.5. **(Added-AFMC)** Analyze programmed and actual attrition factors. **(T-2).**

5.2.5.4.4.6. **(Added-AFMC)** Attend AMU scheduling/production meetings at least once per week. **(T-2).**

5.2.5.4.4.7. **(Added-AFMC)** Present Maintenance Analysis. Present data by using summaries, charts, graphs, tabular displays, and narratives. These data presentations should show the relationships among various factors. Data presentations should be displayed or presented in time to be useful in plans or reports. A printed monthly maintenance summary, tailored to the needs of the unit,

is an excellent method of presenting data. **(T-2).**

5.3. Maintenance Training (MT). MT consists of the Training Management Element and the Development and Instructor Element. Maintenance Training assists SQ/CCs by providing Unit Training Managers (UTM) to manage the enlisted specialty training program. MT will:

5.3.1. Provide initial, recurring and advanced proficiency, qualification, or certification training needed by a technician to perform duties in their primary AFSC and manage course codes to track training IAW AFI 36-2650 and AFI 36-2651. **(T-1)**.

5.3.2. Serve as the single point of contact for all training matters affecting maintenance. **(T-1)**.

5.3.3. The MT Superintendent/NCOIC will maintain administrative responsibility for UTMs whether UTMs are centralized or decentralized. **(T-1)**.

5.3.4. Develop and administer appropriate Maintenance Cyber Discipline training. Training shall be tailored to DoD Information Technology used locally and shall emphasize authorized, and unauthorized uses, prevention, detection, remediation, and provide an overview of recent negative trends and effective mitigation techniques. **(T-1)**.

5.3.4.1. Coordinate with Quality Assurance, MXG/CC designated responders, and facilitators for action when discovery that DoD Information Technology lacks the capability to perform a mission function. **(T-1)**. Example: Enhanced Technical Information Management System containing software for a TO task that does not have a hardware TO approving its installation or use.

5.4. Programs and Resources (P&R). P&R serves as the MXG focal point for interaction with external functional support activities to ensure critical mission generations support, infrastructure personnel management and resources are configured to maximize mission capability/AA. P&R program configurations may vary based on mission but generally P&R coordinates with functional base OPRs to interact on Facility Management (FM), Vehicle Control (VCO), Support Agreements, Unit Safety, Security, Resources, Manpower, Environment, Deployment and Maintenance Information System programs as applicable. Units will maximize consolidation of personnel assigned in P&R as described in **Paragraph 2.4.14** P&R will:

5.4. (AFMC) Programs and Resources (P&R). Developmental testing is conducted throughout the acquisition and sustainment processes to assist engineering design and development, and verify that critical technical parameters have been achieved. Developmental Test & Evaluation (DT&E) supports the development and demonstration of new materiel solutions or operational capabilities as early as possible in the acquisition life cycle. After full- rate production or fielding, DT&E supports the sustainment and modernization of systems. To support integrated testing, as many test activities as practical are conducted in operationally relevant environments without compromising engineering integrity, safety, or security. Developmental testing leads to and supports a certification that the system is ready for dedicated operational testing IAW DoDI 5000.02, Enclosure 6, and AFMAN 63-119, Certification of System Readiness for Dedicated Operational Testing. P&R will:

5.4.1. Develop, maintain, and coordinate all applicable AFI-directed programs and plans affecting maintenance. **(T-1)**.

5.4.1.1. **(Added-AFMC)** Coordinate with the Maintenance Group (MXG)/Squadron SUPTs to manage Test and Evaluation (T&E) resource requirements for MXG.

5.4.1.2. **(Added-AFMC)** MXOPL Logistics Programs.

5.4.1.2.1. **(Added-AFMC)** Programs. The Life Cycle Logistics Management Specialist (LCLMS) support DT&E, and Operational Test and Evaluation (OT&E) activities IAW DoDI 5000.02 and DoDD 5000.01. Provide continued emphasis and awareness by early involvement in DT&E and OT&E activities. The Life Cycle Logistics (LCL) will establish standards and procedures for accomplishment of DT&E and OT&E logistics functions. Ensure compliance with statutory directives; Air Force environmental management, safety, security instructions; and TOs. Develop and provide training and tools to improve the DT&E and OT&E process within the Acquisition Community. Will assist in development of logistics support test plans, data analysis plans, and technical reports. The LCL will assist local management in test execution during DT&E and OT&E program involvement as defined IAW AFI 99-103. The LCLMS is the Logistics Subject Matter Expert (SME) and focal point for Engineering and Program Management personnel during all DT&E and OT&E activities. They will plan, direct, and manage the development and acquisition of logistics support plans for System Program Offices at the Group level. **(T-2).** The process of Integrated Product Support (IPS) Elements for testing, evaluating and, supporting a weapon system from cradle to grave is defined in the Defense Acquisition Guidebook. LCLMS' will determine whether logistics support and system readiness objectives are met. LCLMS' apply the use of the 12 IPS Elements (AFI 63-101/20-101) during DT&E, OT&E and Sustainment. Programs conduct DT&E throughout the systems life cycle, from program initiation through system sustainment, to reduce design and programmatic risks and provide assessments. DT&E can occur as either contractor testing, government testing or a mix of both.

5.4.1.2.2. **(Added-AFMC)** LCLMSs provide complete, logistics planning and support to a broad system, program, or functional area of assignment.

5.4.1.2.2.1. **(Added-AFMC)** Lead logistics planning efforts and secure support for ground and/or flight testing of a broad system, program or functional area through the efforts of self and other team members.

5.4.1.2.2.2. **(Added-AFMC)** Direct and coordinate the efforts of Test Wing (TW), MXG managers and other team members in developing capability estimates and logistics support planning for assigned area of responsibility.

5.4.1.2.2.3. **(Added-AFMC)** Lead and balance test requirements for the various programs within the assigned area against existing or available support capabilities and capacities.

5.4.1.2.2.4. **(Added-AFMC)** Prepare and present maintenance briefing material to inform and advise the MXG staff, visitors and higher authorities on logistics support capabilities and status of programs and projects.

5.4.1.2.2.5. **(Added-AFMC)** Develop cross-coordination staffing and the preparation of correspondence for the MXG on matters involving multiple maintenance functional elements; plans for modernization; develop and submit

budgetary estimates through resource or manpower managers.

5.4.1.2.3. **(Added-AFMC)** Represent the MXG at initial test and evaluation planning meetings, in development of test and evaluation master plans, program management plans, program test plans, program introduction (PI) documents, integrated logistics support plans, and logistics support plans.

5.4.1.2.3.1. **(Added-AFMC)** Perform Program Analyst and Project Manager duties for programs unique to the maintenance complex; such as maintenance back shop and jet engine development or sustainment work.

5.4.1.2.3.2. **(Added-AFMC)** Manage collaboration and attain assistance from qualified specialists or SMEs to develop and implement logistics plans for a variety of projects.

5.4.1.2.3.3. **(Added-AFMC)** Organize and delegate work within the team, provide guidance and training to assigned specialists, reviews work, and provides input to performance evaluations.

5.4.1.2.4. **(Added-AFMC)** Develop and implement plans for logistics support of the TW mission.

5.4.1.2.4.1. **(Added-AFMC)** Review planning documents for assigned area and develop detailed support plans including estimates of manpower requirements by skill, career field and special training requirements; funding requirements; facility management and formulation or review of plans and specifications for facilities modification or for new facility requirements.

5.4.1.2.4.2. **(Added-AFMC)** Prepares and reviews services and support agreements between the AFTC, TW, MXG, contractors, NASA, AFMC and other MAJCOMS, Air Force, other services, and other DOD agencies. Ensures all support agreements requiring MAJCOM involvement are properly routed into the MAJCOM for needed reviews, coordinations, signatures, etc. Ensures any support agreements involving aerospace vehicle transfers or possessions are submitted to AFMC/A4M and AFMC/A3F for review.

5.4.1.2.4.3. **(Added-AFMC)** Review and participate in negotiation of host-tenant and interagency support agreements.

5.4.1.2.4.4. **(Added-AFMC)** Perform functional area chief duties for MXG service contracts, including the development of statements of work, performance work statements, and other contractual documents; serve as liaison with the AFTC Contracting Office.

5.4.1.2.4.5. **(Added-AFMC)** Perform a variety of special assignments to include conducting special one-time and feasibility studies to determine support capability, assess new requirements and develop more effective ways to do business.

5.4.1.2.5. **(Added-AFMC)** Manage equipment, support equipment and, material requirements to support assigned programs.

5.4.1.2.5.1. **(Added-AFMC)** Manage deployment of MXG resources (aircraft, manpower, equipment, spare parts, etc.) to meet test requirements or

war/contingency taskings; loan of government property as Government Furnished Equipment, transportation plans, OPSEC/COMSEC plans, reception of other forces deploying to Edwards AFB to meet test requirements or war/contingency taskings. Conduct studies and analysis in support of bed down activities for new test programs and manage commitment of logistics resources for support of assigned programs/projects and logistics test plans.

5.4.1.2.5.2. **(Added-AFMC)** Manage acquisition logistics support for production weapons systems and for systems in pre-production phases by conducting continual follow-up on changes in test schedules, acquisition of materials and support equipment, availability of funds, status of maintenance manpower, training, and support capabilities, adjusts logistics resources as required to ensure test milestones can be achieved.

5.4.1.2.5.3. **(Added-AFMC)** Formulate innovative solutions to diverse logistics problems encountered with unique test assets.

5.4.1.3. **(Added-AFMC)** MXOPO Organizational Design and Improvement.

5.4.1.3.1. **(Added-AFMC)** Develop workforce resource requirement inputs for T&E activities associated with assigned MXG Research, Development, Test and Evaluation programs IAW AFI 38-101, AFI 99-103, AFI 99-109, DoDD 3200.11, DoDD 5000.1, DoDD 7000.14R, DoDD 5010.42, and DoDI 5010.43.

5.4.1.3.1.1. **(Added-AFMC)** Serve as the MXG and its sub-organizations' focal point for MXG manpower requirements determination for planning and resourcing current, future or potential T&E programs. Perform studies to assess requirements, disconnects, offsets, initiatives, workload and/or adjustments related to military, civilian, or overhire authorizations. Develop decision level data using appropriate resourcing tools, past practices, standards or functional or SME technical estimates. Develops project inputs for statement of capabilities (SOC), Program Objective Memorandum (POM), manpower estimate report, briefs or strawman Unit Manning Document (UMD) to support T&E requirement programing and coordinate efforts with external organizations.

5.4.1.3.1.2. **(Added-AFMC)** Serve as the MXG and its subordinate units' action officer for organization change requests (OCR). Provide recommendations to meet capability and capacity requirements based on current and/or future mission objectives. Develop, manage, and coordinate supporting document with external organizations, and track progression IAW AFI 38-101.

5.4.1.3.1.3. **(Added-AFMC)** Develop decision level data for organizational or process solutions to resolve complex T&E mission capacity and capability issues. Support strategic planning with alternate course of actions (COA), and/or recommendations on maintenance capabilities and resources needed to meet T&E mission requirements effectively and efficiently.

5.4.1.3.1.4. **(Added-AFMC)** Develop management tools as required to aid leadership in making data driven decisions related to mission, resource priorities, and strategic action plans. Tools include support for, but not limited to data gathering, metrics reporting, requirements forecasting, LT&E data management,

resource availability, and Major Graded Area focus areas IAW AFI 99-103, AFI 1-2 and AFI 90-201.

5.4.1.3.2. **(Added-AFMC)** Serve as the MXG commander's focal point for AF CPI to provide visible leadership and promote AF CPI culture of innovation and teamwork. Trained and or certified Green Belt (GB) and Black Belt (BB) practitioners will provide employment of AF CPI methodologies to fulfill AFI 1-2: Commander's Responsibilities and AFI 90-201: The Air Force Inspection System requirements to correct unit deficiencies using root cause analysis IAW AFI 38 Series.

5.4.1.3.2.1. **(Added-AFMC)** GB and BB practitioner will use AF CPI policy guidance, related efficiency methodologies, processes, procedures, tools, and training curriculums to implement and manage CPI throughout the MXG and its sub-organizations.

5.4.1.3.2.2. **(Added-AFMC)** Establish AF CPI program governance via the MXG Corporate Board and implement strategic alignment across the MXG. Develop mission, vision, goals, objectives, and action items and track progression toward meeting goals.

5.4.2. Act as the resource advisor to the MXG/CC. **(T-2)**.

5.4.2. **(AFMC)** [DEV] Within the 412 TW, 412 MXG/CC is not required to appoint a Programs and Resource Advisor. This responsibility will be managed by personnel assigned to the 412 TW.

5.4.3. Coordinate with the MXG/Squadron SUPTs to manage manpower authorizations for the MXG. **(T-2)**.

5.4.3. **(AFMC)** MXOPM Manpower.

5.4.3.1. **(Added-AFMC)** Act as the MXG and sub organization Commander's and supervisor's manpower adviser for personnel staffing actions, strategic human capital planning, workforce management programs, policies, accountability, reporting requirements, and issue resolution.

5.4.3.2. **(Added-AFMC)** Assist commanders and/or supervisors in management of their civilian and military manpower authorizations to support T&E manpower requirements identified in AFI 99-103, AFI 99-109, Program SOCs, and DoDD 3200.11 IAW AFI 38-101, and AFPD 36-1.

5.4.3.3. **(Added-AFMC)** Manage position control numbers and request for personal actions (RPA) staffing actions from "cradle to grave" in support of T&E. Validate requester data and request required information when documentation is incomplete. Coordinate with wing, Center and AFPC agencies as necessary to ensure effective actions. Manage RPA fill action hiring certifications issues and close out actions. Provide periodic status updates.

5.4.3.4. **(Added-AFMC)** Develop COAs to resolve complex management issues and applies critical thinking to resolve organizational staffing challenges.

5.4.3.5. **(Added-AFMC)** Provide reporting metrics, periodic reports, and tools as directed by MXG leadership to assist in the determination of organizational priorities in

the areas of training, staffing, recruitment, and workforce shortfalls and/or surpluses to enable data-driven decisions.

5.4.3.6. **(Added-AFMC)** Develop and manage metrics and reports to higher echelons as requested. Metrics include, but are not limited to; data calls, taskers, and/or guidance from higher headquarters, manpower and occupational demographics, staffing levels, activities necessary to manage POM plus up or reduction actions, reasonable accommodations, medical retirements, training, classifications, capacity, and capability etc. Chair periodic meetings as required. Meetings will include leadership and other personnel necessary to review metrics, address and correct staffing concerns and establish staffing priorities.

5.4.3.7. **(Added-AFMC)** Ensure authorized and assigned personnel are adequate to support the unit mission and tasking plans. Coordinate with wing or Air Logistics Center manpower office representatives for assistance in preparing requests to MAJCOM for UMD adjustments.

5.4.3.8. **(Added-AFMC)** Maintain current Unit Personnel Manpower Roster. Work with MXG Chief, Enlisted Advisor, WAM and unit superintendents to allocate projected gains appropriate billets. Maintain record of approved actions and verify that personnel data subsystems are updated.

5.4.3.9. **(Added-AFMC)** Distribute projected gain/loss lists and maintenance manpower requests to appropriate work centers and establish suspense for updates. Ensure approved actions have been received for update and submit consolidated updates to the appropriate program or system.

5.4.3.10. **(Added-AFMC)** Develop inputs for mass realignment request. Provide research, and validation of UMD. Request Table 30 updates when new Office Symbol Code and/or Personnel Accounting Symbol code is received. Build and submit spreadsheet for mass realignment to AFPC.

5.4.3.11. **(Added-AFMC)** Focal point for T&E reimbursable workforce requirements. Review SOCs for MAJCOM, Special Program Office and/or higher echelon directed workload. Forwards inputs to TW Manpower, Financial Management, and Civilian Employment Cost Management Committee for TW review, validation, coordination, and approval. Monitor overhires and notify units of pending expiration and coordinates revalidation of SOC requirements and funding availability as required. Advises management of available options and coordinates with AFPC to ensure RPA action submitted to extend and/or convert appointment.

5.4.4. Serve as the focal point within the MXG for management of facilities. **(T-2)**.

5.4.4.1. Ensure fire detection and foam suppression training is included in unit facility manager/ occupant training briefings. **(T-2)**.

5.4.4.2. **(Added-AFMC)** MXOL – Logistics Site Support.

5.4.4.2.1. **(Added-AFMC)** Serve as MXG/CC facility advisor for management of T&E facility support to include renovations and major facility modifications IAW AFI 32-1001.

5.4.4.2.1.1. **(Added-AFMC)** Assign Site Support Specialist as necessary to support these functions.

5.4.4.2.1.1.1. **(Added-AFMC)** Manage planned addition, revision, or alteration to any facilities specialized utility system - such systems are facility access control security systems, complex mission critical computer room cooling systems non-real property installed equipment (NRPIE), specialized aircraft electrical systems NRPIE, specialized aircraft specific cooling and activation systems i.e. polyalphaolefin (PAO), avionics, and hydraulics unique NRPIE test support systems.

5.4.4.2.1.1.2. **(Added-AFMC)** Develop and coordinate commercial contracts IAW AFI 64-102.

5.4.4.2.1.1.3. **(Added-AFMC)** Focal point for functional, technical, and Contract Officer Representative matters pertaining to performance-based activities IAW DoDI 5000.72.

5.4.4.2.1.1.4. **(Added-AFMC)** Prepare project statements of work, manage contract budget, and service contracts - such as custodial, trash removal, shop towel, coverall, and industrial gases., cable TV, NRPIE camera systems, elevator services, and NRPIE maintenance and any facility-related awarded unfunded requirements IAW AFI 64-102.

5.4.4.2.1.1.5. **(Added-AFMC)** Develop and manage program specific Letters of Technical Direction (LOTD) in support of mission critical NRPIE such as access control, computer room air conditioning, and aircraft unique hangar aircraft support equipment.

5.4.4.2.1.1.6. **(Added-AFMC)** Manage preparation of real-time program requirement Rough-Order-Magnitude (ROM) cost estimates and initial government estimates (IGE) for modification or renovation of logistics and T&E facilities for support of current and future test requirements IAW UFC 3-740-05.

5.4.4.2.1.1.7. **(Added-AFMC)** Responsible for the installation, inspection, and maintenance of aircraft Sun Shades IAW **Chapter 15**, Aircraft Sun Shade Sustainment.

5.4.4.2.1.1.8. **(Added-AFMC)** Perform building inspection, maintenance, and repair on real property (RP), and NRPIE (AED, fire, safety, security, etc.).

5.4.4.2.1.1.9. **(Added-AFMC)** Develop and prioritize maintenance facility work orders.

5.4.4.2.1.1.10. **(Added-AFMC)** Ensure identified deficiencies and corrective actions are completed. Activities include but are not limited to repair, modification, and facility maintenance.

5.4.4.2.1.1.11. **(Added-AFMC)** Develop MXG Emergency Management and Continuity of Operations Plan and coordinate training and exercise requirements across the MXG.

5.4.4.2.1.1.12. **(Added-AFMC)** Perform facility drills to include fire drills and man down exercises.

5.4.4.3. **(Added-AFMC)** Act as the facility resource planning advisor to the MXG/CC IAW AFI 32-7062.

5.4.4.3.1. **(Added-AFMC)** Develop and manage 10-year facility plan specifying maintenance, upgrade, and replacement projections for T&E logistics facilities, and coordinate plan with Civil Engineer (CE).

5.4.4.3.2. **(Added-AFMC)** Develop TW long range requirements for base site plan.

5.4.4.3.3. **(Added-AFMC)** Provide plan updates; review, and coordinate with CE annually.

5.4.4.3.4. **(Added-AFMC)** Develop and conduct comprehensive plans and studies to prevent and correct problems and ensure TW capacity for current and future test programs.

5.4.4.3.5. **(Added-AFMC)** Manage preparation of long term and potential program requirement Rough-Order-Magnitude (ROM) cost estimates and IGE for modification or renovation of logistics and T&E facilities for support of current and future test requirements IAW UFC 3-740-05.

5.4.4.3.6. **(Added-AFMC)** Develop and manage space planning and allocation database for test program support.

5.4.4.3.7. **(Added-AFMC)** Focal point for Military Construction Projects to support TW activities.

5.4.4.3.8. **(Added-AFMC)** Process T&E program resource allocation requests through TW functional areas.

5.4.4.3.9. **(Added-AFMC)** Provide management input to the facility board working group to ensure proper prioritization of logistics resource allocation.

5.4.4.3.10. **(Added-AFMC)** Develop and manage TW logistics facility integrated project list with CE.

5.4.4.3.11. **(Added-AFMC)** Manage MXG energy conservation plan.

5.4.4.4. **(Added-AFMC)** Partner with appropriate agencies to procure services and resources for maintenance, repairs, and modifications of facilities supporting logistics and T&E programs.

5.4.4.4.1. **(Added-AFMC)** Schedule and chair facility construction and upgrade project meetings for T&E programs.

5.4.4.4.2. **(Added-AFMC)** Develop and manage facility design and prepare cost estimates for T&E programs.

5.4.4.4.3. **(Added-AFMC)** Maintain the TW T&E programs space activity database.

5.4.4.4.4. **(Added-AFMC)** Manage project meetings for new construction and modification of existing facilities per program requirements.

5.4.4.4.5. **(Added-AFMC)** Plan, program, budget, and monitor projects IAW the Planning Programming Budgeting and Execution process for MAJCOM T&E resources.

5.4.4.4.6. **(Added-AFMC)** Plan T&E resource investment and modernization efforts for test program support.

5.4.4.5. **(Added-AFMC)** Assist with coordination of site surveys for deployment locations and maintain copies of the Expeditionary Site Plan Part I for deployment locations IAW AFI 10-404, Base Support and Expeditionary Site Planning.

5.4.4.5.1. **(Added-AFMC)** Focal point for MXG and Operations Group (OG) Combined Test Force (CTF) site planning.

5.4.4.5.2. **(Added-AFMC)** Provide Test Program Support IAW AFI 99-103 and AFI 99-103 AFMC Sup.

5.4.4.5.3. **(Added-AFMC)** Review program introduction and test concept documents for test program needs and provide program support.

5.4.4.5.4. **(Added-AFMC)** Prepare Cost and Resource Estimates. Assess MXG capacity and capability to support including identification of constraints and concerns.

5.4.4.5.5. **(Added-AFMC)** Focal point for MXG final SOC inputs for test program support.

5.4.4.5.6. **(Added-AFMC)** Manage infrastructure for T&E facilities and resources for system life cycle activities.

5.4.5. Serve as the Environmental Coordinator focal point within the MXG. **(T-1)**.

5.4.6. Serve as the focal point for MXG deployment planning and execution actions. **(T-1)**. If designated as a UTC pilot unit IAW AFI 10-401, *Air Force Operations Planning and Execution*, P&R will:

5.4.6.1. Coordinate with other UTC tasked units on cargo and equipment authorizations/requirements to develop and maintain a standardized package to meet specific mission capability requirements. **(T-1)**.

5.4.6.2. Coordinate with the unit equipment custodian(s) to review equipment changes and new equipment requirements driven by changes to UTCs and/or Allowance Standards (AS). **(T-1)**.

5.4.6.3. Assist with coordination of site surveys for deployment locations and maintain copies of the Expeditionary Site Plan (ESP) **Part I** for deployment locations IAW AFI 10-404, *Base Support and Expeditionary (BAS&E) Site Planning*. **(T-1)**.

5.4.6.4. Coordinate with QA biennially to verify aircraft MDS Hot Pit refueling capabilities are current and accurate in Base Support and Expeditionary and ensure applicable ESP/BSP **Parts I** and **II** accurately reflect unit capabilities IAW AFI 10-404, if applicable. **(T-1)**.

5.4.7. Oversee local, functional or host country unique support agreements applicable to the MXG IAW AFI 25-201, *Intra-Service, Intra-Agency, and Inter-Agency Support Agreements Procedures*. **(T-2)**.

5.4.8. Develop and coordinate MXG commercial contracts as directed by the MXG/CC. **(T-1)**.

5.4.9. Manage readiness reporting for the MXG IAW AFI 10-201. **(T-1)**.

5.4.10. Coordinate with LRS Deployment & Distribution Flight to obtain unit assistance in interpreting guidance for marking, packing and marshaling of tasked equipment IAW AFMAN 24-204, *Preparing Hazardous Materials for Military Air Shipments*; AFI 10-401 and AFMAN 91-201. **(T-1)**.

Chapter 6

QUALITY ASSURANCE (QA)

6.1. General. Maintenance quality and equipment reliability is the responsibility of all maintenance personnel. The combined efforts of QA personnel, maintenance leaders, and technicians are necessary to ensure high quality maintenance production and equipment reliability. The QA staff evaluates the quality of maintenance accomplished and performs necessary functions to manage the MSEP. Personnel assigned to QA are not an extension of the work force and shall not be tasked to perform sortie production inspections (such as, clear "Red X" symbols and perform IPIs). **(T-1)**. QA serves as the primary technical advisory agency in the maintenance organization, assisting maintenance supervision at all levels to identify, validate and/or resolve quality, proficiency and/or compliance issues impacting mission generation. The evaluation and analysis of deficiencies and problem areas identified are key functions of QA that highlight and reveal underlying causes of poor quality in the maintenance production effort. Aircraft and equipment condition and personnel proficiency are validated through the MSEP and shall be recorded using the Logistics Evaluation Assurance Program (LEAP) QA database. **(T-1)**. Civil service and contracted personnel are to follow requirements established in their respective civilian position description/contract and accepted quality assessment system.

6.2. Responsibilities. QA is responsible to the MXG/CC or equivalent to perform as the primary technical advisory agency for maintenance actions and to assist work center supervisors in reviewing tasks involved in supporting the maintenance effort. MXG QA Inspectors have the authority to observe, correct and document applicable maintenance activities performed within the MXG. QA will:

6.2.1. Implement and administer the MSEP and other programs as applicable to include:

6.2.1.1. Product Improvement Program (PIP). **(T-1)**.

6.2.1.1.1. DR. **(T-1)**.

6.2.1.1.2. Product improvement inputs. **(T-1)**.

6.2.1.2. Aircraft and equipment impoundment procedures IAW **Chapter 7** **(T-1)**.

6.2.1.3. Functional Check Flight (FCF) program IAW this **Chapter**. **(T-1)**.

6.2.1.4. W&B Program IAW this **Chapter**. **(T-1)**.

6.2.1.5. Hot Refuel/Defuel and Aircraft-to-Aircraft Refuel Programs if applicable. **(T-1)**.

6.2.2. Review and analyze aircraft aborts, IFEs, and incidents involving damage to equipment or injury of personnel to determine if trend analysis, cross-tell or MSEP focus is warranted. **(T-1)**.

6.2.3. Comply with the configuration management program requirements IAW **Chapter 14** **(T-1)**.

6.2.4. In coordination with PS&D, comply with TCTO Program requirements IAW **Chapter 14**, TO 00-5-1 and TO 00-5-15. **(T-1)**.

6.2.5. In conjunction with PS&D, develop a local Job Standard (JST) for both gaining and losing aircraft and equipment transfer inspection IAW **Chapter 14** **(T-1)**. **Note:** For the

purpose of this instruction JST is an alpha code identifying the type job represented in a job standard (defined in IMDS User's Manual AFSM 21-566, Volume 2).

6.2.6. Coordinate with PS&D on all AFTO Form 103s. **(T-1)**.

6.2.7. Manage OTIs. **(T-1)**.

6.2.8. Augment evaluations at the request of the WS. **(T-1)**. Flightline weapons loading inspections/evaluations are the responsibility of WS evaluators.

6.2.9. Evaluate unit maintenance management procedures, including locally developed forms, publications, OIs, checklists, for accuracy, intent, and necessity as referenced in this AFI. **(T-1)**.

6.2.10. Continuously evaluate cyber hygiene and discipline practices and cyber incident reporting per applicable TO, wing directive, and this instruction for compliance or deficiencies. **(T-1)**.

6.2.10.1. Report weapons system and support equipment cyber related deficiencies to the applicable Program Manager in accordance with T.O. 00-35D-54. **(T-1)**.

6.2.10.1.1. Elevate resolution of deficient cyber-requirements or issue via an AF Form 1067, Modification Proposal in accordance with AFI 63-101/20-101, and/or maintenance assistance request (such as, Technical Assistance Request) in accordance with TO 00-25-107 *Maintenance Assistance*. **(T-1)**.

6.3. QA Superintendent (QA SUPT) Responsibilities. In addition to the applicable Flight CC/SUPT duties in **Chapter 2** the QA SUPT will:

6.3.1. Develop and maintain a master training plan to train all QA Inspectors, and include augmentees, if applicable. **(T-1)**. **Note:** See **Paragraph 5.2.1.13** for minimum MAJCOM training requirements for inspectors inspecting MXO function.

6.3.2. Develop and monitor the MSEP using the LEAP QA database and provide supervisors access to MSEP data. **(T-1)**.

6.3.3. Notify the appropriate agencies when deficiencies are found in (AF, MAJCOM/Lead Command, WG, Group (GP)) instructions. **(T-1)**.

6.3.4. Review maintenance-related instructions, supplements, operating instructions, forms and local/functional and emergency action checklists every two years or when source data changes for accuracy, intent, and necessity. **(T-1)**.

6.3.4. **(AFMC)** Units will develop a local tracker to ensure publications are reviewed for currency and accuracy every two years per HAF direction. Units are also required to maintain currency/review procedures for publications outlined in DAFI 33-360. **(T-2).**

6.3.4.1. The QA SUPT will document the review once complete. **(T-1)**.

6.3.5. Review JSTs annually or when source data changes for accuracy, intent and necessity. **(T-1)**.

6.3.5.1. The QA SUPT will document the review once complete. **(T-1)**.

6.3.6. Ensure management and special inspections are performed (when required). **(T-1)**.

6.3.7. Ensure the GP portion of the FOD Prevention Program is conducted IAW **Chapter 11** **(T-1)**.

6.3.8. Oversee and implement the GP Impoundment Procedures IAW **Chapter 7** **(T-1)**.

6.3.9. Coordinate on all requests for locally manufactured, developed, and modified tools and equipment, and maintain records for approved requests. **(T-1)**.

6.3.9.1. This includes pictures or drawings and a description of the use for each item.

6.3.9.1.1. If applicable technical data contains the option for use of these tools and equipment, QA does not need to coordinate or maintain the records on these items.

6.3.9.1.2. Locally manufactured, developed or modified equipment for weapons loading, maintenance and the armament systems flight must be coordinated through the WWM before routing to QA. **(T-1)**.

6.3.10. Verify IPI requirements from MAJCOM and sources outlined in TO 00-20-1 and publish combined MXG IPI listing every 2 years as a minimum or when source data changes. **(T-1)**.

6.3.11. Develop KTL/RIL to supplement MAJCOM listings in conjunction with the Operations Officer/MX SUPT (if required). **(T-1)**.

6.3.11.1. Provide copies of approved KTL/RIL to all affected organizations. **(T-1)**.

6.3.12. Ensure Acceptable Quality Level (AQL) Standards are developed for all tasks including key tasks and routine inspections not included on the MAJCOM AQL. **(T-1)**.

6.3.13. Ensure agendas and presentations are compiled for the MSEP summary. **(T-1)**.

6.3.14. Review wing requests for assistance IAW **Chapter 1** and **Chapter 14** **(T-1)**.

6.3.15. Designate a Chief Inspector. **(T-1)**.

6.3.16. Designate individuals to be the Technical Order Distribution Office (TODO) and Product Improvement Manager (PIM). **(T-1)**.

6.3.17. Designate individuals to be the W&B and FCF Program managers. **(T-1)**.

6.3.18. Monitor the ASIP IAW **Chapter 11** **(T-1)**.

6.3.19. Maintain DOP program oversight IAW **Chapter 11** **(T-1)**.

6.3.20. When hot refueling is performed by maintenance personnel, ensure Hot Refueling Program is accomplished IAW TO 00-25-172 and this AFI. **(T-1)**.

6.3.21. Ensure non-resident organizations hot refueling aircraft at an AF certified hot pit coordinate site/personnel certification, utilization and documentation requirements with the supporting QA and Airfield Management/Operations. **(T-1)**.

6.3.21.1. Using units are responsible for maintaining currency/reporting requirements. **(T-1)**.

6.3.22. Ensure designated Responders/facilitators respond to DoD IT incidents that lack the capability to perform a mission function. **(T-1)**.

6.3.22.1. Consolidate and report incidents in coordination with the WAM or designated official. **(T-1)**. Example: ETIMS containing software for a TO task that does not have a hardware TO approving its installation or use.

6.3.23. **(Added-AFMC)** As the selecting/hiring official for QA inspectors, ensure the individual is a qualified subject matter expert (SME) in the functional area (i.e., avionics, AGE, aircraft maintenance, fabrication, munitions, etc.) and meets position requirements. **(T-2).**

6.4. Chief Inspector Responsibilities. The Chief Inspector is responsible to the QA SUPT for ensuring functions listed below are performed and is responsible for applicable Section NCOIC/Chief duties in **Chapter 2**. The Chief Inspector will:

6.4.1. Use assigned inspectors/augmentees to provide on-the-spot assistance to correct problems. **(T-1)**.

6.4.2. Spot-check TOs, inspection work cards, checklists, job guides and WUC manuals during evaluations and inspections for currency and serviceability. **(T-1)**.

6.4.3. Assist MMA with investigations and studies. **(T-1)**.

6.4.4. Review QA LEAP MSEP inspection summary inputs for accuracy and content. **(T-1)**.

6.4.5. Initiate actions when additional attention is required to resolve adverse maintenance trends or training problems. **(T-1)**.

6.4.5.1. Actions include preparing cross-tell information bulletins and messages for MXG/CC release to other similarly-equipped units and higher headquarters.

6.4.6. Review and compile inputs for updating the IPI listing. **(T-1)**.

6.4.6.1. Maintain a copy of the MXG/CC or equivalent approved IPI listing with the signature and date of review and certification. **(T-1)**.

6.4.7. Review Category II major discrepancies for trends quarterly. **(T-1)**.

6.4.7.1. If frequency or severity of identified discrepancies warrant inclusion of that item into a specific TO governing an action or inspection, the QA Chief Inspector must submit an RC or develop a local work card, local page supplement or checklist IAW TO 00-5-1. **(T-1)**.

6.4.8. Establish procedures for QA Inspectors to document completed inspections. **(T-1)**.

6.4.9. Perform inspections on GITA IAW **Chapter 11** **(T-1)**.

6.4.10. Construct and maintain a master standardized AFTO Form 781-series forms binder IAW TO 00-20-1. **(T-1)**.

6.4.11. Develop an aircrew briefing checklist specifically for high-speed taxi checks (see **Paragraph 6.14**). **(T-1)**.

6.4.12. Review MSEP data monthly to identify high-missed carded items from Personnel Evaluations and Quality Verification Inspections (QVI). **(T-1)**. A high-missed carded item is defined as any work card item missed at least three times during a one-month period.

6.4.12.1. Coordinate with MMA to identify any relationships with repeat, recur and CND trends. **(T-1)**.

6.4.12.2. Include this data in the monthly MSEP summary. **(T-1)**.

6.4.13. Conduct Evaluator Proficiency Evaluations on each inspector. **(T-1)**.

6.4.13.1. Evaluators Proficiency Evaluation (EPEs) will be conducted while the Chief Inspector assesses one Personnel Evaluation (PE) and one technical inspection (QVI/Special Inspection (SI)). **(T-1)**.

6.4.13.2. Each QA Inspector, permanent or augmentee, must pass both EPEs prior to performing unsupervised evaluations and inspections. **(T-1)**.

6.4.14. Document QA Inspector training in the Training Business Area (TBA). **(T-1)**.

6.5. Quality Assurance Inspector Responsibilities. QA Inspectors will:

6.5.1. Evaluate flightline and back shop maintenance tasks/inspections and MXO functions to include items identified by the KTL/RIL. **(T-1)**.

6.5.2. Enter inspection and evaluation reports into the LEAP QA database. **(T-1)**.

6.5.3. Perform QA review of Dull Swords, TCTOs, OTIs, modification proposals, DRs, RCs, instructions and supplements. **(T-1)**.

6.5.4. Provide training/instruction as applicable to address deficiencies identified during evaluations/inspections. **(T-1)**.

6.5.5. Evaluate forms and MIS documentation to evaluate compliance IAW MXG written procedures described in **Chapter 2** **(T-1)**.

6.5.6. Evaluate maintenance TO files that are kept on the aircraft (G files). **(T-1)**.

6.6. Quality Assurance Inspector Training. As a minimum, the local QA Inspector Training Plan will include the applicable items listed below to ensure QA program standardization. **(T-1)**.

6.6.1. Training must cover inspection and evaluation techniques, documenting inspection worksheets and actions to prevent injury to personnel or property/equipment damage. **(T-1)**.

6.6.1.1. **(Added-AFMC)** Training must cover the evaluation and inspections of functional area(s) (e.g., Avionics, AGE, PMEL, Munitions, etc.) or programs (e.g., weight and balance, FCF) and be documented in the individuals applicable training records. **(T-2).**

6.6.2. All EPEs must be tracked in the MIS and/or the LEAP QA database. **(T-1)**. **Note:** Additional requirements for Nuclear Weapons Certifying Officials are located in AFI 21-204.

6.6.3. QA Inspectors inspecting outside of their AFSC will be task qualified on a Work Center Job Qualification Standard (WJQS) in TBA for the KTL requirements they evaluate. **(T-1)**.

6.6.3.1. Chief Inspectors will identify other critical tasks requiring AF Form 797 qualification (QA WJQS) within TBA as required. **(T-1)**.

6.6.3.2. For all other tasks, QA Inspectors must be familiar with the requirements/procedures of tasks they evaluate. **(T-1)**.

6.6.3.2.1. Cross Utilization Training for QA Inspector is not allowed for 2W1/2W0 maintenance tasks. Only 2W1/2W0 personnel will perform these inspections. **(T-1)**.

6.6.3.2.1.1. QA inspectors evaluating Scheduling and Analysis functions must be

trained and qualified. **(T-1)**. **Note:** See **Paragraph 5.2.1.13** for additional requirements.

6.6.4. All QA Inspectors will complete egress certification IAW **Chapter 4** before evaluating egress tasks (if applicable). **(T-1)**.

6.6.5. QA Inspectors may evaluate welding operations and processes. However, QA Inspectors will not evaluate completed welds unless certified IAW TO 00-25-252. **(T-1)**.

6.6.6. MAJCOMs will determine if QA personnel who conduct engine run evaluations are required to maintain the engine run proficiency requirements outlined in **Chapter 11** and document requirements in their supplement to this AFI. **(T-2)**.

6.6.6. **(AFMC)** QA personnel who conduct engine run evaluations are not required to maintain the engine run proficiency requirements outlined in **Chapter 11** **(T-2)**

6.6.7. Inspectors evaluating Low Observables (LO) maintenance must complete applicable LO TD courses and be certified in core training tasks contained in **Attachment 3** of the 2A7X5 CFETP. **(T-1)**.

6.6.8. QA Inspectors must be trained on all associated safety requirements prior to performing inspections on fuel systems or fuel systems repair facilities IAW TO 1-1-3. **(T-1)**.

6.6.9. QA Inspectors evaluating NDI technicians during PEs must be a trained and qualified 2A7X2 (or civilian equivalent) on the method being evaluated. **(T-1)**.

6.6.10. PMEL quality assurance program requirements are defined in AFMAN 21-113 and TO 00-20-14.

6.6.10.1. PEs, QVIs and EPEs will only be performed by PMEL trained and qualified 2P0X1 personnel or equivalent. **(T-1)**.

6.6.10.2. MSEP related inspection (PEs and QVIs) may be performed on other logistics/maintenance actions within the PMEL to include, but not limited to, production control, maintenance supply actions, and QA functions not associated with calibration/certification tasks.

6.7. Maintenance Standardization and Evaluation Program (MSEP). The purpose of the MSEP is to provide units with a method of evaluating technical compliance and measure how well they comply with established standards.

6.7.1. Units will develop a MSEP and conduct local inspections to ensure their programs, processes, maintenance technician proficiency, equipment condition and other focus areas are in compliance with AF, MAJCOM and local directives. **(T-1)**. The unit level MSEP is not applicable to contract maintenance activities unless required by the contract SOW or PWS.

6.7.1.1. The MSEP will be developed in conjunction with inputs from assigned squadron Operations Officers/Superintendents and Group Leadership and will be executed by QA. **(T-1)**.

6.7.1.2. The MXG/CC will focus the unit program on problem areas where improvements are needed. **(T-1)**.

6.7.1.3. The following types of evaluations, inspections and observations support the MSEP: PEs, QVIs, SIs, Management Inspection (MI)s, Detected Safety Violation (DSV)s,

Technical Data Violation (TDV)s, Unsatisfactory Condition Report (UCR)s, and when directed, other inspections.

6.7.1.3.1. These inspection terms may differ in the LEAP QA database however, MAJCOMs must provide non-standard terms and definitions in their supplement to this AFI when used.

6.7.1.3.2. Develop the monthly MSEP on the minimum personnel evaluations, inspections or observation requirements as depicted in Air Force Manpower Standard 21QX Quality Assurance **Attachment 3**, Application Tool, located on the Air Force Manpower Analysis Agency SharePoint site: **https://cs2.eis.af.mil/sites/11190/AFMDandAFMS/AFMS/Forms/FAC1stFAC2nd.aspx**.

6.7.2. Unit MSEP Focus Areas. QA shall assess how units are meeting compliance goals and will identify areas of opportunity for improvement. **(T-1)**. A unit's MSEP will focus on:

6.7.2.1. Compliance with and currency of TOs and directives. **(T-1)**.

6.7.2.1.1. Ensure personnel at all levels are responsible and accountable for enforcing mandatory standards and ensuring all applicable TOs and directives are complete, current and used.

6.7.2.2. Aircraft, systems and equipment forms documentation. **(T-1)**.

6.7.2.2.1. Ensure forms used to document any maintenance related action for aircraft, systems or equipment are documented IAW 00-20 series TOs, specific equipment TO requirements, and other applicable directives and supplements. **(T-1)**.

6.7.2.2.2. MSEP will validate compliance with the MXG's or equivalents' written procedures to ensure aircraft/system forms, equipment forms and MIS documentation are complete, accurate, and accomplished for each shift as referenced in **Paragraph 2.4.53** **(T-1)**.

6.7.2.3. Aircraft, Systems and Equipment Inspections. **(T-1)**.

6.7.2.3.1. Ensure aircraft and equipment, including munitions, are inspected IAW TOs and directives. **(T-1)**.

6.7.2.4. Compliance and Management of Occupational Safety and Health, Environmental, Bioenvironmental, Housekeeping, and FOD Programs. **(T-1)**.

6.7.2.4.1. Personnel at all levels are responsible for minimizing risk to equipment, personnel and the environment. **(T-1)**.

6.7.2.5. Training. **(T-1)**.

6.7.2.5.1. Verify training is correctly documented and ensure individuals are qualified/certified to perform evaluated tasks. **(T-1)**.

6.7.2.6. Unit-Directed Programs. **(T-1)**.

6.7.2.6.1. Verify units' programs are in compliance with local directives. **(T-1)**.

6.7.2.7. Key Task List (KTL). **(T-1)**. The KTL is an AF, MAJCOM or unit developed list of required inspections that cover tasks that are complex and tasks affecting safety of flight.

6.7.2.7.1. MAJCOMs will identify minimum KTLs for each MDS.

6.7.2.7.1. **(AFMC)** Units will use Lead Command KTLs for the specific MDS assigned. The Center/Wing/Group may add additional tasks to the KTL. Lead Command KTLs can be found at the following link: AFMC KTL Hyperlink. **(T-2).**

6.7.2.7.2. All maintenance actions/functions listed on the KTL require mandatory call-in to QA each time the maintenance action/function is accomplished. **(T-1)**.

6.7.2.7.2.1. QA evaluators will respond and perform an evaluation. **(T-1)**.

6.7.2.7.2.1.1. The MXG/CC may waive the inspection or designate authorized a representative(s) to waive the inspection.

6.7.2.7.2.1.2. QA will track all KTLs called in, waived or completed and maintain a list of MXG-designated KTL waiver authorities. **(T-1)**.

6.7.2.7.3. QA will review and update the KTL list at least every 2 years to ensure it encompasses those maintenance actions/functions directly affecting quality of maintenance. **(T-1)**.

6.7.2.8. Routine Inspection List (RIL). **(T-1)**. The RIL is an AF, MAJCOM, or unit developed list of routine inspections that must be performed. Frequency is determined by the MXG/CC or equivalent if not mandated by the MAJCOM. **(T-1)**.

6.7.2.8.1. QA shall consolidate Operations Officer/MX SUPT inputs and suggested changes to the RIL and obtain MXG/CC approval. **(T-1)**.

6.7.2.8.2. Additional RIL requirements, for nuclear capable units, are located in AFMAN 21-200.

6.7.2.8.3. Tasks will not be removed from the RIL without issuing authorities' approval (such as, AF, MAJCOM, MXG/CC). **(T-1)**.

6.7.2.8.4. The RIL must contain the following if applicable to the unit:

6.7.2.8.4.1. Pre-flight. **(T-1)**.

6.7.2.8.4.2. Thru-flight. **(T-1)**.

6.7.2.8.4.3. Basic post-flight. **(T-1)**.

6.7.2.8.4.4. HSC/HPO inspections. **(T-1)**.

6.7.2.8.4.5. Aircraft forms/MIS documentation. **(T-1)**.

6.7.2.8.4.6. Equipment forms/MIS documentation. **(T-1)**.

6.7.2.8.4.7. Aircraft and munitions flightline accountability/accountable property system of record (APSR). **(T-1)**.

6.7.2.8.4.8. Aircraft ground handling. **(T-1)**.

6.7.2.8.4.9. Launch and recovery. **(T-1)**.

6.7.2.8.4.10. Servicing tasks. **(T-1)**.

6.7.2.8.4.11. Technical data. **(T-1)**.

6.7.2.8.4.12. CTK Program. **(T-1)**.

6.7.2.8.4.13. TMDE calibrations when the performing work center is not a PMEL IAW TO 00-20-14. **(T-1)**.

6.7.2.8.4.14. AGE maintenance. **(T-1)**.

6.7.2.8.4.15. AGE flightline use. **(T-1)**.

6.7.2.8.4.16. Housekeeping. **(T-1)**.

6.7.2.8.4.17. Vehicles. **(T-1)**.

6.7.2.8.4.18. Aircraft washes/aircraft corrosion inspections. **(T-1)**.

6.7.2.8.4.19. Supply discipline (example, TNB, DIFM management & coding). **(T-1)**.

6.7.2.8.4.20. Equipment washes/ equipment corrosion inspections. **(T-1)**.

6.7.2.8.4.21. Environmental compliance. **(T-1)**.

6.7.2.8.4.22. NWRM accountability and forms documentation. **(T-1)**.

6.7.2.8.4.23. TCTO Program. **(T-1)**.

6.7.2.8.4.24. Time-Change Program. **(T-1)**.

6.7.2.8.4.25. FHP management. **(T-1)**.

6.7.2.8.4.26. Maintenance Cyber Discipline. **(T-1)**.

6.7.2.8.4.26.1. Upload and download of software and data. **(T-1)**.

6.7.2.8.4.26.2. Malicious code detection and reporting. **(T-1)**.

6.7.2.8.4.27. **(Added-AFMC)** MAJCOM recommended QA routine inspections. Refer to the following link and review the current Lead Command RILs for additional focus recommendations to tailor unit E&I plan as needed**:** **https://cs2.eis.af.mil/sites/22196/Maintenance/Forms/AllItems.aspx?RootFolder=%2Fsites%2F22196%2FMaintenance%2FCombat%20Test%20Wings%20%2896%20MXG%5F412%20MXG%29&FolderCTID=0x012000E36775CB69E86948B13D7299825F11FF&View=%7BD42D7329%2DFBE8%2D4105%2DBC05%2DF7FC47ED1A45%7D**.

6.7.2.9. QA will coordinate with the Munitions Activity (Munitions Flight CC/SUPT; or Operations Officer/MX SUPT in the MUNS) and will develop quarterly standards (such as, number of inspections and frequency) for the following areas:

6.7.2.9.1. Munitions accountability. **(T-1)**.

6.7.2.9.2. Munitions storage practices, security and safety. **(T-1)**.

6.7.2.9.3. Munitions inspections. **(T-1)**.

6.7.2.9.4. Munitions materiel handling and test equipment. **(T-1)**.

6.7.2.9.5. Munitions stockpile management. **(T-1)**.

6.7.2.9.6. Tactical missile reporting system. **(T-1)**.

6.7.2.9.7. Munitions infrastructure (such as, adequacy of lightning protection and grounding systems, bonding of facility doors, adequate power conversion equipment). **(T-1)**.

6.7.2.9.8. Munitions training programs. **(T-1)**.

6.7.2.9.9. Maintenance Cyber Discipline. **(T-1)**.

6.7.3. Unit MSEP Evaluation and Inspection (E&I) Plan. QA will develop an E&I Plan specifying numbers of approved areas and types (PE, QVI, SI, MI) of inspections and evaluations to complete during the month. Types of inspections must be separated and shall not be combined (such as, PE/QVI). **(T-1)**.

6.7.3.1. The E&I Plan, and changes to it, will be coordinated through each squadron Operations Officer/MX SUPT and approved by the MXG/CC. **(T-1)**.

6.7.3.2. The E&I Plan will be reviewed and updated monthly based on trends in the maintenance complex and will be adjusted to meet the MXG/CC's focus areas. **(T-2)**.

6.7.3.3. When developing the E&I Plan, the QA SUPT will:

6.7.3.3.1. Address areas of concern identified by maintenance managers and the WWM. **(T-1)**.

6.7.3.3.1.1. **(Added-AFMC)** Consider historical PEs, QVIs, and other inspections data (especially any items having a pass rate of less than 80 percent); not mission capable (NMC) causes; aborts and trends; in-flight emergencies (IFE) and trends; high component or system failure rates; repeat/recurring/CND discrepancies trends; Deficiency Report (DR)/ Service Report (SR) trends; suspected training deficiencies; technical data violations (TDVs), detected safety violations (DSVs), and tasks outlined in aircraft -6 TOs.

6.7.3.3.2. Tailor the plan for each squadron, flight and section. **(T-1)**.

6.7.3.3.2.1. **(Added-AFMC)** Identify the assessment type (i.e., task, specific item, procedure or process) and minimum number (determined by a documented methodology (e.g., ANSI- Z1.4) or rationale used in the program administration section of the E&I Plan) of Personnel Evaluations (PE), Quality Verification Inspections (QVI), and Routine Inspection List (RIL) and assessment areas to be conducted monthly. **(T-2).**

6.7.3.3.3. Coordinate and distribute the E&I Plan. **(T-1)**.

6.7.4. Evaluation Criteria.

6.7.4.1. Acceptable Quality Levels (AQL). AQLs denotes the maximum allowable number of minor findings that a process or product may be charged for the task to be rated "Pass" and are used to minimize subjectivity in assessing tasks identified by the MSEP.

6.7.4.1.1. MAJCOMs may develop standardized AQLs by weapon system and establish procedures to review at least annually.

6.7.4.1.2. MXG/CCs will establish AQLs for tasks/inspections not included on the MAJCOM AQL listing. **(T-2)**.

6.7.4.1.2.1. AQLs need to be derived/revised from QA performance-based data.

6.7.4.1.3. AQLs/baselines for nuclear maintenance, cruise missile maintenance and nuclear weapons handling tasks are defined in AFMAN 21-200.

6.7.4.2. Discrepancy Categories.

6.7.4.2.1. Category I (CAT I). A required inspection/TO/AFI procedural item missed or improperly completed. This category is a specific AFI requirement, work card item or TO step, warning, caution, or note for a specific condition or action. Use sub-classifications of major or minor to indicate the discrepancy's relative severity.

6.7.4.2.2. Category II (CAT II). An obvious defect, which could have been readily detected by a technician or supervisor, but is not a specific AFI requirement, work card item or TO step, warning, caution, or note for that specific evaluated task. Use sub-classification of major or minor to indicate the discrepancy's relative severity.

6.7.4.3. Findings.

6.7.4.3.1. A major finding is defined as a condition that may endanger personnel, jeopardize equipment or system reliability, impact safety of flight or warrant discontinuing the process or equipment operation.

6.7.4.3.2. Any major discrepancy will result in an automatic inspection failure. **(T-1)**.

6.7.4.3.3. The QA Inspector will intercede and declare a major finding when one additional action will result in one of the following; endanger personnel, jeopardize equipment or system reliability, impact safety of flight or warrant discontinuing the process or equipment operation. **(T-1)**.

6.7.4.3.3.1. The QA Inspector will write up the major finding even though the jeopardizing action was never taken due to their intercession. **(T-1)**.

6.7.4.4. A minor finding is defined as an unsatisfactory condition that requires repair or correction, but does not endanger personnel, impact safety of flight, jeopardize equipment reliability or warrant discontinuing a process or equipment operation.

6.7.4.4.1. CAT II minors shall be documented for trends, but must not be counted against the AQL. **(T-1)**.

6.7.4.4.2. Soft FO contained in tool kits or found in cargo areas of aircraft which pose no FOD threat are classified as a minor finding since it will require more than one additional action to meet the definition of a major finding.

6.7.5. Observations. This category represents observed events or conditions with safety implications or technical violations not related to an evaluation or inspection, are considered unsafe, in violation of established procedures, or in the case of equipment, unfit for operations. Observations include: DSVs, TDVs and UCRs. The LEAP QA database is used to document any of the following conditions:

6.7.5.1. DSV. An observed unsafe act by an individual.

6.7.5.1.1. The QA Inspector must stop the unsafe act immediately. **(T-1)**.

6.7.5.1.2. The QA Inspector will not document a separate DSV on an individual undergoing a PE since the unsafe act automatically results in a "Fail" rating on the PE. **(T-1)**.

6.7.5.1.2.1. The QA Inspector will use DSV verbiage in the PE summary when a safety violation is committed during a PE. **(T-1)**.

6.7.5.2. TDV. An observation of any person performing maintenance without the proper technical data available, available but not in use or not following the correct sequence of steps (if directed).

6.7.5.2.1. The technician must have knowledge of all general directives associated with the job prior to performing the task. **(T-1)**. However, those general directives need not be present at the job site.

6.7.5.2.2. Do not document a separate TDV on an individual undergoing a PE, but use TDV verbiage in the PE summary since failure to use technical data automatically results in a "Fail" rating.

6.7.5.3. UCR. An unsafe or unsatisfactory condition, other than a DSV, chargeable to the work center supervisor.

6.7.5.3.1. UCRs will be documented even when it is not possible to determine who created the condition. **(T-1)**.

6.7.6. Evaluations. An evaluation represents the direct evaluation of a logistics action, inspection, or training conducted/performed by an individual or team. Evaluations are used to evaluate job proficiency, degree of training, and compliance with technical data or instructions.

6.7.6.1. PE. A PE is an over-the-shoulder (direct) evaluation of a maintenance action, inspection, or internal MXG support process (such as, PS&D, Analysis, MOC). Individuals performing, supervising or evaluating tasks are subject to a PE. PEs may be performed on individuals working alone or as part of a team.

6.7.6.1.1. Rate PEs “Pass or Fail” based on established AQLs/standards. **(T-1)**.

6.7.6.1.2. Document the PE in the LEAP QA database. **(T-1)**.

6.7.6.1.3. PEs will be accomplished on all technicians who perform maintenance. **(T-1)**. MAJCOMs will “established” the frequency. **(T-2)**.

6.7.6.1.3.1. **(Added-AFMC)** Ensure personnel performing maintenance on aircraft/equipment receive a PE every 24 months. For failed PE, conduct a follow-up evaluation on the same task within 30 days (extensions may be given by exception). **(T-2).**

6.7.6.1.4. Personnel in any AFSC certified to perform nuclear maintenance or logistics operations (example, limited general maintenance, transfer, transport) will also comply with applicable PE requirements in AFMAN 21-200. **(T-1)**.

6.7.6.1.5. Types of PEs.

6.7.6.1.5.1. Individual Evaluations. This is a QA over-the-shoulder (direct) evaluation of a technician or supervisor performing a job.

6.7.6.1.5.2. Team Evaluations. This is a QA over-the-shoulder (direct) evaluation of technicians and supervisors performing a team task.

6.7.6.1.5.2.1. A team task is one requiring more than one person to complete the task (for example, refueling, ECM pod up/down loading, bomb build-up, towing, weapons maintenance, pylon installation).

6.7.6.1.5.2.2. Team evaluations must accurately assess the proficiency of each individual under evaluation. **(T-1)**.

6.7.6.1.5.2.3. Refer to AFMAN 21-200 for nuclear weapons maintenance and handling evaluations.

6.7.6.1.6. QA Inspectors will conduct PE's on each NDI technician, for each NDI method annually (every 2 years for the ARC) to ensure effective trending on NDI methods. **(T-1)**.

6.7.6.2. Performing a PE. When performing a PE, the QA Inspector will brief the individual or team on the evaluation and how it will be rated. **(T-1)**.

6.7.6.2.1. The QA inspector will determine what task will be evaluated. **(T-1)**.

6.7.6.2.2. The PE will include an evaluation of: the individual's training records, SCR (if task requires), tools, equipment, TMDE (use/impact of certification label limitation on maintenance being performed), and TOs used to perform the task. **(T-1)**.

6.7.6.2.3. The evaluation starts when the individual or team begins the task, or portion of the task to be evaluated, and is completed when the task or previously determined portion of the task is finished. **(T-1)**.

6.7.6.2.4. Provide feedback to the individual or team and supervision upon completion. **(T-1)**.

6.7.6.3. Rating PEs. QA Inspectors rate each evaluation based on AQLs/standards. The rating applies only to the specific task evaluated and not to other tasks that a technician or supervisor is qualified to perform. Upon completion of a failed evaluation, the QA Inspector must provide on-the-spot feedback. **(T-1)**. Determine ratings as follows:

6.7.6.3.1. Pass: Number of discrepancies does not exceed AQL/standards.

6.7.6.3.2. Fail: An evaluation that results in any of the following:

6.7.6.3.2.1. Number of discrepancies exceeds the established AQL/standards.

6.7.6.3.2.2. A technician fails to detect a major discrepancy while complying with an inspection or TO requirement.

6.7.6.3.2.3. A technician fails to comply with a technical data step that could affect the performance of the equipment involved or cause injury to personnel.

6.7.6.3.2.3.1. QA Inspectors will notify individuals immediately during the PE that a TDV was committed. **(T-1)**.

6.7.6.3.2.3.2. Do not document a separate TDV on an individual undergoing a PE, since failure to use technical data automatically results in a "Fail" rating.

6.7.6.3.2.4. A technician demonstrates a lack of technical proficiency, system

knowledge or demonstrated knowledge commensurate with skill grade.

6.7.6.3.2.5. Training and certification not documented.

6.7.6.3.2.6. A technician commits a safety violation.

6.7.6.3.2.6.1. Use the word "Safety" when a safety violation is committed during a PE.

6.7.6.3.2.6.2. Do not document a separate DSV on an individual undergoing a PE since the unsafe act automatically results in a "Fail" rating on the PE.

6.7.6.3.2.7. A technician fails to document maintenance actions in appropriate equipment records.

6.7.6.3.2.8. For nuclear weapons maintenance, an unsatisfactory rating must be given when any deficiencies or applicable unsatisfactory conditions exist IAW AFMAN 21-200. **(T-1)**.

6.7.7. Inspections: An inspection represents inspections of equipment, programs and processes to ensure compliance with established standards. Inspections are rated as "Pass" or "Fail". Inspections include:

6.7.7.1. QVIs. A QVI is an inspection of equipment condition, or a maintenance process, an assessment following a maintenance inspection, servicing or repair action, or verification that a technician or supervisor properly completed an inspection or repair action.

6.7.7.1.1. QVIs shall not be conducted after equipment operation when such operation could invalidate indications of proper job accomplishment.

6.7.7.1.2. Limit QVIs to the same inspection card deck or technical data required for the job. This inspection does not require disassembling parts, removing stress panels or like actions.

6.7.7.1.3. A QVI required for -6 TO inspections may be accomplished by checking a portion of the required card or area.

6.7.7.1.4. The QVI report should reflect deficiencies by the individual who accomplished the task and identify specific discrepancies.

6.7.7.1.5. Document these discrepancies in active equipment records and forms, for example AFTO Form 781A, AFTO Form 244, *Industrial/Support Equipment Record*.

6.7.7.1.6. Rate QVIs "Pass" or "Fail" by comparing the number of discrepancies with the established AQLs/standards.

6.7.7.1.6.1. Pass: Number of discrepancies does not exceed established AQL/standard.

6.7.7.1.6.2. Fail: An inspection that results in any of the following:

6.7.7.1.6.2.1. A technician fails to detect a major discrepancy while complying with an inspection or TO requirement.

6.7.7.1.6.2.2. Number of CAT I minor discrepancies exceeds the established AQL/standard.

6.7.7.1.6.2.3. A technician is not signed off in training records as task qualified.

6.7.7.1.6.3. Document the QVI in the LEAP QA database.

6.7.7.1.6.3.1. Each QVI is chargeable to the technician or supervisor who signed off/cleared the "corrected by" block or "inspected by" block of the applicable maintenance form or equipment record.

6.7.7.1.6.3.2. When evaluating the technician who signed off the "inspected by" block, evaluate only the items normally verified by signing off the "Red-X".

6.7.7.1.6.3.3. Only one evaluation is scored for each inspection.

6.7.7.2. Management Inspection (MI). Perform these inspections to follow-up on trends, conduct investigations or conduct research to get to the root cause of problems. MXG/CCs, SQ/CCs or work center supervisors may request MIs. MIs may encompass PE/QVI trends and other inspection data, NMC causes, aborts and trends, IFE trends, high component or system failure rates, suspected training deficiencies, and tasks outlined in aircraft -6 TOs. MI results are reported to the requester. MIs can be non-rated and may be counted in QA trends. The LEAP QA database will be used to document MIs. **(T-1)**.

6.7.7.3. Special Inspections (SIs) are inspections not covered by QVIs, PEs or MIs. SIs may include, but are not limited to, aircraft and equipment forms inspections, document file inspections, CTKs, TO files, vehicle inspections, housekeeping, safety practices, FOD Program, SIs may be condition, procedural or compliance oriented.

6.7.7.3.1. The LEAP QA database will be used to document special inspections. **(T-1)**.

6.7.7.3.2. SIs will be rated as "Pass" or "Fail" based on established AQLs/standards.

6.7.8. Discrepancy Reporting. Report all discrepancies to the applicable work centers. **(T-2)**.

6.7.8.1. QA will provide an authoritative, validated source reference for all reported discrepancies (such as, work cards, job guides, WUC manuals, checklists, occupational safety requirements, TOs, and other applicable references). **(T-1)**.

6.7.9. Units will grade their MSEP evaluations using objective ratings based on the following five-tier rating system:

6.7.9.1. Outstanding: 95-100% **(T-1)**.

6.7.9.2. Excellent: 90-94.99% **(T-1)**.

6.7.9.3. Satisfactory: 80-89.99% **(T-1)**.

6.7.9.4. Marginal: 70-79.99% **(T-1)**.

6.7.9.5. Unsatisfactory: 0-69.99% **(T-1)**.

6.7.9.6. Inspections and evaluations performed (such as, PE, SI, QVI) are rated "Pass/Fail". Exception: Unless otherwise directed by AFMAN 21-200 and AFI 21-204 for Nuclear Weapons PEs and Certification Program.

6.7.9.7. Ratings are calculated by dividing the total number of inspections passed by total completed. For example, QA inspects 10 aircraft preflights with the following results: 9

"passes" and 1 "failure". Divide the total "passes" by the total inspections (9/10=0.90) 90 percent for an "Excellent" rating.

6.7.9.7.1. Deduct 0.5 percentage points from overall percentage grade for each TDV, DSV, and UCR. For example, a squadron earns an overall rating of 90 percent, "Excellent", however, QA observed 4 TDVs and 3 DSVs. Multiply the sum (7) by 0.5 and subtract the product (3.5) from the original 90 percent. The adjusted total is 86.5 percent; therefore, the squadron is rated "Satisfactory".

6.7.10. A cumulative MXG score will be determined by dividing the Group's total number of inspections and evaluations passed by the total inspections and evaluations completed. **(T-1)**.

6.7.10.1. Deduct 0.5 percentage points for each TDV, DSV, and UCR from the overall percentage grade, using same formula in **Paragraph 6.7.9.7.1**.

6.7.11. Monthly Summary. QA shall publish and distribute the monthly summary to the MXG/CC or equivalent and inspected organizations. **(T-1)**.

6.7.11.1. For security purposes, classified portions of the MSEP will be published separately from the main summary. **(T-1)**.

6.7.11.2. QA will compile the summary from inspection data and attach the load crew evaluation statistics provided by WS. **(T-2)**.

6.7.11.3. The MSEP summary should include visual information, graphs, narratives, quality trends identified through inspections and evaluations, discussion of common problem areas and descriptions of successful programs or initiatives.

6.7.11.4. The following areas must be addressed in the summary:

6.7.11.4.1. Compliance with and currency of TOs and directives to include unit. **(T-1)**.

6.7.11.4.2. Aircraft and equipment forms documentation. **(T-1)**.

6.7.11.4.3. Compliance and management of Safety, Environmental, Housekeeping, cyber discipline/Hygiene and FOD Programs. **(T-1)**.

6.7.11.4.4. Training Program. **(T-1)**.

6.7.11.4.5. Key Task List (KTL). **(T-1)**.

6.7.11.4.6. Routine Inspection List (RIL). **(T-1)**.

6.7.11.4.7. TDVs, DSVs, and UCRs. **(T-1)**.

6.7.11.4.8. Munitions Program. **(T-1)**.

6.7.11.4.9. TMDE PMEL Activity Summary (if TMDE lab assigned). **(T-1)**.

6.7.11.4.10. High-missed carded items. **(T-1)**.

6.7.11.4.10.1. A high-missed carded item is defined as any work card item missed at least three times during a one-month period.

6.7.11.4.10.2. Units should use the high-missed carded items to enhance maintenance training programs, detect trends and improve the quality of maintenance.

6.7.11.4.10.3. MMA will review items to identify any relationships with repeat, recur and CND trends. **(T-1)**.

6.7.11.4.11. Narrative Report: The monthly narrative report must contain an analysis of the MSEP results, a summary of significant CAT I and II discrepancies, technical inspections and recommendations for improvement. **(T-1)**.

6.7.11.4.11.1. Prior to preparing the narrative report, QA will conduct a study of trends. **(T-1)**.

6.7.11.4.12. Trend Analysis. QA will review previous reports to determine if inspected areas have improved or declined. **(T-1)**.

6.7.11.4.12.1. Consistent high scores in any category may indicate the programs emphasis is not focused on the unit's actual problem areas. Low scoring areas may require a reassessment of the corrective actions taken by management. Continuous communication between MMA, unit leadership, maintenance supervision, and QA personnel is essential.

6.7.11.4.12.2. Highlight trends and root causes in the summary.

6.7.11.4.12.2.1. **(Added-AFMC)** Establish and document procedures to follow-up highlighted trends and/or root causes to closure. **(T-2).**

6.7.11.4.12.2.2. **(Added-AFMC)** Ensures the work center develops and implements a corrective and preventive action process. (e.g., AF CPI Practical Problem Solving Method (PPSM), 5 Whys, etc.). **(T-2).**

6.7.12. MSEP Meetings. The MXG or equivalent will conduct quarterly meetings to review a summary of the last three months of MSEP data. **(T-1)**.

6.7.12.1. The MXG/CC or equivalent shall chair the meeting. **(T-1)**.

6.7.12.2. Attendees must include, as a minimum, SQ/CCs, Operations Officers/MX SUPTs, WWMs, Chief Inspector, senior analysts, or their designated representative. **(T-1)**.

6.7.12.3. **(Added-AFMC)** MSEP Summary. The MSEP summary shall be distributed to HQ AFMC/A4MM. **(T-2).**

6.7.13. **(Added-AFMC)** HQ AFMC/A4MM Command QA Functional Manager stall:

6.7.13.1. **(Added-AFMC)** Oversee the AFMC MSEP, and serve as POC for AFMC QA functions.

6.7.13.2. **(Added-AFMC)** Ensure development and review of Commanders Inspection Program Self-Assessment Checklists (SACs) IAW AFI 90-201 AFMC Sup.

6.7.13.3. **(Added-AFMC)** Review results of HQ AFMC/IG inspections and unit MSEP reports for needed policy actions.

6.7.13.4. **(Added-AFMC)** Host and chair the Quality Assurance Working Group (QAWG).

6.7.13.5. **(Added-AFMC)** QAWG members include unit QA Chiefs/reps. Additionally, HQ AFMC/IG, HQ AFMC MFMs/SME, COR and designated union representatives may attend as required.

6.7.13.6. **(Added-AFMC)** QAWG will conduct a technical interchange meeting every 2 years in person (funding permitting) and participate in teleconferences at least bi-monthly. **(T-2).**

6.7.13.7. **(Added-AFMC)** Manage MAJCOM responsibilities for LEAP database and perform as LEAP Functional Administrator duties as stated in **paragraph 6.8**

6.8. LEAP QA Database. Units will use the LEAP QA database to capture MSEP data. **(T-1)**. The LEAP User's Manual provides information on registration, site management, and evaluation/inspection input and can be found at: **https://amclg.csd.disa.mil/mi/LEAPQA/Account/Login.aspx?ReturnUrl=%2fmi%2fLEAPQA%2fDefault.aspx**.

6.8.1. LEAP QA Database Roles and Responsibilities. Roles in LEAP are assigned based on each user's authorized level of control needed. The roles themselves operate in a hierarchical manner with each successively higher role possessing all of the rights of the subordinate roles. Only one role will be assigned to a LEAP user at any given time.

6.8.1.1. Application Administrator. This role is limited to Defense Information System Administration (DISA) programming staff and Program Management Office (PMO) personnel only. They perform Department of the AF-wide database management and modification. LEAP Application Administrator will:

6.8.1.1.1. Host a quarterly (virtual) Functional Review Board (FRB) and an annual (Physical or Virtual) Functional Review Board. **(T-1)**.

6.8.1.1.1.1. Attendees shall include: DISA Programming staff, PMO, AF/A4LM LEAP representative, Functional Administrators, and when possible, Site Managers. **(T-1)**.

6.8.1.2. Provide initial training to Functional Administrators and Site Managers as necessary. **(T-1)**.

6.8.1.3. Update the LEAP User's Manual as necessary. **(T-1)**.

6.8.1.4. Provide a monthly status of all System Change Requests (SCRs). **(T-1)**.

6.8.2. Functional Administrator. LEAP Functional Administrators provide overall database management and typically operate at the MAJCOM level. Usually assigned to a MAJCOM's policy section, they ensure proper use and alignment of the database with current policy guidelines. They also operate as the primary focal point for all LEAP-related issues within their MAJCOM and coordinate directly with the LEAP PMO. LEAP Functional Administrators will:

6.8.2.1. Manage access to LEAP either directly or through local site offices that have the capability for delegation for Site Managers only, for example, G081 Manager on site. **(T-1)**.

6.8.2.2. Develop and assign LEAP Finding Codes IAW MAJCOM directives. **(T-1)**.

6.8.2.3. Create, modify, and manage sites within the LEAP Database for their MAJCOM. **(T-1)**.

6.8.2.4. Transcribe and manage Command Task Lists (CTL) in LEAP IAW MAJCOM directives (example, RILs).

6.8.2.5. Assist local Site Managers with day-to-day operations in LEAP to include troubleshooting and reporting SCRs to the PMO. **(T-1)**.

6.8.3. Site Manager. LEAP Site Managers provide local oversight for their respective Group (or equivalent). Possessing "base level" control, they are able to approve and modify LEAP Users and assign roles up to and including other Site Managers. While there is no limitation to how many Site Managers can be assigned per site, the level of control available should warrant assignment based on appropriate rank/position (typically, QA Superintendent and Chief Inspector). LEAP Site Managers will:

6.8.3.1. Manage access to LEAP by coordinating new user documentation with their assigned G081 Manager and approving accounts in LEAP after user registration. **(T-1)**.

6.8.3.2. Modify user accounts according to need. **(T-1)**.

6.8.3.3. Ensure LEAP users are deactivated or downgraded in LEAP when out-processing the QA office. **(T-1)**.

6.8.3.4. Create Flights and Sections in LEAP to which evaluations will be assigned. **(T-1)**.

6.8.3.5. Assign RILs (Command Task Lists/Site Task Lists) within the LEAP application to Organizational Sites in order to facilitate entry of the MXG's Evaluation and Inspection Plan. **(T-1)**.

6.8.3.6. Build and manage the E&I Plan (if used) in LEAP and ensure it incorporates all MAJCOM specific requirements. **(T-1)**.

6.8.4. Read-Only Guest. LEAP Read-Only Guests are intended to be supervisory personnel and unit leadership who require regular access to LEAP Reports and Evaluation documentation.

6.9. QA Product Improvement Programs (PIP). QA runs PIP for the maintenance complex. Combined with daily maintenance data reporting, the PIP monitors and reviews maintenance data to identify opportunities to improve aircraft and equipment. PIP includes the following programs:

6.9.1. DR Reporting.

6.9.2. TO RC requests.

6.9.3. SMR code change request(s).

6.9.4. Configuration Management (CM) and Modification Management Program; AF Form 1067, Modification Proposal; and TCTOs.

6.9.4.1. QA is responsible for CM and Modification Management. This includes reviewing, submitting and tracking unit modification proposals being worked by MAJCOMs/Lead Commands and ensuring proper implementation of approved modification instructions or TCTOs.

6.9.4.2. QA will manage/document modifications IAW **Chapter 14**, AFI 63-101/20-101, TO 00-20-2 and TO 00-5-15. **(T-1)**.

6.9.4.3. QA will establish a process for updating the weapon systems MIS that require manual updates for TCTO configuration. **(T-1)**.

6.9.4.4. **(Added-AFMC)** In addition to accomplishing duties and responsibilities listed in **paragraph 6.9.5**, The PIM will:

6.9.4.4.1. **(Added-AFMC)** Evaluate the overall unit configuration management program by reviewing technical, managerial, and documentation aspects of the program. Report any deficiencies to appropriate local manager or as directed in TO 00-5-15, Air Force Time Compliance Technical Order Process, and AFMC instructions. Immediate action, urgent action, and safety TCTOs require particular attention and emphasis. **(T-2).**

6.9.4.4.2. **(Added-AFMC)** Monitor and document initial compliance on TCTOs and determine depth and frequency of inspection coverage. Coverage is directly related to the complexity of the TCTO as well as to how critical the system or the component is to be modified. **(T-2).**

6.9.4.4.3. **(Added-AFMC)** Support verification, validation and TCTO kit proofing, OTIs and command-directed modifications. **(T-2).**

6.9.4.4.4. **(Added-AFMC)** Along with the TCTO monitor, attend all TCTO planning and reconciliation meetings. **(T-2).**

6.9.4.4.5. **(Added-AFMC)** Ensure all test aircraft that do not meet TCTO applicability criteria due to installed modifications are identified and tracked in a comprehensive database system. This non-applicability list will reference the waiver of compliance signed by the MXG/CC. **(T-2).**

6.9.4.4.6. **(Added-AFMC)** Coordinate with the MOF PS&D and the combined flight test (CFT) modification manager (when necessary), the PIM will ensure all aircraft that are de-modified have a conformity check (de-mod reconciliation) complied with to ensure aircraft TCTOs are reinstated (As applicable). **(T-2).**

6.9.5. Product Improvement Manager (PIM). The MXG/CC or equivalent will assign a PIM within their organization with responsibilities as specified in this **Chapter**. **(T-1)**. The PIM promotes deficiency reporting and provides a sound PIP based on inputs from maintenance activities. The PIM interacts with assigned AFETS personnel, FSR and MAJCOM/Lead Command as applicable to remain cognizant of ongoing and new improvement initiatives. The PIM emphasizes and promotes product improvement initiatives and ensures maintenance personnel are familiar with them by circulating flyers/newsletters, visiting commander's calls, presenting the program at maintenance orientation briefings and making routine visits to maintenance areas.

6.9.5.1. Deficiency Reporting. DR is the process of reporting prescribed by TO 00-35D-54. Maintenance processing of warranty items is located in TO 00-20-3. The PIM's will:

6.9.5.1.1. Monitor the DR process to ensure items are properly loaded in the MIS database. **(T-1)**.

6.9.5.1.2. Ensure compliance with acceptance inspection reporting requirements on DRs for aircraft returning from depot or contractor maintenance. **(T-1)**.

6.9.5.1.3. Ensure DRs are submitted using Joint Deficiency Reporting System (JDRS) at **https://jdrs.mil. (T-1)**.

6.9.5.1.4. Review the DR prior to releasing to the ALC or AFMC Maintenance Wings IAW TO 00-35D-54. **(T-1)**.

6.9.5.1.5. Verify each report against pertinent publications and assign the appropriate precedence and category. **(T-1)**.

6.9.5.1.6. Screen reported deficiencies for possible unit-unique contributing factors and initiate management action on unsatisfactory conditions resulting from local procedures or a lack of technical capability. **(T-1)**.

6.9.5.1.7. Perform/coordinate a technical review of DRs returned to the unit without an adequate response to determine whether resubmitting with additional information is warranted. **(T-1)**.

6.9.5.1.8. Perform exhibit-processing oversight by coordinating with the ALC and the LRS to ensure proper exhibit control and handling. **(T-1)**.

6.9.5.2. RC Process. The PIM will review and route RCs IAW TO 00-5-1. **(T-1)**.

6.9.5.3. SMR code change request. Submit an SMR code change request IAW TO. 00-25-195, *AF Technical Order System Source, Maintenance, and Recoverability Coding of Air Force Weapons, Systems, and Equipment*. The PIM will:

6.9.5.3.1. Track the status of SMR change requests. **(T-1)**.

6.9.5.3.2. Conduct a technical review of SMR change requests returned from depots and item managers with an unsatisfactory answer to determine whether to resubmit with additional information. **(T-1)**.

6.9.5.3.3. Coordinate repair evaluation meetings when approved SMR change requests affect several agencies. **(T-1)**. Ensure units with active AFREP coordinate SMR code changes through the PIM prior to submission to the MAJCOM AFREP Manager. **(T-1)**.

6.9.5.3.4. Serve as focal point for base-level repair and manufacturing capability. **(T-1)**.

6.10. Technical Order Distribution Office (TODO). The TODO ensures TOs and CPINS are managed IAW AFI 63-101/20-101, TO 00-5-1, TO 00-5-15 and TO 00-5-16. TO 00-5-1 provides criteria for establishing levels of TO distribution activities. Additionally, TODOs shall control electronic technical data configuration IAW **Chapter 8 (T-1)**. Establish the PMEL TODO under the control of the TMDE Flight. **(T-1)**. The TODO will:

6.10.1. Coordinate with QA SME for each incoming TCTO to determine applicability. **(T-1)**.

6.10.1.1. All TCTOs received from outside agencies need to be routed through QA for the review process.

6.10.1.2. TCTO applicability is determined by aircraft serial number for aircraft, engine serial number for engines, and by part number or other specific criteria for commodities.

6.10.1.3. TCTOs need to be manually or electronically date stamped to reflect the date the electronic or hard copy is received.

6.10.1.3.1. Date stamping all TCTOs with the date received indicates QA has reviewed the TCTO and that applicability has been determined.

6.10.1.3.2. TCTO electronic date stamping can be accomplished by either (1) utilizing a locally-developed spreadsheet containing the minimum following information: TCTO number, MDS, receiving TODO name, applicability determination and the date received, all of which must be associated with the corresponding TCTO or (2) inserting the receipt date on the TCTO utilizing the Adobe Tools feature. For either option, the date received will be entered by the QA TODO responsible for tracking TCTOs. **(T-1)**.

6.10.1.3.2.1. If used, the TCTO tracking spreadsheet or Adobe-inserted date stamped TCTOs will be electronically secured and controlled by the receiving QA office. **(T-1)**.

6.10.1.3.3. Only date-stamped TCTOs are authorized for use. **(T-1)**.

6.10.1.4. Post TCTO file copies IAW TO 00-5-1. **(T-1)**.

6.10.1.4.1. TCTO file copies may be posted and distributed in electronic format provide all requirements of TO 00-5-1 and AFMAN 33-363 are sustained. Electronic TCTO distribution is automated for ETIMS/IETM.

6.10.1.5. For hard copy TCTOs, provide a file copy of the TCTO to PS&D. **(T-1)**.

6.10.1.6. Ensure personnel assigned as TODO/Technical Order Distribution Account (TODA) managers meet requirements set forth in TO 00-5-1 and AFI 63-101/20-101. **(T-1)**.

6.10.2. Manage the QA Central TO File. **(T-1)**.

6.10.2.1. As a minimum, the QA Central TO File must contain copies of general and procedural TOs and copies of all TCTOs pertaining to the assigned aircraft and equipment owned, operated or maintained. (Paper copies for paper TOs or local access for digital TOs) **(T-1)**.

6.10.2.2. The file is kept to meet QA requirements, not to duplicate TOs held by maintenance work centers.

6.10.3. Manage TO accounts using ETIMS IAW TO 00-5-1. **(T-1)**.

6.10.4. Limit use of Local Work Cards, Local Job Guides, Local Page Supplements or Local Checklists to accomplish maintenance on AF equipment. **(T-1)**. Locally prepared technical instructions will not be used to circumvent approved technical data (see TO 00-5-1). **(T-1)**.

6.10.4.1. The TODO will review and manage all locally developed products IAW TO 00-5-1 and MAJCOM supplements for safety and adequacy of procedures. **(T-1)**.

6.10.4.2. Local Work Cards, Local Job Guides, Local Page Supplements and Local Checklists need to be reviewed for currency when source reference data changes.

6.10.4.3. TODO will develop local publications IAW AFI 33-360 to ensure compliance with these policies. **(T-1)**.

6.10.5. Prepare a list of all changes and revisions to indexes, TOs, inspection work cards and checklists. **(T-1)**.

6.10.5.1. This list will include TO number and date received. **(T-1)**.

6.10.5.2. The TODO will date stamp the cover page of all paper TOs, changes, supplements, Local Work Cards, Local Job Guides, Local Checklists and CPINS to reflect the date the hard copy is received. **(T-1)**.

6.10.5.2.1. This list will be included in the wing's weekly maintenance plan and flying schedule or electronically linked. **(T-1)**.

6.10.5.2.2. Supervisors need to review the list of changes and ensure all personnel are aware a change or revision has been received.

6.10.5.3. "Immediate" action TCTOs must be implemented upon receipt, and "Urgent Action" TCTOs, safety supplements and interim supplements must be brought to the attention of local maintenance supervision within 24 hours of receipt. **(T-1)**. **Note:** Communication of a grounding, or potential grounding event (TCTO, OTI, PM event) to weapon systems operating in a deployed environment and/or under the authority of an operational command must follow the grounding procedures outlined in AFI 11-401, and 63-101/20-101. Units will not directly communicate home station requirements to its deployed forces but provide communication through their respective MAJCOM. **(T-1)**.

6.10.6. Ensure all authorized technical data variances are kept with aircraft and equipment historical records IAW **Chapter 14** **(T-1)**.

6.10.7. If designated as Lead TODO (primary as designated in block 5 of the AFTO Form 43 per TO 00-5-1), will conduct a management inspection on other maintenance TODOs/TODAs in the maintenance complex at least annually along with performing spot checks of TO files. **(T-1)**.

6.10.7.1. As part of this inspection, the TODO will confirm TODO/TODA personnel and Library Custodian have completed the mandatory minimum requirements of TO System training. **(T-1)**.

6.10.7.2. The Lead TODO(s) will coordinate with other TODOs and TODAs, and local Client Support Administrators, Functional Systems Administrators, and applicable functional OPRs to ensure eTools are configured with current and only authorized software to support TO and maintenance documentation. **(T-1)**. **Note:** Coordination with the local Communications Squadron to verify network configuration requirements for eTools are available and sustained to meet the requirements listed in TO 31S5-4-ETOOL-1-WA-1. Additional user support available through the Air Force Technical Order Functional Support Team, **af.etimstofst@us.af.mil** or DSN 872-9300.

6.10.8. Control the electronic data configuration on applicable eTools IAW **Chapter 8** **(T-1)**.

6.10.8.1. TODO/ Functional Systems Administrators will develop local procedures to quarantine eTools and eTool update history in the event of a mishap. **(T-1)**.

6.10.9. Maintain records of ETIMS IAW TO 00-5-1. **(T-1)**.

6.10.9.1. TODOs shall set up software sub-accounts with each appropriate shop/section and ensure each shop/section has the most current software on hand. **(T-1)**.

6.10.9.2. TODOs will include ETIMS or equivalent system in the routine and annual checks required by TO 00-5-1. **(T-1)**.

6.11. One-Time Inspections (OTI) program. The OTI program is managed by the MXG IAW TO 00-20-1. OTIs are normally look-only actions to verify the existence of suspected equipment conditions or malfunctions.

6.12. Functional Check Flights (FCFs) to include Operational Check Flights (OCFs).

6.12.1. Check Flights are performed to ensure an aircraft is airworthy and/or capable of accomplishing its mission. Additional guidance may be found in AFI 11-401, AFI 11-202 V3, *General Flight Rules*; AFI 13-201, *AF Airspace Management*; TO 1-1-300, *Maintenance Operational Checks and Check Flights*; TO 00-20-1; and applicable -6 TOs and -1 Flight Manuals.

6.12.1.1. OCF shall be kept to a minimum and are not used to replace TO 1-1-300, *Maintenance Operational Checks and Check Flights* or MDS specific -6 TO Functional Check Flight (FCF) requirements. OCFs must be flown by experienced aircrews (not required to be an FCF qualified aircrew), must be briefed by QA for aircraft condition, and accomplished following the same maintenance criteria as FCFs. **(T-1)**.

6.12.2. The QA FCF Program Manager will:

6.12.2.1. Establish local FCF procedures IAW TO 1-1-300 and checklists for any specific local aircraft requirements to include configuration, administration, control, and documentation of the FCF Program. **(T-1)**.

6.12.2.1.1. Coordinate these procedures with OG Standardization/Evaluation and publish them in a wing publication/supplement IAW AFI 33-360. **(T-1)**.

6.12.2.2. Coordinate with the appropriate squadron for an FCF pilot/aircrew and provide squadron operations with the aircraft tail number, reason for the FCF and anticipated takeoff time. **(T-1)**.

6.12.2.3. Maintain an information file for briefing aircrews. **(T-1)**.

6.12.2.3.1. As a minimum, this file must contain unit directives concerning FCF procedures and an FCF checklist for each MDS assigned. **(T-1)**.

6.12.2.3.1.1. **(Added-AFMC)** Information file will also include: **(T-2).**

6.12.2.3.1.1.1. **(Added-AFMC)** Mission profile for each type of assigned aircraft, consisting of checks to be accomplished, presented in consecutive order. **(T-2).**

6.12.2.3.1.1.2. **(Added-AFMC)** TO 1-1-300, Acceptance/Functional Check Flight And Maintenance Operational Checks. **(T-2).**

6.12.2.3.1.1.3. **(Added-AFMC)** List of authorized FCF crew members signed by the OG/CC. **(T-2).**

6.12.2.4. An FCF checklist will be used for each FCF. **(T-1)**.

6.12.2.5. Ensure all FCFs are debriefed with the appropriate debrief function. **(T-1)**.

6.12.2.5.1. During debriefing, the FCF checklist and aircraft forms will be reviewed to determine if all requirements have been accomplished. **(T-1)**.

6.12.2.5.2. After completing the review, the FCF checklist will be sent to PS&D for inclusion in the aircraft jacket file. **(T-1)**.

6.12.2.6. Maintain a copy of the AF Form 2400, *Functional Check Flight Log*, or equivalent automated product for deficiency and trend analysis. **(T-1)**.

6.12.2.6.1. **(Added-AFMC)** Review the log monthly for trends indicating problems requiring further analysis or corrective actions. Identify deficient areas and forward to the MXW/CC and OG/CC for required review or action. **(T-2).**

6.12.3. FCF-qualified QA Inspectors will:

6.12.3.1. Ensure the FCF aircrew is briefed on the purpose and extent of the flight, previous maintenance problems and discrepancies recorded on the aircraft or engines related to the FCF. **(T-1)**.

6.12.3.2. Ensure aircraft W&B documents are reviewed. **(T-1)**.

6.12.3.3. Ensure AF Form 2400 or an equivalent automated product is maintained to provide information for evaluation and analysis. **(T-1)**.

6.12.3.3.1. Include the date and time of the FCF, aircraft serial number, reason for FCF, name of debriefer and name of aircraft commander. **(T-1)**.

6.12.3.3.2. The AF Form 2400 or equivalent automated product will also indicate if the aircraft was released for flight, reasons for any non-release, action taken and date completed and the date maintenance documents were forwarded to PS&D or records section. **(T-1)**.

6.12.3.4. Ensure all maintenance actions are completed and all AFTO Form 781-series forms are documented IAW MDS specific -6 TO and TO 00-20-1 or electronic equivalent. **(T-1)**.

6.12.3.5. All maintenance actions on transient aircraft requiring FCF must be reviewed by QA prior to FCF. **(T-1)**.

6.12.3.5.1. If the aircraft MDS/type is not assigned at the transient base, then the owning unit must provide a qualified FCF pilot/crew and maintenance as required. **(T-1)**.

6.12.4. Flight Requirements. The mandatory requirements for FCF are outlined in TO 1-1-300 and the applicable -6 TO. FCF profiles are determined by the maintenance requirement causing the FCF. The decision to fly a full profile FCF is the decision of the MXG/CC. The FCF profile will be tailored for the discrepancy causing the FCF by applying the following guidance:

6.12.4.1. Require a clean configuration whenever FCFs are flown for flight controls, fuel controls or engine changes. **(T-1)**.

6.12.4.2. Do not remove fixed wing pylons, fixed wing tip tanks and fixed external stores unless they interfere with fuel scheduling, aerodynamic reaction, air loading, signal propagation. **(T-1)**.

6.12.4.3. Do not fly FCFs in conjunction with other missions or training requirements, unless authorized in TO 1-1-300. **(T-1)**.

6.12.5. FCF Release. An FCF release occurs upon the successful completion of all requirements as determined by the FCF aircrew. The final decision to release rests solely with the aircraft commander. An aircraft may be released for flight if a malfunction occurs during an FCF, which is not related to the condition generating the FCF and the original condition checks good.

6.12.5.1. An FCF conditional release may occur when the aircraft does not successfully complete FCF requirements due to a specific system malfunction. The FCF aircrew, in coordination with maintenance, determines a FCF conditional release if the malfunction may be corrected without generating another FCF. If upon review of the corrective action, the FCF aircrew accepts the maintenance action as a satisfactory repair of the malfunction, they may release the aircraft from FCF.

6.12.6. MAJCOMs will determine the process and level of command that will issue instructions for FCF procedures away from home station in their supplements to this AFI.

6.12.6.1. **(Added-AFMC)** While performing an FCF away from home station, the applicable requirements for FCFs of the transient/host base must be followed. The transient/host base QA office must be contacted and should be the focal point for all FCF requirements. **(T-2).**

6.13. Inflight Operational Checks. Inflight operational checks (as applicable) will be accomplished IAW TO 1-1-300, TO 00-20-1 and applicable -6 and -1 TOs. **(T-1)**.

6.13.1. Document inflight operational checks IAW TO 00-20-1.

6.14. High Speed Taxi Checks. The MXG/CC and OG/CC may authorize high speed taxi checks when a maintenance ground operational check requires aircraft movement at higher than normal taxi speeds (with qualified FCF aircrews) to operationally check completed maintenance.

6.14.1. High speed taxi checks (as applicable) will be accomplished IAW TO 1-1-300 instead of FCFs. **(T-1)**.

6.14.1.1. Process aircraft forms through QA using FCF procedures. **(T-1)**.

6.14.1.2. QA will develop an aircrew briefing checklist specifically for high speed taxi checks, to include the required FCF briefing items and pertinent warnings, cautions. **(T-1)**.

6.14.2. Configure aircraft with the minimum -1 operational fuel requirements. **(T-1)**.

6.14.3. Ensure aircraft is prepared for flight and the Exceptional/Conditional Release is signed off prior to conducting high speed taxi checks. **(T-1)**.

6.15. Weight and Balance (W&B) Program. QA will maintain the W&B Program IAW TO 1-1B-50, *Basic Technical Order for USAF Aircraft Weight and Balance*. **(T-1)**.

6.15.1. W&B manuals for Class I and II aircraft are maintained in a central file. **(T-1)**.

6.15.1.1. The Lead Command will standardize the method of supplemental handbook storage and physical location for like-MDS aircraft. **(T-2)**.

6.15.1.1. **(AFMC)** [DEV] Weight and balance handbook storage and physical location will be determined by MXG/CC or equivalent for test/mission unique aircraft.

6.15.2. QA will manage W&B on commercial derivative aircraft IAW **Chapter 6** **(T-1)**. **Note:** The contractor is responsible for managing W&B programs on contract logistics supported aircraft.

6.15.3. The W&B Program Manager will ensure:

6.15.3.1. Sufficient personnel are qualified on assigned aircraft IAW TO 1-1B-50. **(T-1)**.

6.15.3.2. All assigned aircraft are weighed IAW prescribe MDS specific publications and directives. **(T-1)**. The W&B Program Manager will:

6.15.3.2.1. Keep W&B documents required by TO 1-1B-50 for each assigned aircraft. **(T-1)**.

6.15.3.2.2. Use the Automated Weight and Balance System, and maintain a back-up copy of all W&B documents. **(T-1)**.

6.15.3.3. Procedures are established for routing completed TCTO and modification information for W&B changes. **(T-1)**.

6.15.3.4. Essential W&B data and changes to the basic weight and moment are available for appropriate mission planning (such as, Standard Configuration Loads, updates to supplemental handbook). **(T-1)**.

6.15.3.5. Periodic serviceability inspections are accomplished on unit-stored and maintained W&B equipment (as applicable). **(T-1)**.

6.15.3.6. Coordination with Operations Officer/MX SUPT in developing a W&B Preparation Checklist if the aircraft -5 TO is not comprehensive enough for the task. **(T-1)**.

6.15.3.7. The SCR reflects W&B certification. **(T-1)**.

6.15.4. W&B Qualified QA Inspector Responsibilities. The W&B Qualified QA Inspector will:

6.15.4.1. Verify scale readings and accomplish/oversee the actual computations. **(T-1)**.

6.15.4.2. Supervise the preparation, leveling and weighing of the aircraft IAW MDS specific –2 and –5 series TOs and TO 1-1B-50. **(T-1)**.

6.15.4.3. Inspect W&B documents before flight when locally-accomplished modifications affect the basic aircraft weight and moment. **(T-1)**.

6.15.4.4. Review computations for accuracy. **(T-1)**.

6.16. (Added-AFMC) Chafing Awareness Program. This program is mandatory for fighter aircraft units and other MDS IAW applicable MDS technical data. QA must monitor and track instances of wire, harness and metal line/tube chafing. A randomly selected 10 percent of assigned aircraft are inspected when notification is received of a potential chafing problem involving like model, lot number or block of aircraft. **(T-2).**

6.16.1. **(Added-AFMC)** The Chief Inspector shall recommend initiating an OTI if the sampled aircraft indicates a chafing problem or the detected chafing is an operational safety hazard. The MXG/CC will be the final approval authority on the scope of the OTI. **(T-2).**

6.16.2. **(Added-AFMC)** QA will utilize a database for the purpose of tracking wire and harness chafing problems identified through OTIs and maintenance cross-tell reports. Consult the database before expending man-hours performing inspections. **(T-2).**

Chapter 7

IMPOUNDMENT PROCEDURES

7.1. Aircraft and Equipment Impoundment. Aircraft or equipment is impounded when intensified management is warranted due to system or component malfunction or failure of a serious or chronic nature. Refer to AFI 91-204 for aircraft and equipment involved in accidents, mishaps or incidents. Impounding aircraft and equipment enables investigative efforts to systematically proceed with minimal risk relative to intentional/unintentional actions and subsequent loss of evidence.

7.1.1. **(Added-AFMC)** Coordinate with the Wing Safety Office to determine reporting requirement, when property damage to aircraft, equipment, commodities, or resources exceeds the Class D threshold $25,000 or more but less than $60,000.

7.2. Specific Guidance. MXG/CCs, or equivalent, will develop and implement a standardized Impound Official training course. The course will include review of applicable AFIs, TOs, impoundment clearing procedures, and leverage FSR and AFETS expertise to ensure Impound Official is prepared to assume all duties and responsibilities of an impoundment official.

7.2.1. MXG/CCs, or equivalent, will ensure compliance with the procedures in this **Chapter** and will develop a local Impoundment Program. **(T-1)**. Local program procedures, requirements and responsibilities will be captured in a local supplement to this instruction. **(T-1)**.

7.2.1.1. QA is the OPR for the Impoundment Program and will develop local impoundment checklists. **(T-1)**.

7.2.1.1. **(AFMC)** Unit QA will ensure development of a local operating instruction for local procedures and development of a local impoundment checklists (see **Attachment 9** for sample Impoundment checklist) for use, notification, release officials, specific forms entries, appointment and responsibilities of impoundment investigating officials, special handling or tagging of parts from impounded items sent through the repair cycle and conducting impoundment investigations across organizations. **(T-2).**

7.2.1.2. QA in coordination with MT, will serve as the OPR and focal point for the management of the Impound Official training course. The course completion is mandatory prior to being assigned as an Impound Official. **(T-1)**.

7.2.2. The MXG/CC and MXG/CD or equivalents are the Impoundment Release Authorities. **(T-1)**.

7.2.2.1. In the event of a dual MXG/CC and CD absence, the MXG/CC or CD will appoint an individual as the designated Impoundment Release Authority for the period of the dual absence. **(T-1)**.

7.2.2.2. **(Added-AFMC)** The MXG/CC or CD will appoint an individual in writing as the designated Impoundment release authority at deployed location(s) under their control. The owning MXG/CC, MXG/CD, or equivalent, is the impoundment release authority for aircraft transiting to enroute locations. **(T-2).**

7.2.3. The Impoundment Release Authority determines the need for a one-time flight and will coordinate appropriate authorization IAW TO 00-20-1. **(T-1)**. **Note:** If the aircraft/equipment were impounded for a mishap, coordinate with the safety office prior to releasing the aircraft/equipment from impound. **(T-1)**.

7.2.4. MAJCOMs will determine the amount of time unit QAs will maintain copies of finalized Impoundment reports in their supplement to this AFI. **Note:** See Air Force Records Information Management System (AFRIMS) Reference.

7.2.4.1. **(Added-AFMC)** Impoundment reports will be kept for a period of one year from the date of incident. Ensure incidents are documented in the applicable component/subcomponent historical records as applicable **(T-2).**

7.2.5. **(Added-AFMC)** Impoundments may be transferred from an aerospace vehicle and/or an equipment item to a sub-component once the sub-component is removed (engine, gun system, etc. determined to be causal for asset impoundment and is removed from the aircraft).

7.2.6. **(Added-AFMC)** Units will ensure procedures are developed to safeguard/secure possible investigative evidence such as data records (e.g. crash survivable flight data recorder, seat data recorder, Cockpit voice recorder) per AFI 91-204 upon aircraft impoundment for potential safety related incidents. **(T-2).**

7.3. Impoundment Authorities.

7.3.1. Impoundment Authorities are designated by the MXG/CC or equivalent and will be tracked on the SCR. **(T-1)**. Impoundment Authorities will:

7.3.1.1. Select the Impoundment Official. **(T-2)**.

7.3.1.2. Determine if impoundment is warranted when:

7.3.1.2.1. An aircraft landing gear fails to extend or retract due to an unknown condition. **(T-1)**.

7.3.1.2.2. The aircraft has been confirmed as being contaminated with chemical, biological, or radiological materials. **(T-1)**.

7.3.1.2.3. An aircraft sustains FO damage from an unknown cause. **(T-1)**.

7.4. Impoundment Official Responsibilities. The Impoundment Official is designated as the single POC for impounded aircraft or equipment and will hold the minimum rank of MSgt and will be tracked on the SCR. **(T-1)**. The Impoundment Official will:

7.4. (AFMC) Impoundment Official Responsibilities. MSgt or Equivalent.

7.4.1. Be responsible for controlling and monitoring the investigation of impounded aircraft or equipment. **(T-1)**.

7.4.2. Use established checklists to guide the sequence of actions. **(T-1)**.

7.4.3. Control and track access of personnel to impounded aircraft or equipment. **(T-1)**.

7.5. Mandatory Impoundments. Aircraft and/or equipment will be impounded:

7.5.1. When the Impoundment Authority determines extraordinary measures are required to address any degradation of aircraft airworthiness or serious aircraft/equipment anomaly. **(T-1)**.

7.5.2. Following an aircraft mishap as defined in AFI 91-204 and AFMAN 91-223, *Aviation Safety Investigations and Reports*. **(T-1)**.

7.5.3. When support equipment is known or suspected to have been a factor in a mishap or may have contributed to injuries. **(T-1)**.

7.5.4. Following an un-commanded flight control movement. **(T-1)**. The MXG/CC and OG/CC will determine the need for an FCF for uncommanded flight control movement. **(T-1)**.

7.5.5. Following an inadvertent ordnance release or explosive mishap. **(T-1)**.

7.5.6. When authorized procedures are not adequate or the unit is unable to identify or repair loaded nuclear weapons system malfunctions within the criteria of AFI 91-107. **(T-1)**.

7.5.7. Following aircraft engine anomalies to include but not limited to:

7.5.7.1. Unselected propeller reversal. **(T-1)**.

7.5.7.2. Flameout/stagnation (for single engine aircraft). **(T-1)**.

7.5.7.3. Unselected power reversal. **(T-1)**.

7.5.7.4. Engine case penetrations, ruptures, or burn-through from an internal engine component. **(T-1)**.

7.5.7.5. When an aircraft experiences a loss of thrust sufficient to prevent maintaining level flight at a safe altitude. **(T-1)**. This includes all cases of multiple engine power loss or roll back.

7.5.7.6. Engine damage due to a foreign object and source of FO is determined to be internal to the engine. **(T-1)**. For Propeller driven aircraft, both the propeller and engine will be impounded as a single unit when the engine has confirmed internal damage due to a foreign object. **(T-1)**.

7.5.7.7. Engine damage which occurs during transport. **(T-1)**.

7.5.8. Following an in-flight fire. **(T-1)**.

7.5.9. When an aircraft experiences an in-flight loss of all pitot-static system instruments or all gyro stabilized attitude or direction indicators. **(T-1)**.

7.5.10. When there is evidence of intentional damage, tampering, or sabotage. **(T-1)**.

7.5.11. When physiological incidents attributable to aircraft systems or cargo occurs. **(T-1)**.

7.6. Impoundment Procedures.

7.6.1. When the Impoundment Authority directs impoundment, a Red X symbol will be placed in the applicable AFTO Form 781A for aircraft, applicable engine work packages for uninstalled engines or AFTO Form 244 for equipment (or electronic form equivalents) with a statement indicating the reason for impoundment and the name of the assigned Impoundment Official. **(T-1)**.

7.6.2. The MOC will be notified when an impoundment decision has been made. **(T-1)**.

7.6.3. Aircraft or equipment records will be controlled at the discretion of the Impoundment Official. **(T-1)**. When required, the Impoundment Official will:

7.6.3.1. Obtain and secure the current aircraft forms and the aircraft jacket file for aircraft, applicable engine work packages for uninstalled engines, or the AFTO Form 244 for equipment (or electronic form equivalents). **(T-1)**.

7.6.3.2. Notify the MIS DBM administrator to isolate the aircraft or equipment serial number in order to prevent any changes and maintain the integrity of the historical data until the aircraft or equipment is released. **(T-1)**.

7.6.3.3. Request and collect any training records, required to complete the impoundment investigation. **(T-1)**.

7.6.3.4. On aircraft impounded for potential safety related incidents, ensure the Cockpit Voice Recorder/Flight Data Recorder circuit breakers are pulled immediately after engine shutdown or before applying external power to safeguard Cockpit Voice Recorder/Flight Data Recorder data, if equipped. **(T-1)**.

7.6.3.5. Ensure impounded aircraft/equipment is identified by cordon with cones, ropes or placards indicating impound condition and aircraft location. **(T-1)**.

7.6.4. Impoundment Official will limit maintenance actions on impounded aircraft or equipment until the cause is determined. **(T-1)**.

7.6.4.1. The Impoundment Official will determine what maintenance can be performed in conjunction with the maintenance required to release the aircraft or equipment from impoundment. **(T-1)**.

7.6.4.1.1. Impoundment Official will validate aircraft disposition with Wing Safety to determine if a safety investigation is ongoing. **(T-1)**.

7.6.4.2. Parts removed from impounded aircraft or equipment will be carefully controlled. **(T-2)**. This is to ensure that parts, once confirmed as the cause for impoundment, are available to be processed as DR exhibits.

7.6.5. The Impoundment Official will select a team of qualified technicians dedicated to determine the cause of the problem that led to the impoundment. **(T-1)**.

7.6.5.1. Impoundment team members will be relieved of all other duties until released by the Impoundment Official. **(T-2)**.

7.6.6. Once the cause of the malfunction or failure has been positively determined, the Impoundment Official will brief the Impoundment Release Authority on findings, corrective actions, and requests release of the aircraft or equipment from impoundment. **(T-1)**.

7.6.7. If the cause of the discrepancy could potentially affect other aircraft or equipment in the fleet, QA will provide cross-tell information for up-channeling to the MAJCOM and the designated Lead Command IAW AFPD 10-9. **(T-1)**.

7.6.8. Clear impoundments from forms/MIS IAW TO 00-20-1. **(T-1)**.

7.6.9. If the cause of a reported malfunction cannot be determined or a positive corrective action cannot be confirmed, the Impoundment Release Authority will determine if further actions are required (such as, requesting depot assistance, further troubleshooting, FCF/OCF). **(T-2)**.

7.6.10. MAJCOMs will publish guidance outlining impoundment and release procedures for transient aircraft.

7.6.10. **(AFMC)** Unit QA will ensure development of a local operating instruction to include, procedures for off-station aircraft impoundment while transient, home station notification, release officials, forms entries, appointment and responsibilities of impoundment investigating officials, special handling or tagging of parts from impounded items sent through the repair cycle and conducting impoundment investigations across organizations. **(T-2).**

7.6.10.1. At locations where no MXG/CC or designated representative is available, the aircraft assigned MXG/CC may temporarily delegate Impoundment and Release Authority.

7.7. Rules of Impoundment Specifically for Explosive-Related Events/Mishaps. When an inadvertent release or an explosive mishap is reported, the following procedures will apply:

7.7.1. In-flight:

7.7.1.1. When the involved aircraft returns to the de-arm or parking area, the aircraft will be impounded. **(T-1)**. Limit maintenance actions to those required to make the aircraft safe.

7.7.1.2. The MXG/CC, MOC, Munitions Control, WWM, QA and Wing Safety will be notified of the impoundment action. **(T-1)**.

7.7.1.3. The aircraft with unsafe munitions will be parked and isolated in an area approved by the weapons safety office and airfield management. **(T-1)**.

7.7.1.4. Investigate and report the incident IAW AFI 91-204. **(T-1)**.

7.7.2. Ground:

7.7.2.1. The senior ground crew member will be in charge of the aircraft or equipment until relieved and will ensure involved persons remain at the scene. **(T-2)**.

7.7.2.2. Protect other aircraft or equipment located near the incident if an explosive hazard exists. **(T-1)**.

7.7.2.3. Do not change the position of any switches except as needed for safety. **(T-1)**.

7.7.2.4. Limit maintenance actions to those actions required to make the aircraft or equipment safe. **(T-1)**.

7.7.3. Preserve mishap evidence to the maximum extent possible. **(T-1)**. An example would be segregating an aircraft gun versus destroying it if it poses no immediate danger. This allows for evaluation of all the evidence and the ability to recreate the mishap conditions.

7.7.4. If an incident, malfunction, or mishap is suspected to have occurred or caused by in-use, installed, or otherwise configured munition (live or inert), or a 20 or 30MM gun system jam creating a safety condition, notify the Global Ammunition Control Point Air Force Life Cycle Management Center, Munition Division (AFLCMC/EBH) Munitions Rapid Response Team: DSN: 312-777-2666; COMM: (801) 775-2666, and the MAJCOM munitions staff. **(T-1)**.

7.7.4.1. Refer to AFI 91-202 for additional information about the Munitions Rapid Response Team. **Note:** The Munitions Rapid Response Team can also provide units

technical assistance in resolving recurring 20 or 30MM gun system jams and malfunction isolation.

7.7.5. For impoundments involving nuclear loaded weapon systems (see **Paragraph 7.5.6**) also follow applicable requirements/criteria outlined in AFI 91-107. **(T-1)**.

Chapter 8

TOOL AND EQUIPMENT MANAGEMENT

8.1. Tool and Equipment Management. The objectives of the Tool and Equipment Management Program are to prevent and eliminate FOD to aircraft, engines, missiles, training and support equipment, and to reduce costs through strict effective control and accountability of assets. To ensure standardization among maintenance units, commanders and key leaders are responsible for executing an effective tool program. MAJCOMs will identify small unique unit tool and equipment management requirements in a supplement, addendum or deviation as described in the purpose statement of this AFI. DFT/CFT will adhere to local tool control policies and procedures provided in the MXG/MXO in-brief (see **Paragraph 5.2.1.9**) when working on aerospace equipment possessed by the unit. The AF enterprise Tool Accountability System is TCMax®. **(T-1)**. Exception: N/A to aircraft/weapon system programs that provide tool and equipment accountability support as an internal function of the program (e.g., F-35 ALIS).

8.1. (AFMC) Tool and Equipment Management. Small unique units designated as NSOs will follow guidance in AFI 21-101 AFMC Sup Addendum A or Addendum C for AFRL.

8.2. Guidelines for Program Management. Wings will document procedures for the control and management of all tools/equipment used for aircraft/aerospace equipment maintenance or which enter the flightline or aerospace equipment maintenance industrial areas, to include all wing organization's (Hospital, CE, vehicle Mx, Security Forces), to provide mission support in a wing level publication IAW AFI 33-360. **(T-1)**. The MXG/CC, or equivalent, is the OPR for development of this publication and will coordinate with all wing organizations that work in, or enter, the above mentioned areas to ensure they have established tool/equipment control procedures documented in the wing publication. **(T-1)**. As a minimum, guidance will address the following:

8.2. (AFMC) Guidelines for Program Management. Units will use the Blanket Purchasing Agreement (BPA) for acquiring tools. **https://org.eis.afmc.af.mil/sites/HQAFMCA4/A4M/Hand_Tools/ (T-2).**

8.2.1. Standardized procedures for security, control, and accountability of tools and equipment. **(T-1)**.

8.2.1.1. Chits are not authorized.

8.2.1.2. **(Added-AFMC)** Include standardized procedures for clecos. **(T-2).**

8.2.2. Inventory requirements. **(T-1)**. As a minimum, units will conduct and document an annual inventory of all tools and equipment. **(T-1)**.

8.2.3. Procedures for warranted tool management. **(T-1)**.

8.2.3. **(AFMC)** Warranty/Quality Tool Program. The purpose of the warranty/quality tool program is to ensure high quality; industrial-strength warranted tools are available for use in aircraft and equipment activities. Warranty tools will be purchased using the BPA or through local contracts with a warranty tool vendor. Units desiring to establish a warranty tool program must coordinate their program through both the supply and contracting squadrons. Detailed management procedures are contained in AFI 23-101. **(T-2)** The following general guidelines apply:

8.2.3.1. Procedures to tag/segregate unserviceable warranty tools. **(T-1)**.

8.2.3.2. **(Added-AFMC)** Procedures for etching/de-etching of tools. Ensure method does not void warranty. **(T-2).**

8.2.3.3. **(Added-AFMC)** Office responsible for maintaining replacement tools (if applicable) and number of tools stocked. **(T-2).**

8.2.4. Procedures for control and management of replacement, expendable and consumable hand tools, HAZMATs, and other items contained in CTKs. **(T-1)**.

8.2.5. Procedures for transfer of tools/CTKs at the job site (on-site transfers). **(T-1)**.

8.2.5.1. Ensure tool accountability and control is maintained when transfer occurs between the individuals. As a minimum the individuals involved in the transfer will accomplish a joint inventory and document accordingly. **(T-1)**.

8.2.6. Procedures for lost or missing tools. **(T-1)**.

8.2.6.1. **(Added-AFMC)** Procedures for aircraft that have already taxied or are flying when tools, equipment, TOs, or any object is lost and was used on the aircraft. **(T-2).**

8.2.7. Assignment of Equipment Identification Designators (EID) for CTKs, non-CA/CRL equipment, and assignment of CTK numbers for tools. **(T-1)**.

8.2.8. Procedures for issue, marking, and control of PPE, tools or equipment (such as, hearing protectors, reflective belts, headsets) assigned/issued to individuals. **(T-1)**.

8.2.8. **(AFMC)** At a minimum, these markings will identify the individual. **(T-2).**

8.2.9. Procedures to ensure positive accountability and control of rags. **(T-1)**.

8.2.9.1. A rag is defined as a remnant of cloth purchased in bulk or a standardized, commercial quality, vendor-supplied shop cloth used in general industrial, shop, and flightline operations.

8.2.9.1.1. Cheesecloth is considered a rag; however, paper products/paper towels are not considered rags.

8.2.9.1.1. **(AFMC)** Procedures if paper product is used, identify if and when they will be controlled. **(T-2).**

8.2.9.2. Rags should be uniform in size and color.

8.2.9.3. Marking or identifying each shop rag with a CTK number is not necessary.

8.2.10. Procedures to limit numbers of personnel authorized to procure tools. **(T-1)**.

8.2.11. Procedures for control of locally manufactured or developed tools and equipment. **(T-1)**.

8.2.12. Procedures for FSRs/DFTs/CFTs when working on equipment within the unit. **(T-1)**.

8.2.13. Standardized procedures and responsibilities for decentralizing CTKs, tools, and equipment outside tool room/support section to meet mission requirements. **(T-1)**.

8.2.13.1. Inventory and accountability requirements described in this AFI apply equally to all decentralized CTKs tools, and equipment. **(T-1)**.

8.2.14. Procedures for control of response equipment permanently stored/located in trailers or vehicles. **(T-1)**.

8.2.15. Procedures for requiring a second party or on-duty supervisor inspection of CTKs when conditions warrant a single person shift. **(T-1)**.

8.2.15.1. The same individual that signs out a CTK cannot sign it back in. **(T-1)**.

8.2.16. Procedures for controlled access to tool rooms. **(T-1)**.

8.2.17. **(Added-AFMC)** Procedures for long term tool kit (CTK) storage. **(T-2).**

8.2.18. **(Added-AFMC)** Procedures for control of equipment issued/dispatched to work areas. **(T-2).**

8.2.19. **(Added-AFMC)** Procedures for control of shop machine accessories/attachments. **(T-2).**

8.2.20. **(Added-AFMC)** Procedures for control of tooling included in TCTO/Mod Kits. **(T-2).**

8.2.21. **(Added-AFMC)** Procedures for loaned tools to include issue, tracking, duration, and verification. **(T-2).**

8.2.22. **(Added-AFMC)** Procedures for training personnel on tool control and accountability measures. **(T-2).**

8.3. General Program Guidelines.

8.3.1. The Flight CC/SUPT will designate CTK custodians. **(T-1)**.

8.3.1.1. CTK custodians are responsible for tool, HAZMAT, and consumable asset accountability and control. Exception: A separate person may be designated as the HAZMAT monitor.

8.3.2. Flight CC/SUPT and/or Section NCOICs/Chiefs (or equivalents) will determine the type, size, contents and number of CTKs required for their work centers. **(T-1)**.

8.3.2.1. The WWM will make this determination for load crew CTKs, when assigned. **(T-1)**.

8.3.2.2. **(Added-AFMC)** Consider deployment tasking's, TDYs, and special test project requirements when making CTK determinations. Ensure user input is considered when determining quantity, content and layout of tool kits. **(T-2).**

8.3.3. Design CTKs to provide for quick inventory and accountability of tools. CTKs and tools will be clearly marked with the Equipment Identification Designator (EID) (follow guidance below). **(T-1)**.

8.3.3.1. **(Added-AFMC)** If a tool is to be permanently removed from a CTK/TK ensure any previously assigned World Wide Identification (WWID) markings are de-etched (reference warranty procedures if applicable). **(T-2).**

8.3.4. CTK contents will be standardized to the maximum extent possible within functional elements of a squadron that have similar missions (such as, aircraft flights/sections and Combat Armament Support Team). **(T-1)**.

8.3.5. Each tool, item of equipment, or consumable contained in a CTK will have an assigned location identified either by inlay cuts in the shape of the item, shadowed layout, label, or silhouette. **(T-1)**.

8.3.5.1. No more than one item will be stored in a cutout, shadow, or silhouette except for tools too small to be etched individually may be place in CTKs as a set (such as, drill bits, allen wrenches, apexes, or paired items like gloves, booties). **(T-1)**.

8.3.6. A Master Inventory List (MIL) will be required for each CTK or series of identical CTKs. **(T-1)**.

8.3.6. **(AFMC)** Tools will be described on the MIL to accurately depict the actual size or type to ensure positive tool control, i.e. screwdriver, common, 6 inches; socket, 3/8 drive X 5/8. **(T-2).** CTK custodian or designated representative must review and sign the MIL. A copy of the MIL will also remain in each CTK/equipment kit at all times for inventory purposes. **(T-2).**

8.3.6.1. The WWM will approve/sign a single MIL to be used as the standard for all Load Crew CTKs on like mission-design-series aircraft; a copy will be maintained in each support section. **(T-1)**.

8.3.6.2. When items such as dispatchable support equipment or dispatchable special tools are issued separately (not contained in a CTK) and contain multiple parts that are required for its use (such as, cartridges containing consumables, cables, hoses, adapters), a MIL of all the items will be provided with the support equipment or special tools to facilitate positive accountability of all items during checkout, transfer, and check in. **(T-1)**.

8.3.6.3. The MIL resides in the TCMax®, but a hard copy of the signed MIL must reside with each dispatchable CTK to provide the ability to verify the inventory regardless of location. **(T-1)**.

8.3.6.4. If items such as identification tags or dust caps are attached to tools/equipment, they will be secured in a manner that will minimize any possibility of FOD. **(T-1)**.

8.3.6.4.1. Items not permanently attached, will be marked/etched with the appropriate CTK number. **(T-1)**.

8.3.6.4.2. All items will be listed on the MIL. **(T-1)**.

8.3.6.5. Consumables may be placed in CTKs. If so, they will be identified on the MIL as consumables. **(T-1)**. Examples of consumables include; safety wire, adhesive, wire bundle lacing, solder.

8.3.6.5.1. Do not include common hardware items such as bolts, nuts, and/or screws unless they are required for the tool to perform its intended function. Cartridges or equivalents containing consumable items whether disposable or not will be accounted for to mitigate FOD hazards. **(T-1)**.

8.3.6.5.2. **(Added-AFMC)** If not using the MIL or TCMax® to document missing/removed tools then use AFMC Form 61, *Missing/Removed Tools and Equipment*, to annotate missing/removed tools. **(T-2).**

8.3.6.6. Tool sets placed within a CTK will be identified on the CTK MIL by total number of items in the set (such as, allen wrench set - 9 each allen wrenches + container for a total of 10). **(T-1)**.

8.3.6.6.1. Items identified as too small to be marked, etched, or stamped, as approved by QA, will be annotated with a description of the individual items contained within the set on the CTK/MIL (such as, the variation in the size of the items contained within the set, Apex, file, drill bit, size). **(T-1)**.

8.3.6.7. Missing, removed and/or broken tools/items will be documented in the TCMax® if they cannot be replaced immediately. **(T-1)**.

8.3.6.7.1. In addition, for dispatchable CTKs, dispatchable support equipment, and dispatchable special tools containing multiple parts, missing, removed and/or broken tools/items will be documented on a MAJCOM/locally generated form, or on the hard copy MIL. **(T-1)**.

8.3.6.7.1.1. If a MAJCOM/locally generated form is used, the form will be kept with each dispatchable CTK, dispatchable support equipment and dispatchable special tools. **(T-1)**.

8.3.6.7.1.2. Pencil/pen may be used for hard copy MIL documentation and erased/lined through when cleared.

8.3.6.7.2. The EID will be removed from any permanently removed item/tool. **(T-1)**.

8.3.6.7.3. A permanently removed (without planned replacement) item/tool constitutes a change to the inventory and requires a new MIL.

8.3.6.7.4. The CTK custodian has the authority to interchange "like" (form, fit, function) items.

8.3.7. Equipment and accessories that do not present a FOD potential and will not leave the work center, support section, or tool room, need not be included in a CTK; however, this equipment must have designated storage locations established. **(T-1)**.

8.3.7.1. Designated locations may be work areas or stations.

8.3.8. The CTK Custodian will establish designated locations for test equipment and common accessories (such as, waveguides, attenuators, fittings, cables, adapters) that are not part of a CTK. **(T-1)**.

8.3.8.1. As a minimum, designated locations will be labeled to identify the contents. **(T-1)**.

8.3.8.2. Industrial shop machinery accessories/attachments (example, blades, arbors, chucks, gears) need not be controlled as tools; however, these items will be maintained in designated storage locations for accountability. **(T-1)**.

8.3.8.2.1. As a minimum, storage cabinets/drawers will be labeled to identify the contents. **(T-1)**.

8.3.9. Tools/expendable items used for titanium engine blade blending or oxygen system maintenance will be kept in special purpose kits separate from other tools. **(T-1)**.

8.3.9.1. In addition to normal CTK identification, the titanium engine blade blending kits will be marked “For Titanium Engine Blade Blending Only”. **(T-1)**.

8.3.9.2. In addition to normal CTK identification, oxygen system maintenance kits will be marked “For Oxygen System Use Only”. **(T-1)**.

8.3.10. Discard removable (slide on) pocket clips and spare parts from tools when possible (flashlights, continuity testers, small screwdrivers) prior to placement in tool kits. **(T-1)**.

8.3.10.1. Do not disassemble or damage tools for sole purpose of removing clips (example, tape measures, rubber switch guards).

8.3.11. Tools not controlled through CTK procedures are NOT authorized on the flightline, or in any maintenance area (for example, personal Mini Maglite® flashlights, Leatherman®, Buck Knives®). **(T-1)**.

8.3.11.1. Units will mark and control equipment that a workcenter assigns/issues to an individual IAW MAJCOM supplements. **(T-1)**.

8.3.11.2. Personally-purchased tools are not authorized. **(T-1)**.

8.3.12. Flashlights, lanterns, portable lighting devices and light sources will conform to the requirements of TO 00-25-172 when used during servicing operations; TO 1-1-3 when used during fuel cell maintenance; and AFMAN 91-201 when used in explosive environments. **(T-1)**. **Note:** Aircraft and equipment TOs may dictate additional restrictions.

8.3.13. **(Added-AFMC)** Tool Replacement Procedures. A stock of spare tools is authorized to replace broken, worn, or missing tools to prevent unnecessary work delays. Spare and consumable tools are highly pilferable and pose an increased fraud, waste, and abuse potential. **(T-2)** MXG/CC (MXW/CC or equivalent functional authority for maintenance) will establish strict controls to include the following:

8.3.13.1. **(Added-AFMC)** Inventory and document all replacement Spare tools quarterly. **(T-2).**

8.3.13.2. **(Added-AFMC)** Replacement spare tools will not be issued until the receipt of the unserviceable tool or AFMC Form 310 has been received. **(T-2).**

8.3.13.3. **(Added-AFMC)** Replacement spare tools must be marked with the CTK WWID prior to issue. **(T-2).**

8.3.13.4. **(Added-AFMC)** If previously issued serviceable spare tools are to be used as replacement tools, completely de-etch any prior assigned markings before placing in spare tools storage. **(T-2).**

8.4. TMDE Management Guidelines. Support Sections will designate a TMDE Monitor who will act as the focal point with the designated servicing PMEL (whether on-base or off-base) for managing the TMDE calibrations requirements for the owning work center. **(T-1)**. The TMDE Monitor will:

8.4.1. Establish procedures for turn-in and pick-up of TMDE requiring calibration. **(T-3)**.

8.4.2. Coordinate emergency calibration requirements. **(T-3)**.

8.4.3. Review quarterly TMDE schedules and annual master identification (ID) lists within 5 duty days of receipt from servicing PMEL. **(T-3)**.

8.4.3.1. Forward any corrections to the servicing PMEL within 3 duty days to have the PMEL Automated Management System/MIS updated. **(T-3)**.

8.4.4. Take necessary actions to minimize the late delivery of TMDE for scheduled calibration. **(T-3)**. Servicing PMEL will notify OWC of overdue TMDE under established procedures. **(T-3)**.

8.4.5. Use PMEL Automated Management System or equivalent MIS (as coordinated with supporting PMEL) to control TMDE processed for maintenance. **(T-3)**.

8.4.6. Ensure TMDE submitted for calibration has all required documentation complete, the AFTO Form 350 (as applicable) provides adequate malfunction description and accessories/ items required for calibration accompany the TMDE to include batteries (as applicable). **(T-1)**.

8.4.7. Ensure classified TMDE is protected IAW AFI 16-1404. **(T-1)**.

8.4.8. Ensure TMDE shipped off base for calibration or repair and return is shipped by traceable means and IAW AFI 24-602V2. **(T-1)**.

8.4.8.1. The TMDE Monitor will maintain a file consisting of all supporting documentation for each type of shipment. **(T-1)**.

8.4.8.2. Safeguard any IUID marks during calibration/TMDE activities to the extent possible. In the event the UII is damaged during calibration activities, the TMDE Monitor will notify the responsible Equipment Custodian and/or EAE to replace the mark with the same UII. **(T-1)**.

8.4.9. For deployment purposes, ensure equipment, tools, and HAZMAT items are properly identified, prepared, and documented IAW AFI 10-403. **(T-1)**.

8.5. Tool Accountability. Flight CC/SUPT and Section NCOICs/Chiefs, through CTK Custodians, are responsible for tool and equipment accountability and control (knowing where tools are and who has responsibility for them). When a person signs for a tool or piece of equipment, they are considered the user and accountable for the item until it is returned to the tool room and accountability transfers back to the CTK Custodian (through a representative or tool room employee).

8.5.1. All units must use TCMax® for accountability and control of tools and equipment. **(T-1)**. Contractors and MEOs are not required to use TCMax® unless specified in the Performance Work Statement/Statement of Work. **Note:** Refer to **Paragraph 8.1** for exceptions.

8.5.1.1. Units are required to electronically back up TCMax® at least once a month. **(T-1)**.

8.5.1.1.1. This backup must be kept physically and electrically separate from the computer that houses the tool control database. **(T-1)**.

8.5.1.2. Units will use TCMax® to:

8.5.1.2.1. Track the issuance and receipt of all assigned tools, equipment, tool kits, HAZMAT items, TOs (does not apply to TOs, equipment and HAZMAT kept in a shop and not dispatched). **(T-1)**.

8.5.1.2.1.1. HAZMAT items issued for one time use (oil cans, hydraulic cans, mixing compounds) are supply items and do not have to be tracked in TCMax®. However, HAZMAT and supply procedures will be followed. **(T-1)**.

8.5.1.2.2. Track authorizations/restrictions for special tools/equipment (by individual). **(T-1)**.

8.5.1.2.3. Track CTK and Support Section inspections. **(T-1)**.

8.5.1.2.4. Track spare, lost, damaged, and/or removed tools. **(T-1)**.

8.5.1.2.5. Develop and manage tool/equipment inventories. **(T-1)**.

8.5.1.2.6. Develop and manage deployment kits (import/export). **(T-1)**.

8.5.1.3. If TCMax® is not available (such as at a deployed location), units will use the AF Form 1297, Temporary Issue Receipt, a MAJCOM, or locally approved form for accountability and control of CTKs, equipment, and tools. **(T-1)**.

8.5.1.3. **(AFMC)** If an automated system is not available, units may use AFMC Form 62, *CTK Inventory and Control Log*, to sign in and out CTKs/TKs and use AFMC Form 61 to document Missing/Removed tools.

8.5.2. The CTK Shift Supervisor will account for all dispatchable/decentralized CTKs, tools, and equipment at the beginning and end of each shift. **(T-1)**.

8.5.2. **(AFMC)** If an automated system is not available, units may use AFMC Form 62 or computer generated equivalent to document separate shift inventories.

8.5.2.1. Shift inventories must be documented by both outgoing and incoming personnel. **(T-1)**.

8.5.2.2. CTKs present during tool room shift inventories do not need to be opened for inventory.

8.5.3. At least annually or when the CTK Custodian changes, conduct a comprehensive inventory of all dispatchable/decentralized tools, non-Custodian Authorization/Custody Receipt Listing (CA/CRL) equipment, and CTKs. **(T-1)**.

8.5.3.1. The purpose of this inventory is to perform an extensive inspection of all tools and non-CA/CRL equipment, to include condition, identification markings, and accuracy of the MIL/CRL Supplemental Listing.

8.5.3.2. CTK Custodians will ensure all tools are inspected for serviceability IAW TO 32-1-101, Use and Care of Hand Tools and Measuring Tools. **(T-1)**.

8.5.3.3. CTK Custodians will document these inventories and maintain the most current inventory. **(T-1)**.

8.5.4. Users will perform a visual inventory of all dispatchable/decentralized CTKs when issued for use, at the completion of each job or tasks, and when returned to the tool storage facility. **(T-1)**.

8.5.4.1. Users will accomplish a CTK inventory prior to operation of any aircraft or equipment when maintenance actions are performed (such as, engine run, landing gear retraction, flight control operational checks). **(T-1)**.

8.5.4.2. Users will perform an immediate and complete inventory of all CTKs when returning to the work area after sheltering for real-world/exercise events. **(T-1)**.

8.5.4.3. Users will ensure dispatchable tools, equipment, eTools and CTKs are locked and/or secured when left unattended. **(T-1)**.

8.5.5. eTools: Units will use the following procedure to maintain positive control of assigned eTools:

8.5.5.1. Manage eTools IAW TO 00-5-1, and this instruction. **(T-1)**.

8.5.5.2. Track dispatchable eTools in TCMax®. **(T-1)**.

8.5.5.3. Ensure only serviceable eTools with current technical data are available for checkout, and any missing plugs/covers/doors are documented IAW **Paragraph 8.3.6.7** **(T-1)**.

8.5.5.4. Make maximum use of eTool warranties. **(T-1)**.

8.5.5.5. Ensure eTools are used for official and authorized purposes IAW TO 31S5-4-etool, 17 & 33 Series instructions, MAJCOM guidance, and this AFI. **(T-1)**.

8.5.5.5.1. Not install unauthorized files or software (such as, games, mp3s). **(T-1)**.

8.5.5.5.2. Not use unauthorized external media devices to retrieve data from removable hard drives. **(T-1)**.

8.5.5.6. Coordinate with the local Cybersecurity Liaison and/or Information System Security Managers to identify publish local guidance on restrictions for the use of eTools/PEDs in classified processing areas. **(T-1)**.

8.5.5.7. Establish procedures for shipping TOs, eTools, and required support equipment needed to ensure eTools availability to support mobility and deployed operational requirements. **(T-1)**.

8.5.5.8. If applicable, units will update Defense Integration and Management of Nuclear Data Services (DIAMONDS) hardware and status IAW TO 11N-3150-8-1, USAF DIAMONDS Policy and Procedures. **(T-1)**.

8.5.5.8.1. For accountability, DIAMONDS laptops and hardware must be managed and tracked in TCMax®, but do not require placement on unit equipment account IAW TO 11N-3150-8-1. **(T-1)**.

8.6. Tool and Equipment Marking and Identification.

8.6.1. To ensure tool rooms have unique identifiers, wings (or equivalent) must ensure other units within the same wing or Personnel Assignment Symbol (PAS) code do not duplicate the WWID. **(T-1)**. MAJCOMs/ANG will develop, sustain, and review annually a complete listing of all the WWID utilized within their MAJCOM/ANG. MAJCOMs will update AF/A4LM with WWID changes as they occur. Reference the AF/A4LM SharePoint® site: **https://usaf.dps.mil/sites/haf-a4/A4L/AF_A4LM/Policy/SitePages/Home.aspx**

8.6.1.1. All units must permanently mark their tools and equipment with the standard EID. **(T-1)**. GSU may use the parent wing EID. Replacement spare tools stored in the tool room do not need to be etched until placement in a specific CTK.

8.6.1.2. The EID will consist of nine characters (numbers/letters) of which the first four characters will be a unique WWID code. **(T-1)**.

8.6.1.2.1. The WWID identifies the base (first and second character), unit (third character), and shop (fourth character). The remaining five characters are available for tool/CTK equipment numbering.

8.6.1.2.1.1. The first two characters of the WWID in the EID are based on the wing/unit PAS base code. Multiple wings (or equivalent) at the same base (example, ANG, AFR, and RegAF) must have different WWID codes. **(T-1)**.

8.6.1.2.1.2. The third and fourth characters designate the unit and shop by using unique/distinguishable characters. To ensure tool rooms have unique identifiers, wings (or equivalent) must ensure other units within the same wing or PAS code do not duplicate the first 4 characters of the EID. **(T-1)**.

8.6.1.2.1.3. Request additional "base" code information from AF/A4LM at: **usaf.pentagon.af-a4.mbx.a4lm-m-maintenance-policy@mail.mil**, DSN 222-2345/2346.

8.6.1.3. The unit will establish the remaining five characters (any combination of numbers/letters) for CTKs, tools, and dispatchable equipment identification. **(T-1)**.

8.6.1.4. Units must place the 9-digit EID on all CTKs, tools not assigned to a box, and dispatchable equipment that is of sufficient size. **(T-1)**.

8.6.1.4.1. The 9-digit EID must be placed on the outside of dispatchable CTKs. **(T-1)**.

8.6.1.4.2. Tools located inside the tool box may be marked with less than 9-digits but must contain the 4-digit WWID and will have identifying character(s) that ties the tool back to the CTK. **(T-1)**. For example, tools inside an assigned dispatchable CTK "U6JG00001" may be marked "U6JG1." Units may affix non-metallic barcode labels on tools to prevent re-etching as long as the use of the tool and its work environment does not normally result in excessive damage to the label making it unreadable.

8.6.1.4.3. Tools will be marked with the most current EID. **(T-1)**.

8.6.1.4.4. All previous CTK identifiers will either be removed or marked out (this does not include PMEL markings). **(T-1)**.

8.6.1.4.5. Small tool sets and/or items that cannot be marked as described in **Paragraph 8.3.6.6** above (such as drill bits, allen wrenches in sets, apexes) will be maintained in a container marked with the EID and an identifying character(s) that ties the tool back to the CTK along with the number of tools contained. **(T-1)**.

8.6.1.4.5.1. The container is counted as one of the items.

8.6.1.5. MXG/CCs may require use of the EID in addition to AFTO Form 66, *TMDE Bar Codes (Polyester Film)*, for TMDE routinely (example, once per week) dispatched from a work center or use of the AFTO Form 66 alone.

8.6.1.6. For items that physically or mechanically check tolerances that require calibration, do not etch, or stamp an EID in any manner that will affect calibration or the ability to calibrate. **(T-1)**.

8.6.1.6.1. If marking is in question consult TO 00-20-14 and/or PMEL to validate applicable marking criteria.

8.6.2. Permanently mark (by etching or other means) grease guns, dispensing cans, spray bottles, pump oilers, and similar containers with the type of grease, fluid, or other liquids and Military Specification (MILSPEC) of the contents. **(T-1)**. If the MILSPEC is subdivided into Grades, Classes, or Types, include that info on the permanent marking. **(T-1)**.

8.6.2.1. If no MILSPEC exists, the item will be marked with the manufacturer's name, part number/NSN from the applicable Safety Data Sheet. **(T-1)**. 8.6.2.2. Keep hoses and fittings separate for each type of grease. **(T-1)**.

8.6.2.2. If containers are used to hold or apply substances classified as hazardous materials, ensure labeling requirements are IAW AFI 90-821, *Title 29 Code of Federal Regulations 1910.1200(f), Occupational Safety and Health Standards, Toxic and Hazardous Substances*. **(T-0)**.

8.6.3. Prior to etching tools and equipment, consult applicable technical order to ensure no special circumstances apply for the item being etched (such as, fiberglass handled hammers are etched IAW TO 32-1-101 and safety glasses. **(T-1)**.

8.6.4. CTKs, tools, and dispatchable equipment that may possess a unique serial/tracking number must be marked with an EID number. **(T-1)**.

8.6.4.1. If the item cannot be marked, etched, or stamped, annotate the additional designator on the CTK contents list. **(T-1)**.

8.6.5. Items that are assembled and are not intended to be disassembled during use, require only one mark/etch/stamp and one entry in the MIL (such as, scribes, flashlights, grease guns, feeler gauges). **(T-1)**.

8.6.6. Remove the EID from unserviceable tools and tools removed from the CTK (with the exception of warranty tools where removal of EID may void the tool warranty) and update TCMax® and the MAJCOM/locally generated form or hard copy MIL accordingly. **(T-1)**.

8.6.7. Ensure all tools which are accountable on a CA/CRL must be marked with a UII. **(T-1)**. Units need to safeguard any IUID marks. In the event the UII is damaged, notify the responsible Equipment Custodian and/or EAE to replace the mark with the same UII.

8.7. Locally Manufactured, Developed, or Modified Tools and Equipment. All locally manufactured, developed, or modified tools and equipment used on aerospace equipment must be approved by the MXG/CC, their equivalent, or a designated representative and meet the requirements described in **Chapter 9** **(T-1)**.

8.7.1. This procedure does not apply to tools and equipment authorized for local manufacture in MDS specific technical data or equivalent engineering approved document. QA will coordinate on all requests for approval and use of locally manufactured, developed, or modified tools or equipment. **(T-1)**.

8.7.2. Work centers will review items and requirements every two years for applicability and current configuration. **(T-1)**. See **Chapter 6** and **Chapter 9** for additional guidance.

8.7.3. Weapons loading, maintenance and armament systems locally-designed equipment must be coordinated through the WWM. **(T-1)**. Weapons loading, maintenance and armament systems locally-designed equipment must meet the following requirements:

8.7.3.1. In the event munitions/armament LME, is not included in technical data or listed on the MMHE Focal Point web site **https://cs2.eis.af.mil/sites/10134/sitepages/home.aspx**, contact the MMHE Focal Point AFLCMC/EBDW, 615 Apalachicola Road, Suite 101, Eglin AFB, FL 32542-6845 to establish/validate LME disposition.

8.7.3.1.1. Units must use MMHE Focal Point-designed munitions/armament LME for new procurements if a design exists and fills the requirement. **(T-1)**.

8.7.3.1.1.1. Munitions/armament LME is specialized equipment designed to interface with or support munitions or armament suspension equipment (such as, tools, handling dollies, storage racks, maintenance stands, transport adapters). All munitions/armament LME contained on the MMHE Focal Point web site meets applicable AFMAN 91-203 and USAF standards, and is approved for local manufacture and use at unit level AF-wide. Drawing packages for these items are available to the unit via the MMHE Focal Point website.

8.7.3.1.1.2. Munitions/armament LME specifically designed to interface with or support munitions that are not contained in technical data or on the MMHE Focal Point website (such as, hardened/protective aircraft shelter missile racks, Y-stands, munitions chocks, specialized tools) must be coordinated at unit level and forwarded to the MAJCOM Functional Manager for coordination, evaluation or both. **(T-1)**.

8.7.3.1.1.2.1. If the MAJCOM Functional Manager determines the item has AF utility, the drawings shall be forwarded to ACC/A4WC for review and addition to the MMHE Focal Point Master Project List that results in formal development and placement onto the MMHE Focal Point website.

8.7.3.1.1.3. Munitions/armament LME not designed to interface with or support munitions that are not contained in technical data or on the MMHE Focal Point web site must be approved by QA. **(T-1)**.

8.7.3.1.1.3.1. Units are encouraged to forward any such approved LME for possible inclusion on MMHE Focal Point web site by sending an approved drawing package to the MAJCOM Functional Manager for coordination/evaluation.

8.7.3.1.2. All LME must meet applicable AFMAN 91-203 and USAF standards. **(T-1)**.

8.7.3.1.3. All equipment designated for use with nuclear weapons test and handling must meet requirements in AFI 91-103. **(T-1)**.

8.7.3.1.4. All weapons loading, maintenance and armament systems LME must be maintained and inspected for serviceability on a regular basis IAW applicable TO 00-

20-series, TO 35D-1-2, *Maintenance Instructions WIPB-Miscellaneous Munitions Handling and Support (Munitions Related)*, and TO 35D-2-2 *Munitions Materiel Handling Equipment Miscellaneous And Locally Manufactured – Armament Related*. **(T-1)**.

8.7.3.1.4.1. AFTO Form 244, or equivalent, must be maintained for all LME items (racks, stands, adapters) except hand tools. **(T-1)**.

8.7.3.1.4.2. Equipment without technical data must, as a minimum, be inspected every 180 days for corrosion, physical defect, and lubrication as required. **(T-1)**.

8.8. Tool Room Operations and Security.

8.8.1. Operations. Tool rooms will be set up to ensure accountability. **(T-1)**.

8.8.1.1. Procedures will be established to ensure custodial control. **(T-1)**.

8.8.1.2. Tools will not be issued individually from dispatchable CTKs. **(T-1)**.

8.8.1.2.1. When a recurring need exists for common tools to be issued individually, (such as, hammers, screwdrivers, pliers, drills, wrenches) individual issue bins/drawers may be established as a CTK within the tool room. **(T-2)**.

8.8.1.3. Process reports for tools that are lost, damaged, or destroyed, due to neglect IAW AFI 23-101. **(T-1)**.

8.8.2. Security.

8.8.2.1. The tool room must be capable of being locked and afford protective measures such as monitoring, 24-hour coverage, or controlled key access. **(T-1)**.

8.8.2.1.1. When all CTKs are not capable of being secured in the tool room, the Section NCOIC/Chief will design a process to prevent the unauthorized use or access to tools and equipment. **(T-1)**.

8.8.2.1.2. Due to space and facility limitations, it may not be possible to store oversized tool kits in the tool room.

8.8.2.2. Locks will be used on tool kits stored outside the CTK to provide a physical barrier to opening the container lid, drawer or door and prevent the unauthorized removal of tools. **(T-1)**.

8.8.2.2.1. Locks are not required on tools and equipment that are stored within secured tool rooms or work centers.

8.8.2.2.2. Tools and equipment will never be secured (locked) to the exterior of an aircraft. **(T-1)**.

8.8.2.2.3. Tool kits located within high traffic, controlled movement areas or that could limit aircraft movement or be exposed to jet blast are required to be locked when unattended/not in use and moved to un-obstructive/exposed location but do not need to be secured to another object if none are readily available. **(T-1)**.

8.8.2.2.3.1. Alert Aircraft in Protection Level Areas 1, 2 and Alert Status Aircraft in Protection Level Area 3. CTKs in these areas that are directly supporting alert status aircraft do not have to be locked when unattended and not in use as long as

they are inventoried at the beginning of each shift, after each maintenance task, and at the end of each shift.

8.9. Lost Item/Tool Procedures.

8.9.1. Limit authorization to clear Red X's when an item/tool cannot be located to no lower than Operations Officer/MX SUPT. **(T-1)**.

8.9.2. Supervisors need to ensure all assigned personnel are familiar with lost item/tool procedures. If an item/tool or a portion of a broken item/tool is discovered missing, the following procedures apply:

8.9.2.1. The person identifying the missing item/tool will search the immediate work area for the item/tool. **(T-1)**.

8.9.2.1.1. If not found, after completing an initial search the individual will notify the expediter/Pro Super or equivalent. **(T-1)**.

8.9.2.2. Place a Red X in the aircraft or equipment forms of all affected aircraft or equipment with a description of the item/tool and a specific, last known, location of the item/tool. **(T-1)**.

8.9.2.3. Expediter/Pro Super or equivalent will immediately notify the Flight CC/SUPT, Support Section, MOC, and QA. **(T-1)**.

8.9.2.3.1. Initiate a thorough search for the item/tool. **(T-1)**.

8.9.2.3.2. Initiate the lost tool report if tool is not located during initial search. **(T-1)**.

8.9.2.3.3. **(Added-AFMC)** Initiate AFMC Form 310, Lost/Found Item Report, if the item is not found within two hours of start of search. Maintain reports in QA section for two years. **(T-2).**

8.9.2.4. If it is suspected that the item/tool has fallen into an inaccessible or unobservable aircraft area, perform a NDI or use borescope equipment to locate the lost item/tool. **(T-1)**.

8.9.2.4.1. If the item/tool is in an inaccessible area that poses no FOD threat and the action is to leave the item/tool in place, the x-ray (or equivalent) with the identification of the exact item/tool location and copies of all information concerning the lost item/tool are maintained in the aircraft historical file until the item/tool is recovered. **(T-1)**.

8.9.2.5. If at any time during the investigation the item/tool is found, notify the Flight CC/SUPT, Support Section, MOC, QA, expediter, Pro Super or equivalent, and the owning work center. **(T-1)**.

8.9.2.5.1. If the item/tool is found, but is inaccessible, the Operations Officer/MX SUPT may explore other possible actions to include having the unit or a DFT disassemble the aircraft to remove the item/tool.

8.9.2.5.1.1. If the aircraft MDS is one that has a PDM or is scheduled for depot modification, any inaccessible lost item/tool will be listed with location on the AFTO Form 345, Aerospace Vehicle Transfer Inspection Checklist and Certification, for removal by the depot. **(T-1)**.

8.9.2.6. The Operations Officer/MX SUPT will determine when the search for the lost item/tool may be discontinued. **(T-1)**. If the item/tool is not found:

8.9.2.6.1. Notify the MOC and the MXG/CC when the search for the lost item/tool has been discontinued. **(T-1)**.

8.9.2.6.2. Ensure lost item/tool report is completed IAW locally established procedures. **(T-1)**.

8.9.2.6.3. If applicable, ensure the TCMax® is documented IAW **Paragraph 8.3.6.7** **(T-1)**.

Chapter 9

MATERIEL MANAGEMENT SUPPORT

9.1. General. Material management plays a critical role in optimizing mission generation capabilities. Although assigned to LRS, all DMS personnel must be integrated into daily mission generation operations both at home station and deployed. The critical nature of direct interaction between maintenance and materiel management activities at the point of maintenance provides units direct access to materiel management SMEs to accurately identify, communicate, acquire or disposition materiel management support necessary to maximize combat capability. MXG/CC and MSG/CC will coordinate to ensure direct mission generations support focuses on readiness and the unit's ability to execute daily and deployed flying operations simultaneously. **(T-1)**. This **Chapter**, coupled with AFI 23-101, provides the minimum materiel management support requirements necessary to provide the best possible opportunity for success in meeting mission generation requirements. The AF has consolidated materiel management support under the AF Sustainment Center. The AF Sustainment Center provides fleet-wide supply support to all AF weapon systems and leverages consolidated repair facilities and ALCs capability to optimize weapon system availability.

9.2. Decentralized Materiel Support. Decentralized Materiel Support personnel coordinate maintenance and materiel management actions and manage supply transactions for the MXG. The duty location for DMS personnel is the applicable maintenance unit as agreed upon by the MXG and base 2S0 functional manager. Personnel rotations, as determined by the base 2S0 functional manager will be accomplished with consideration of operational, career development, and training requirements. **(T-1)**.

9.2.1. In units with Decentralized Materiel Support personnel, the LRS Superintendent exercises control and career-field development opportunities for Decentralized Materiel Support (2S0XX) personnel. **(T-1)**.

9.2.2. In units/work centers directly supported by Decentralized Materiel Support personnel, the Logistics Readiness Squadron Materiel Management Flight is responsible for ensuring materiel management support roles and responsibilities listed are completed IAW 23-series publications.

9.2.3. LRS Superintendent will ensure complete DMS coverage of MXG duty periods, to include weekend duty. **(T-1)**.

9.2.4. At a minimum, DMS personnel will provide the following support functions to the maintenance unit: monitor and track assets in the repair cycle, resolve supply support problems, and report aircraft parts status and changes in base level repair capability to maintenance supervision. **(T-1)**.

9.2.4.1. Decentralized Materiel Support personnel also support maintenance in processing issue requests, researching sources of supply, entering manual requisitions (part number only), updating exception code lists, and resolving other peculiar maintenance supply problems. **(T-1)**.

9.2.4.2. DMS personnel will manage processes, in addition to those previously described, such as parts ordering, backorder review and validation, Readiness Spares Packages, and TNB. **(T-1)**.

9.3. Supply Discipline. Supply discipline is the responsibility of all military and civilian personnel regardless of grade or position. Personnel at all levels need to ensure the practice of good supply discipline IAW AFI 23-111.

9.4. Readiness Spares Package Review. Maintainers play a critical role in the annual Readiness Spares Package review process. This role includes active maintenance participation in the base level validation process conducted by the LRS and their MAJCOM during the annual Readiness Spares Package pre-review process in preparation for the Weapon System Program Manager final review. Close maintenance-materiel management collaboration is essential to ensure RSPs are properly sized to support contingency maintenance requirements. See AFMAN 23-122 for further details.

9.5. Bench Stock. Flight CCs/SUPT and/or Section NCOICs/Chiefs will determine the contents of their bench stock IAW qualification criteria in AFMAN 23-122. **(T-1)**. Examples of bench stock items include: nuts, bolts, cotter keys, washers, resistors, capacitors, light bulbs, sealants and batteries. Bench stock levels are managed and based predominantly on consumption. Monthly and semi-annual bench stock listings are provided by the LRS/DMS. A thorough review of these listings is extremely important to ensure that bench stock supports the mission efficiently and economically.

9.5.1. Bench stock assets are organizationally purchased and therefore organizationally owned. Appointment of DMS personnel as bench stock monitors must be agreed upon by the applicable Squadron Superintendents.

9.5.2. Mark bins containing 50 percent or less of the authorized quantity to facilitate monthly inventories. **(T-1)**. Do not include items coded TCTO, unacceptable for AF use and critical in bench stock. Controlled Item Code S and C may be in bench stock with MAJCOM approval. Other controlled Item Codes are authorized with written approval from Unit Commander. See AFMAN 23-122 for additional information.

9.5.3. Work center supervisors will:

9.5.3.1. Semi-annually complete a bench stock joint review with the Customer Support Liaison Element, Materiel Control. **(T-1)**.

9.5.3.1.1. During these reviews, special emphasis needs to be given to items with no demands in the past year and items with excessive quantities not supported by demands. The continuance of stocking such items is the exception and not the normative process. See AFMAN 23-122 for further details.

9.6. Consumable Readiness Spares Package. The Consumable Readiness Spares Package process provides requirement and asset visibility, has automated transfer and deployment procedures, has the capability to provide the correct priority and project-coded replenishment requisitions, and eliminates redundant requirements. Additionally, Consumable Readiness Spares Package procedures provide MAJCOMs with a standard process to support consumable item requirements during contingency operations. Refer to AFMAN 23-122 for Consumable Readiness Spares Package procedures and options.

9.7. Shop Stock. Shop stock includes gas cylinders, random length bar stock, sheet metal, plastic, fabric, electrical wire, and similar items not normally included in bench stocks. Maintain shop stock for day-to-day operations. Monitor shop stock to prevent materiel from becoming

excessive or outdated. Shop stock should not normally exceed 90-days usage, or the unit of issue or unit pack, whichever is greater. Store shop stock near/adjacent to bench stock items, if practical, but do not mix them together. Clearly identify materiel as "Shop Stock" and label them with noun, national stock number or part number, unit of issue, and shelf-life, if applicable.

9.8. Operating Stock. Operating stock includes connector dust covers, hydraulic line caps/plugs, and similar items that are normally recovered after use and re-used. Store operating stock near/adjacent to bench stock items, if practical, but do not mix them together. Monitor operating stock to prevent it from becoming excessive or outdated. Retain partially used bench stock items in bench stock and not in operating stock. Identify, tag, and turn in items with no forecasted use IAW AFI 23-101. Clearly identify items as "Operating Stock" and label them with noun, national stock number or part number, unit of issue, and shelf-life as applicable.

9.9. Work Order Residue. Work order residue includes expendable bit/piece items left over from maintenance work orders or bench stock deletions. Store work order residue near/adjacent to bench stock items, if practical, but do not mix them together. Ensure excesses are consolidated for turn-in to LRS at least annually. Clearly identify items as "Work Order Residue" and label them with noun, national stock number or part number, unit of issue, and shelf-life as applicable. Control all work order residues used on or around aircraft, uninstalled engines, and AGE.

9.10. Adjusted Stock Levels. Adjusted stock levels are used when the demand level or consumption is inadequate to support the requirement. A single occurrence of a mission limiting status is not sufficient reason to establish an adjusted stock level but should result in a LRS/materiel management activity review of demand data for accuracy. The using work center, with assistance from LRS/materiel management activity, will prepare the request IAW AFMAN 23-122 and provide adequate justification (such as, seasonal materiel requirements, long lead-time items, infrequent use components that cause an NMC condition and result in a new procurement or excessive lead-time to restock). Route the request through the applicable Squadron Operations Officer/MX SUPT for approval prior to submitting to LRS/materiel management activity. Using work centers will maintain a master file of approved adjusted stock level items and follow-up on all requests until completed. **(T-1)**.

9.11. Shelf-life Items. Using work centers will control the quantity and inspect (Type I and Type II) shelf-life items kept in unit bench stock, operating/shop stock and work order residue IAW AFMAN 23-122. **(T-1)**. Personnel managing bench, shop, or operating stocks will:

9.11.1. Identify serviceable shelf-life items/locations with a colored and/or highlighted label that clearly states the items expiration date. **(T-2)**.

9.11.2. Check expiration dates on issued items and do not accept outdated items. **(T-2)**. Refer to AFMAN 23-122 for outdated and/or unserviceable shelf-life items.

9.11.3. Not open shelf-life containers until needed and use the oldest items first. **(T-2)**.

9.11.4. Ensure shelf-life material stored in other than original containers are marked with original shelf-life expiration codes. **(T-2)**.

9.11.5. Recycle, reclaim, or turn-in for disposal, shelf-life items which are loose in the bin and expiration dates cannot be determined. **(T-2)**.

9.12. Equipment Items. Flight CCs/SUPTs and/or Section NCOICs/Chiefs will review equipment items needed for mission accomplishment IAW AFI 23-101. **(T-1)**.

9.12.1. Equipment Custodians will contact the EAE for assistance in researching and preparing documents for gaining authorizations and ordering equipment items IAW AFI 23-101. **(T-2)**. Refer to AFMAN 23-122, for the required procedures to order and deploy equipment items.

9.13. Special Purpose Recoverable Authorized Maintenance (SPRAM). SPRAM assets are fault isolation spares, shop standard spares, training spares, -21 TO spares (AME), test station spares, and stand-alone spares. These assets are Expendability, Recoverability, Reparability Code (ERRC) XD/XF items, which are controlled and managed as in-use supplies.

9.13.1. Flight CCs/SUPTs and/or Section NCOICs/Chiefs will review all SPRAM authorizations annually and certify as valid IAW AFI 23-101, AFMAN 23-122, and AFI 21-103. **(T-1)**.

9.14. Supply Assets Requiring Functional Check, Calibration, or Operational Flight Programming. Maintenance sections must identify items requiring functional checks, calibration, or operational flight programming prior to use. **(T-3)**.

9.14.1. Maintenance sections will prepare a list of items, (including the repair section's organization and shop code) for items requiring functional checks, calibration, or operational flight programming. **(T-3)**.

9.14.1.1. The list will be routed through the Operations Officer/MX SUPT to the LRS. **(T-3)**.

9.14.1.2. This list shall be updated/validated IAW AFMAN 23-122. **(T-3)**.

9.14.2. The LRS/management materiel activity issues the items to repair sections when assets are initially received on station, when functional checks, calibration, or programming is due or when serviceability is doubtful.

9.14.3. If a Part issues requiring a functional check, ensure it is not restricted in the weapon system -6 TO. Refer to TO 00-20-3 for functional check and frequency requirements.

9.15. Time Compliance Technical Order (TCTO) Kit Procedures. TCTO kit management is a shared responsibility between maintenance and supply IAW TO 00-5-15 and AFI 23-101.

9.15.1. Initiate requests for kits, parts and special tool requirements through LRS as outlined in **Chapter 14**.

9.15.2. Transfer TCTO kits with aircraft or equipment. AFMAN 23-122, TO 00-5-15, and TO 00-5-1 contain detailed guidance for the transfer of TCTO kits.

9.15.3. Retain TCTO kits for aircraft returning to the unit for TCTO compliance.

9.16. Supply Points. Supply points may be established within individual work centers when time or resources required to move items dictates the need to do so.

9.16.1. Storage space for the supply points is provided by the supported work center.

9.16.2. Management of the supply point processes will be agreed to and documented by participating group commanders. **(T-1)**. Participating group commanders will require appointment of supply point monitors to manage and account for supply point assets as part of their agreement. **(T-1)**. LRS Materiel Management Activities will maintain overall accountability and control of supply point assets. **(T-1)**.

9.16.3. Supply points must be reconciled semi-annually by the Supply Point Monitor. **(T-1)**.

9.16.3.1. One of the semiannual reconciliations will be done at the same time as the annual supply point inventory IAW AFI 23-101. **(T-1)**.

9.17. Local Manufacture. Local manufacturing is an essential part of maintenance unit support. The applicable end-item TOs identify items subject to local manufacture and specific procedures for processing are in AFMAN 23-122.

9.17.1. MXG/CCs will publish directives outlining procedures covering the manufacture of items source coded local manufacture IAW **Chapter 2**, **Chapter 4**, and **Chapter 8** **(T-1)**.

9.17.2. MXG directives as a minimum will include:

9.17.2.1. Procedures that prevent abuses and specify coordination requirements as a minimum coordination will include: QA, EAE, office Wing/Base Safety and indorsement by the approval authority. **(T-1)**.

9.17.2.2. Identifying the approval authority for local manufacture requests. **(T-1)**.

9.17.2.3. Identifying drawing, sample, technical data and DD Form 1348-6, *DoD Single Line Item Requisition System Document*, source requirements as required. **(T-1)**.

9.17.2.3.1. Ensure guidance identifies that drawings are obtained from the appropriate repository (such as, Engineering Data Service Center or JEDMICS).

9.17.2.4. Establishing coordination process for all the appropriate fabricating sections to determine the bits and pieces required to manufacture the item. **(T-1)**.

9.17.2.4.1. Coordinating bit and piece parts requirements and availability with the LRS/DMS.

9.17.2.5. Identifying all work centers that have action on the AFTO Form 350 for items requiring multiple section processing. **(T-1)**.

9.17.3. **(Added-AFMC)** Efforts should be made to purchase items in-lieu of local manufacture if practical when the item has been specifically designed and manufactured for the intended use/purpose.

9.18. DIFM Management.

9.18.1. DIFM inputs are critical to recording and getting credit for proper repair cycle times.

9.18.2. DIFM status codes are broken down into three categories; delayed maintenance time, repair time, and AWP time. Repair time is the only time recorded and used to determine the number of assets that should be stocked. Not using the proper codes when they change reduces the number of assets on base.

9.18.3. The roles and responsibilities for DIFM management are identified in AFI 23-101. The LRS/DMS provides the D23 or equivalent to assist each repair section in DIFM Management. The D23 is provided in both maintenance location and stock number sequence. Repair sections use the D23 to manage the flow of serviceable and unserviceable DIFM assets in the repair cycle and to ensure the DIFM status and location is updated.

9.18.3.1. If a parts request is backordered and the removal of the unserviceable DIFM item does not further limit or restrict the operational capability of the end item, it will be

removed and sent to the applicable support section for either repair, NRTS approval, or condemnation with a subsequent turn-in to LRS/materiel management activity (as a credit DIFM) IAW TO 00-20-3. **(T-1)**.

9.18.3.1.1. Repair assets to the fullest extent authorized.

9.18.3.2. Repairable components will be processed, repaired, and returned to the FSC within the required time frame IAW AFI 23-101. **(T-1)**.

9.18.3.3. The D23 will not be used to manage serviceable assets.

9.18.4. Repair Cycle Throughput. Throughput is the average time it takes to move individual items through the repair cycle. Timelines for turn-in are outlined in AFI 23-101.

9.18.5. Units will establish local procedures for the control of repair cycle assets throughout the maintenance repair cycle IAW AFI 23-101 and AFMAN 23-122. **(T-1)**.

9.18.5.1. Procedures will include methods of accounting for all components and accessories, procedures for control of assets in AWP or AWM status, and procedures and responsibilities for cross CANN, removal of bits and pieces, and scheduling and control of repair cycle assets. **(T-2)**.

9.18.6. AWP and cross-CANN assets will be controlled and managed IAW AFMAN 23-122. **(T-1)**.

9.18.6.1. Maintenance activities will closely control reparable assets in AWP status. **(T-1)**.

9.18.7. Maintenance Turn-In to Supply. Maintenance is responsible for DIFM items until the item is returned to LRS/DMS.

9.18.7.1. Work centers must properly tag and secure repair cycle assets and place items in a leak–proof containment liner (no leaks/stains/tears/punctures), as required. **(T-1)**.

9.18.7.1.1. To prevent spillage, any item containing any type of residual fluid, regardless of hazard classification, will be drained, purged, preserved, capped, plugged and placed in a leak-proof containment liner before placement into a serviceable reusable container for storage or shipment. **(T-1)**.

9.18.7.1.2. The work center must comply with packaging, environmental control, inert certification, purge and preservation requirements as specified in applicable TOs, AFI 24-602V2, AFMAN 24-204, and place sufficient copy(s) of the technical document(s) for handling, storage, shipping and distribution of copies inside the container. **(T-1)**.

9.18.7.2. Include AFTO Form 350, **Parts I** and **II**, and a condition tag or label with all items turned into supply IAW TO 00-20-3. **(T-1)**. **Note:** Some DIFM assets may require additional tags.

9.18.7.2.1. Enter the correct action taken code on AFTO Form 350, **Part II.**

9.18.7.3. Accomplish proper reclamation and demilitarization actions on condemned repair cycle assets IAW AFMAN 23-122 and AFH 23-123, Vol. 2, **Part I**, **Sec. 6C**.

9.18.7.3.1. **(Added-AFMC)** Base maintenance organizations must properly dispose of consumable items through DLADS/DRMS. Items will be segregated by DEMIL

code and demilitarized by generating unit as required, prior to being turned into DLADS/DRMS. Reference DoDM4160.28-V2, paragraph 3.1, Table 1 for DEMIL code definitions/requirements. **Note:** DEMIL code A are the only assets that do not have a DEMIL requirement, but are still required to be transferred to DLADS/DRMS and will not be thrown in the trash.

9.18.7.4. DIFM items (serviceable or unserviceable) will be processed and turned in to LRS IAW AFI 23-101. **(T-1)**.

9.19. Tail Number Bins (TNB).

9.19.1. Establishment and management of TNBs is a shared responsibility between maintenance and supply. TNBs are storage locations established and controlled to store issued parts awaiting installation and parts removed to FOM. TNBs are set up by tail number, serial number, or identification number.

9.19.2. TNB items used to satisfy MICAP conditions are not CANNs. If a TNB asset is issued to satisfy a part request, maintenance personnel will:

9.19.2.1. Reorder the item and notify the expediter of the new document number. **(T-3)**.

9.19.2.2. Update the aircraft forms and the MIS. **(T-3)**.

9.19.2.3. If a due-out is created prior to transfer of these items, notify the LRS/materiel management activity to change the "mark-for" field on the due-out detail. **(T-3)**.

9.19.3. Seal and store partially completed TCTO kits and parts in the TNB and mark the container or package with the tail number, serial number, or equipment identification number and TCTO number. **(T-1)**.

9.19.4. Maintain security and control of TNB assets. **(T-1)**.

9.19.5. Track property placed in the TNB by tail number, serial number, or equipment identification number. Each entry will indicate:

9.19.5.1. Date received. **(T-2)**.

9.19.5.2. Noun/nomenclature. **(T-2)**.

9.19.5.3. Document number. **(T-2)**.

9.19.5.4. Status (FOM, Issue/Due-Out Release (ISU/DOR), TCTO). **(T-2)**.

9.19.5.5. Removal information (date, time, signature, and employee number of the person who picked up the property). **(T-2)**.

9.19.5.6. Remarks. **(T-2)**. Enter “NONE” if no remarks are necessary.

9.19.5.7. Current JCN. **(T-2)**.

9.20. CANN Actions. See **Chapter 11** for CANN procedures and responsibilities.

9.21. Bench Check and Repair Policy. Maintenance sections bench check items as part of the off-equipment troubleshooting process. When workload requires, the Section NCOIC/Chief determines the priority for bench check actions. Specific procedures for bench check and repair policy are provided in TO 00-20-3. The following general guidelines apply:

9.21.1. Order required parts “fill or kill.”

9.21.1.1. If the part is not in stock and a MICAP condition exists, backorder the new request.

9.21.1.2. Determine local repair capability before requisitioning off-base support or going lateral support.

9.21.2. Remove the suspected item, fill out the AFTO Form 350, and annotate it as repair and return. Attach AFTO Form 350 to the item; place the item in the repair cycle; and annotate the name of the repair section on the form.

9.21.3. Bench-check, repair, take NRTS action, or condemn the item.

9.21.3.1. If the item is repaired or otherwise determined to be serviceable, the repair section informs the Support Section the item is available for pick-up so on-equipment maintenance action may resume.

9.21.3.2. If the item cannot be repaired, the repair section informs the Support Section to initiate a backordered request and takes appropriate NRTS and condemnation action on the unserviceable asset.

9.22. Maintenance Turn-Around Record Update Processing. Work centers processing TRNs will coordinate with LRS/DMS and follow requirements outlined in AFI 23-101, AFMAN 23-122, and AFH 23-123. **(T-1)**.

9.23. Buildup Items. Maintain items requiring build-up prior to use (such as, wheels and tires) in supply points in a built-up configuration.

9.23.1. Send items to appropriate work centers for build-up and return them to the supply point for re-issue.

9.23.1.1. Use AF Form 1297 or control log to control assets sent for build-up when the supply point is operated by other than maintenance personnel.

9.23.1.2. Validate AF Form 1297 daily if over 10 days old.

9.23.2. Local procedures will be established to control assets when maintenance operates the supply point and assets are sent to another organization for build-up. **(T-1)**.

9.24. DR Exhibits. DR exhibit procedures for issue, turn-in, and storage are contained in TO 00- 35D-54 and AFI 23-101. DRs shall be inputted into the JDRS at **https://jdrs.mil. (T-0)**.

9.25. Destruction of TOP SECRET Material. Destruction of TOP SECRET material requires a receipt according to DODM 5200.01, Vol 3, DOD Information Security Program: Protection of Classified Information and AFI 16-1404. A copy of the destruction certificate will be included with the turn-in documentation. **(T-0)**.

9.25.1. Provide sensitive instruments interior container protection. **(T-1)**.

9.25.2. Ensure a copy of the LRU/SRU historical record accompanies turn-in of all items. **(T-1)**.

9.26. Certifying Items Associated With Explosives. Ensure items such as MERS, TERS, pylons, launchers, rafts, bomb racks, ejection seats, fire suppression bottles, gun systems and components are certified explosive-free prior to turn-in to LRS and/or Defense Logistics Agency

(DLA) Disposition Services. **(T-1)**. Refer to TO 11A-1-60 and AFMAN 21-201 for specific certification requirements.

9.27. (Added-AFMC) Repair Network Enhancement Program (RNEP)(formerly IREP). MXG/CC is the OPR for the RNEP program. RNEP provides maintenance group senior leadership a forum to evaluate current aircraft weapons systems resource and support status, highlight specific problem areas, focus on local repair initiatives to include the AFREP processes, and discuss ways to improve the overall repair cycle process. **(T-2).**

9.27.1. **(Added-AFMC)** RNEP Meeting. The meeting will be held at least quarterly; chaired by the MXG/CC. LRS CC/CL and MSG/CC will attend RNEP for awareness of materiel management issues affecting aircraft maintenance and mission generation. Recommended participants (as required) include the following: LRS, FSC, representatives from maintenance units, O&M resource advisors, maintenance analysis, AFREP (if applicable), QA, Aircrew Flight Equipment, and others as determined by the MXG/CC. The responsible asset manager should be the focal point to lead the discussion of the key data about a specific part. MXG/CC will conduct a DIFM status review and determine RNEP meeting content based on local requirements. **(T-2).**

9.27.1.1. **(Added-AFMC)** Subject Matter Review. One of the objectives of the RNEP meeting is to increase overall base self-sufficiency for repair and reduce the overall cost of operations. Topics discussed vary based on local requirements, but should include key elements of asset management and costs associated with each of the maintenance stock fund divisions. The number of items reviewed in each topic is determined locally. **(T-3).** Units can determine the specific format/visual aids used for presentation and may include the following information:

9.27.1.1.1. **(Added-AFMC)** Asset Profile/Top Projected MICAP Situations. An asset profile is an in-depth review of an asset identified as critical to mission accomplishment or that causes frequent MICAP situations. Data in an asset profile may include number authorized and on-hand, number repaired and not repaired, number of MICAPs, MICAP cause codes, average repair cycle days, average AWP days, monthly demand, item cost, and financial value of assets in the repair cycle. The overall health of the assets should include reasons for MICAP situations and solutions to resolve them. **(T-3).**

9.27.1.1.2. **(Added-AFMC)** Test Station Equipment Profile. Test station in-commission time is critical to efficient repair cycle output. TMDE and other shop deficiencies may have a negative effect on the base repair cycle process. The wing should focus on actions which maximize test station capability. **(T-3).**

9.27.1.1.3. **(Added-AFMC)** Wing Self-Sufficiency Initiatives. Initiatives include discussion of new wing, group and squadron AFREP initiatives and other local self-sufficiency repairs. Discussions must include how initiatives are crossfed to appropriate depot, Lead Command and all other like-MDS bases. Discuss product improvement initiatives and maintenance related to Airmen Power by Innovation (API). **(T-3).**

9.27.1.1.4. **(Added-AFMC)** High Cost Maintenance. Unit funded TCTOs/modifications, high cost work centers, SPRAM back orders, financial value of parts in the repair cycle, etc. **(T-3).**

9.27.1.1.5. **(Added-AFMC)** Top CANN Items. Items with significant CANN histories. Review information which includes the number of times items were CANNed in the last 30 days, average CANN occurrences over the last 6 months, projected get well date, and the time required to CANN the item. **(T-3).**

9.27.1.1.6. **(Added-AFMC)** Unit Aircraft Engine Status Review. A status review summary should include number in work, projected production date, and supply drivers for work stoppage. **(T-3).**

9.27.1.1.7. **(Added-AFMC)** Repair Cycle Bottlenecks. Review any area, which impedes the repair cycle process, such as frozen supply, records, supply, rejects, test station backlogs, personnel deficiencies, manpower shortages etc. Review high-time due in from maintenance (DIFM). **(T-3).**

9.27.1.1.8. **(Added-AFMC)** AWP Summary. Analyze due-outs causes and back order priorities to determine if supply action is required to correct any deficiencies/problems. **(T-3).**

9.27.1.1.9. **(Added-AFMC)** Repair Cycle Throughput. Throughput is the average time it takes to move individual items through the repair cycle. Review/compare the 12-month average versus the current month repair cycle time (RCT) to determine if progress is being made. 2LM reparable items must be processed without delay as established in AFI 23-101. Non-2LM repairable items must be processed within 4 days for serviceable assets and 10 days for unserviceable assets. **(T-3).**

9.27.1.1.10. **(Added-AFMC)** Part Store Issue Effectiveness. Percentage of aircraft parts issued from the flightline part store vs. the main warehouse. Disregard this element when LRS does not segregate aircraft components into a separate warehouse. **(T-3).**

Chapter 10

MUNITIONS POLICY AND WEAPONS LOAD CREW PROGRAM

10.1. AF Munitions Policy. AF munitions policies are contained in AFMAN 21-200 and AFMAN 21-201. AF nuclear munitions policy is contained in AFI 21-204.

10.1.1. Live and inert missiles (or electrical simulators) of the same type, for example Captive Air Training Munitions with Air to Air must not be loaded or flown together on an aircraft for any purpose. **(T-2)**. Live and inert (to include training or practice) bombs must not be loaded in/on the same dispenser/rack or flown on an aircraft load together. **(T-2)**. Any request to deviate from or waiver to this policy must be coordinated through the WWM, and must be submitted via official message to the MAJCOM Munitions Division, Weapons Safety, and Operations Weapons and Tactics/Training Divisions. **(T-2)**. **Note:** Units that fly rocket pods will not fly TP rockets with any combination of live rockets. **Note:** With Program Office/Seek Eagle approval, configurations with inert Air-to-Ground Missiles (AGM) can be flown with all types of bombs and rockets. The MAJCOM Munitions Division is the sole approval authority for these deviations/waivers. Test organizations may load and fly live and inert munitions on the same aircraft for test missions only, as long as the flight profile is IAW an approved test directive that has been through a Safety Review Board process and flight clearance through the applicable Program Office/Seek Eagle office has been properly obtained.

10.1.2. Request for waiver of, or deviation to, this policy will include as a minimum: (1), an Operational Risk Assessment report and proposed controls to mitigate or eliminate hazards to personnel, damage to aircraft and support equipment or inadvertent employment of live ordnance, and (2), a signed copy of the Test Requirement Plan, Test Plan, or Concept Employment Plan. **(T-2)**. Approved requests will remain valid only for the event requested and will not exceed 60 days. **(T-2)**.

10.1.3. Captive Air Training Munitions. Safety pins/streamers for arming keys/safe-arm handles on Captive Air Training Munitions may be removed for daily training/flying operations provided positive control and accountability is maintained for these items.

10.1.3.1. Captive Air Training Munitions AIM-9M arming handles will be permanently removed. **(T-1)**. These components are only removed for foreign or dropped object prevention.

10.1.3.2. Any Captive Air Training Munitions missile used for exercises, Load Crew Training and inspections should be configured to the maximum extent possible with all safety devices and components to mirror the parent tactical munitions.

10.2. Unit Committed Munitions List (UCML), Test/Training Munitions List (TTML). Operational units will use UCMLs. **(T-1)**. Test/Training units will use TTMLs unless they require a UCML, for example North American Aerospace Defense Command (NORAD) Committed. **(T1)**. The UCML/TTML is a list of Primary Munitions (PM), Support Munitions (SM), and Limiteduse Munitions (LM) necessary to meet unit operational/test/training requirements and is published IAW this instruction. The list of PM will not include more than 10 individual munitions or Munitions Family Groups (MFG) combined per mission, design, and series (MDS) aircraft assigned. **(T-2)**. The UCML/TTML also specifies the minimum certified

load crews required to meet unit requirements. MAJCOMS may supplement UCML/TTML processing, coordination and appendix requirements.

10.2.1. As a minimum, UCML/TTML's will be updated annually to identify all munitions tasked and/or required to support test/training or OPLANs, DOC statements, and Ready Aircrew Program tasking memorandum. **(T-1)**. Additional munitions may be included on the UCML/TTML as SM or LM munitions if required by the unit or designated by the MAJCOM (A4M performs this in the ANG) to support test, training, or deployment. The UCML/TTML is the base document for aircrew and load crew training munitions forecasts, authorizations and operations. Units will start their UCML/TTML validation in July, and have a coordinated input to the MAJCOM Munitions Division in August. **(T-2)**. MAJCOMs will supply approved UCML/TTML to the units in September.

10.2.2. Unit changes to the UCML/TTML will be justified by Wing Weapons and Tactics, coordinated and processed through the WWM, Munitions Squadron/Flight, MXG/CC and OG/CC before sending it to higher headquarters and MAJCOM. **(T-2)**.

10.2.3. Standard Conventional Load lists are not part of the UCML/TTML. They are stand-alone documents.

10.2.4. The WWM determines the minimum number of certified load crews depicted on the UCML and recommends approval to the MXG/CC. The minimum number should be based on supporting the initial/lead UTC requirements. Additionally, follow-on UTCs tasked simultaneously with the initial/lead UTC will be considered to determine minimum load crew requirements. The WWM determines the number of load crews depicted on the TTML as required to meet training unit syllabus and/or test unit mission requirements. **Note:** WWM will specify in writing the minimum number of load crews required in aggressor units when no UCML/TTML exists. **(T-1)**.

10.3. Weapons Load Crew Training Program (WLCTP). The USAF WLCTP ensures all weapons load crew members obtain and maintain the certification/qualification and proficiency needed to effectively meet safe, secure, and efficient munitions loading/unloading operations supporting their unit's mission. The objective of the WLCTP is to develop and maintain a high state of mission readiness for immediate and effective generation/employment of munitions loaded aircraft. WLCTP provides the basis for accomplishing peacetime missions while maintaining critical wartime capability. The WLCTP is managed by Weapons Standardization.

10.3.1. Weapons Standardization (WS). WS plans and conducts nuclear and conventional weapons load certification and training requirements to support unit tasking and operational plans. WS is comprised of the superintendent, the LSC, lead crews and an academic instructor. WS will manage and govern the Weapons Standardization Program. **(T-1)**. In TFI-associated units, the WWM will ensure ARC/RegAF LSC (minimum of two certifying officials) are available to cover weekend loading evaluations. **(T-2)**. This arrangement must be in writing (grade, names) and reviewed on an annual basis. **(T-2)**. Training, certification, proficiency evaluations and qualifications required to load munitions on aircraft are the sole responsibility of Weapons Standardization.

10.3.1. **(AFMC)** Weapons Standardization (WS). When multiple LSCs (not to exceed one per MDS) are assigned, a lead LSC will be identified to perform semi-annual evaluations and

ensure standardization of loading. Applicable procedures in this section will be adopted for use by test and evaluation load crews assigned to geographically separated units. **(T-2).**

10.3.2. Weapons Standardization Program. The Weapons Standardization Program is established to ensure munitions loading standardized training, procedures, and policies, are in place to support mission requirements. The Weapons Standardization Program is made up of the WS personnel, weapons academic training, practical training, munitions loading certification, weapons task qualification, and proficiency evaluations. These core elements are managed and governed by the WS. WS will establish and manage a program to train, certify and maintain proficiency for each load crew based on the munitions designated by the UCML/TTML and/or those munitions designated by the WWM for SM's and LM's. **(T-1)**.

10.3.3. WS Superintendent (SUPT) Responsibilities. The WS SUPT is responsible to the WWM, and performs Section NCOIC/Chief duties outlined in **Paragraph 3.10**. The WS SUPT develops and oversees the Weapons Standardization Program, sets standards, develops local policies and procedures, and interprets all technical data and directives governing the Weapons Standardization Program. **Note:** ARC & Air Force Special Operations Command (AFSOC) WS SUPT responsibilities may be performed by the LSC Team Chief. The WS SUPT will:

10.3.3.1. Manage WLT training munitions, components, and accessories. **(T-1)**.

10.3.3.1.1. Ensure load crew training munitions are maintained to the same standard and are representative of the parent munitions to the maximum extent possible. **(T-1)**.

10.3.3.1.2. If defects exist that preclude the use of training munitions for WLT/ Dual Loading Operation, they will be turned in to the Munitions Flight/Squadron for maintenance or replacement IAW AFMAN 21-201. **(T-1)**.

10.3.3.2. Ensure training munitions and munitions items meet unit needs. **(T-1)**. The UCML/ TTML will be the source document for WLT munitions requirements and authorizations and the WS SUPT must ensure correct munition variants are requested to support unit taskings. **(T-2)**.

10.3.3.2.1. The WS SUPT will ensure sufficient quantities of load crew training munitions are forecasted for IAW AFMAN 21-201 and issued assets are serviceable to support both load crew and Dual Loading Operation training programs. **(T-1)**.

10.3.3.2.1.1. If sufficient training munitions are not available to support Dual Loading Operation training, coordinate use of assigned items from WS supply point for management flexibility.

10.3.3.2.2. The WS SUPT will review and validate all munitions forecasts submitted by WS and the Armament Flight prior to submission to MAJCOM. **(T-1)**. Refer to AFMAN 21-201 for guidance on submitting the annual non-expendable air-munitions training forecast to the MAJCOM.

10.3.3.2.3. Training munitions. Authorized quantities of training munitions can be referenced in the "Air Force Standard for Non-Expendable Air-Munitions Training" located on the Air Force Conventional Munitions SharePoint site at: **https://cs2.eis.af.mil/sites/10027/SitePages/Home.aspx**. These numbers reflect the maximum munitions required exclusively for weapons load crew certification and

recurring training. These munitions are forecasted by and assigned to weapons load training (W1) accounts.

10.3.3.2.3.1. Units may request and justify additional quantities of munitions than specified on these tables but may not be allocated munitions unless sufficient quantities are available and approved.

10.3.3.2.4. Units with multiple MDS will use the authorization for the MDS that provides the greater quantity per item; these authorizations are not cumulative. **(T-1)**. For example, if a base has both F-15E and F-16 aircraft assigned and both MDS are tasked on the UCML/TTML for Guided Bomb Unit (GBU)-12 then only two, not four, GBU-12s will be allocated to support both MDS.

10.3.3.2.4.1. If a situation exists where the WLT facilities are physically separated and the WWM determines it negatively impacts load crew training to move munitions from one to the other, then each facility will be authorized the minimum number of tasked training munitions. **(T-2)**.

10.3.3.3. Ensure load crews demonstrate proficiency on each type aircraft racks and stations prior to certification on that munition. **(T-1)**.

10.3.3.3.1. For conventional munitions capable of multiple carriage, both aircraft parent station and multiple carriage loading are required.

10.3.3.3.2. For nuclear weapons, only the aircraft stations that are maintained in nuclear certified status are loaded.

10.3.3.3.3. Develop an annual load crew proficiency schedule to ensure one third of the required munitions will be loaded bi-monthly (monthly for short tour locations) and one quarter of required munitions will be loaded quarterly for Traditional Reservist/Drill Status Guard members to demonstrate crew proficiency. Additionally, WS SUPT will ensure munitions with multiple configurations such as JDAM MFG, AIM-9 L/M/X are loaded in different months to provide adequate munitions coverage during the year. **(T-1)**.

10.3.3.4. Ensure load crews are familiar with fuse inspection, installation and wiring IAW MDS-33 series TO procedures or TO 11A-1-63, Munitions Assembly Procedures—Inspection and Assembly of Conventional Munitions. **(T-1)**.

10.3.3.4.1. Conduct this training during initial certification.

10.3.3.5. Ensure EPEs are performed on each LSC/Lead Crew member at least semi-annually to validate standardization of the weapons load training program. **(T-1)**.

10.3.3.5.1. Results will be documented on the AF Form 2419 and will be maintained within the WLCMT or MAJCOM approved equivalent. **(T-1)**.

10.3.3.5.2. WWM and/or WS SUPT will perform EPEs on LSC members during load crew evaluations. **(T-1)**. Exception: For the 354th Fighter Wing EPEs will be accomplished during weapons task qualification training. **(T-1)**.

10.3.3.5.3. LSC members perform EPEs on Lead Crew members during load crew evaluations. **(T-1)**.

10.4. Loading Standardization Crew (LSC). The LSC is assigned to WS and reports to the WS SUPT. The LSC administers the Weapons Standardization Program and the WWM and/or WS SUPT evaluate and certify the LSC according to criteria in this AFI.

10.4.1. The LSC Team Chief must be at least a TSgt 2W171. **(T-1)**.

10.4.2. The LSC trains, evaluates, and certifies the lead crews and load crews.

10.4.2.1. The LSC will perform semi-annual evaluations, (quarterly at short tour locations), on all certified load crews on at least one of the unit's PM. **(T-1)**. Lead crew members may assist; however, at least one member of the LSC must be present. **(T-1)**.

10.5. Weapons Academic Instructor. A WS member is designated to oversee and manage the Weapons Academic Training Program.

10.5.1. The WWM will designate WS members (minimum 7-skill level) as primary (primary instructor will be a permanently assigned individual to WS, minimum grade of TSgt) and alternates, to conduct initial and recurring weapons academic training for all wing 2W1XXs (or equivalent contractor personnel). **(T-1)**.

10.5.1.1. The instructors will have a SEI for at least one of the assigned MDS weapons system and familiarized with all UCML/TTML items. **(T-1)**.

10.5.2. The primary academic instructor will manage the Weapons Academics Training Program and associated materiel. **(T-1)**.

10.5.3. The primary weapons academic instructor will review the Weapons Academics Training Program annually IAW AFI 36-2650. **(T-1)**.

10.5.3.1. The weapons academics instructor is not considered a maintenance instructor.

10.6. Squadron Lead Crews. The lead crews are assigned to the WS and assist the LSC in training, evaluating and certifying unit load crews in safe and reliable munitions loading procedures.

10.6.1. For contingency operations or deployed locations a lead crew should deploy to perform WS functions.

10.6.2. If a lead crew is not deployed, the senior 2W1X1 weapons loading person (with WWM coordination) on location will have WS authority. **(T-1)**. For example, a new munition or load configuration is required to support operations and crews need to be trained on location (provided Seek Eagle approval has been granted and verified technical data/procedures are available).

10.7. Training Facilities/Aircraft.

10.7.1. Practical training will be conducted in a facility dedicated to load crew training that is of sufficient size to accommodate required aircraft, training munitions and associated support equipment. **(T-1)**.

10.7.1.1. Adequate office space and classroom with appropriate heating and cooling are required in the academic and practical training area. See AFMAN 32-1084 for facility requirements.

10.7.2. Aircraft will have a fully configured and operational (electrical and mechanical) weapons system for load training purposes. **(T-1)**.

10.7.2.1. If a permanent load trainer for example, Armament Systems Trainer and/or GITA) is assigned, it also will have a fully configured and operational weapons system. **(T-2)**.

10.7.2.1. **(AFMC)** [DEV] If a permanent load trainer for example Armament Systems Trainer and/or GITA) is assigned, the MXG/CC, with WWM coordination, will determine which GITA/TAA systems and subsystems will be fully configured and operational to support weapons load training and document IAW **Chapter 11** **(T-2).**

10.7.2.2. In addition, WS will develop a schedule for periodic maintenance to weapons system components. **(T-1)**.

10.7.2.3. **(Added-AFMC)** [DEV] 412TW is authorized the following exceptions:

10.7.2.3.1. **(Added-AFMC)** [DEV] When using the F-16 Block 15 GITA for weapons load crew training:

10.7.2.3.1.1. **(Added-AFMC)** [DEV] Block 50 pylons physically installed on a Block 15 aircraft remain unconnected due to the different connector alignment.

10.7.2.3.1.2. **(Added-AFMC)** [DEV] 1760 capable munitions cannot hook up electrically to the pylon because the connectors are of different design and are not compatible.

10.7.2.3.1.3. **(Added-AFMC)** [DEV] Weapons load training requirements for F-16A, AM, C/D, CG and CJ configurations are completed using the appropriate MDS flight manual to obtain load configurations. The 1F-16C-33-1-2, 1-F-16AM-33-1-2 and all applicable C/AM loading checklists are used for load crew training.

10.7.2.3.2. **(Added-AFMC)** [DEV] When using BRU-61, serial number 2 and 3 for weapons load crew training on F-22 aircraft:

10.7.2.3.2.1. **(Added-AFMC)** [DEV] BRU-61, serial number 2 contains four inert GBU-39s and is different from a standard BRU in that it does not have internal compressors or orifices and contains one additional JMMI cable. The shell and external hardware is the same as a standard BRU capable of facilitating weapons load training.

10.7.2.3.2.2. **(Added-AFMC)** [DEV] BRU-61, serial number 3 is an empty rack and is different from a standard BRU in that it does not have internal electronics, compressors or orifices. The shell and external hardware is the same as a standard BRU capable of facilitating weapons load training.

10.8. Weapons Academics. All 2W1X1s (and civilian equivalents performing in 2W1 capacity) assigned to a wing regardless of duty position, and non-2W1X1 personnel who maintain specific weapons task qualification will complete initial and recurring (not exceeding a 15-month interval) weapons academic training. **(T-1)**.

10.8.1. Complete initial academic training before the start of any practical training. **(T-1)**.

10.8.1.1. Recurring academic training may also be part of training and recertification for failed loads.

10.8.1.2. Initial and recurring course outlines may be combined.

10.8.1.3. A minimum score of 80 percent must be attained to receive credit for academic testing. **(T-1)**.

10.8.2. Coordinate training requirements and course control documents annually through Wing Safety or the safety officer and MT. **(T-1)**.

10.8.2.1. Wing Safety will approve all nuclear surety training lesson plans. **(T-1)**.

10.8.2.2. The WWM is the final approval authority for course documents. **(T-1)**.

10.8.3. Weapons academic training may fulfill the requirements for explosive safety and nuclear surety training if requirements of AFI 91-101 and AFMAN 91-201 are met. Course control documents are tailored to unit and contingency needs and, as a minimum, will include the following items:

10.8.3.1. Local publications that prescribe weapons related operating procedures or directives. **(T-1)**.

10.8.3.2. Safety (occupational and explosive) and security. **(T-1)**.

10.8.3.3. Aircraft, munitions, AGE, SE, TMDE, and munitions trailer familiarization. **(T-1)**.

10.8.3.4. Testers, handling equipment and special tools. **(T-1)**.

10.8.3.5. Operations in revetments/protective aircraft shelters. **(T-1)**.

10.8.3.6. Weapons storage and security system vaults (tasked units). **(T-1)**.

10.8.3.7. Applicable command unique training requirements in 36-26XX supplements. **(T-1)**.

10.8.3.8. Hazards inherent during Concurrent Servicing Operations. **(T-1)**.

10.8.3.9. Task Assignment List and applicable -16/-33 TOs (initial academics/ load crew personnel only). **(T-1)**.

10.8.3.10. Explain Master Nuclear Certification List, Dull Sword definition and reporting procedures IAW AFMAN 91-221 and other related directives (applies to all units with nuclear certified equipment regardless of mission). **(T-1)**.

10.8.3.11. Nuclear weapons systems fault isolation and troubleshooting procedures (if applicable). **(T-1)**.

10.8.3.12. Explain procedures for operations involving nuclear weapons, to include safety wiring and sealing, use of Tamper Detection Indicators, two-person concept, no-lone zone, PRP, and AF Form 504, *Weapons Custody Transfer Document*, custody transfer procedures (if applicable). **(T-1)**.

10.8.3.13. Discuss accident, incident and deficiency reporting. Include in this training: DULL SWORD, AVOID AMBER, AVOID RED, BENT SPEAR, BROKEN ARROW,

NUCFLASH, EMPTY QUIVER, Weapons Custody and Control Procedures and Command Disablement Systems (if applicable). **(T-1)**.

10.8.4. Weapons Expediter training. Weapons Expediter training will be instructed by the Weapons Academic Instructor. **(T-1)**.

10.8.4.1. Initial training is required prior to assuming duties as a Weapons Expediter. **(T-1)**.

10.8.4.2. Expediter training will address the following subject areas:

10.8.4.2.1. Basic Expediter duties within this AFI. **(T-1)**.

10.8.4.2.2. AF Forms 2430 and AF Form 2434 documentation. **(T-1)**.

10.8.4.2.3. Munitions flightline accountability. **(T-1)**.

10.8.4.2.4. Emergency procedures. **(T-1)**.

10.8.4.2.5. NET Explosive Weight/Explosive Site Planning. **(T-1)**.

10.8.4.2.6. Review and monitor JSTs (screen 469, 100, and 122 as a minimum). **(T-1)**.

10.8.4.2.7. Aircraft MESLs (as applicable). **(T-1)**.

10.8.4.2.8. Maintenance on conventional and nuclear explosives loaded aircraft. **(T-1)**.

10.8.4.2.9. MNCL items (as required) and nuclear policies pertaining to flightline activity. **(T-1)**.

10.8.4.2.10. **(Added-AFMC)** TICMS/munitions accountability procedures. **(T-2)**.

10.9. Practical Training. Practical training starts when academic training is complete. Practical training is the initial hands-on procedural training given to load crew members. The LSC or lead crews administer practical training to each load crew member on required munitions and aircraft. They ensure practical training duplicates operational conditions to the maximum extent possible and stress requirements such as loading/unloading on/off various types of munitions trailers (with applicable accessories), DLOs, two-person concept, safety wiring and sealing/roto sealing, controlled access and weapon custody receipt and transfer procedures, as required.

10.10. Task Assignment List. A Task Assignment List is a functional grouping of procedural steps from applicable -16/-33 series TOs, by crew position, to be accomplished in sequence by each crew member during a loading operation. Task Assignment Lists are used during training for all loading operations except those for which job oriented procedures have been published (B-2 rotary launcher conventional munitions, and B-52H Conventional Air Launched Cruise Missile pylon and Conventional Stores Rotary Launcher loading/unloading is accomplished procedurally parallel to the -16 procedures). Task Assignment Lists are not a replacement for TO procedures, but are used to standardize procedures and facilitate the training of unit load crews.

10.10.1. Task Assignment Lists will include single, dual loading operation, cross-loading and integrated munitions loading procedures (including gun and chaff/flare loading) as applicable. **(T-1)**.

10.10.2. Units may develop task assignment lists for aircraft armament electrical functional checks (at unit's discretion).

10.10.3. Separate Task Assignment Lists will be developed for weapons qualification tasks performed by non-2W1X1 personnel. **(T-1)**.

10.10.4. MRPLs and semi-annual evaluations are not considered training operations.

10.10.5. Minimum responsibilities of each load crew position (MAJCOMs may develop more detailed Task Assignment Lists).

10.10.5.1. Two member load crews (CV-22, MC-130J/H/P, and HH-60).

10.10.5.1.1. Crew member number one will be the load crew chief and is in charge of the loading operation. **(T-1)**.

10.10.5.1.2. Crew member number two will assist crew member number one in performing the aircraft preparation and loading munitions. **(T-1)**.

10.10.5.2. Three member load crews. (AC-130U/W/J, A/OA–10, F–15, F–16, F-22, F-35 and MQ-9).

10.10.5.2.1. Crew member number one will be the load crew chief and is in charge of the loading operation. **(T-1)**.

10.10.5.2.2. Crew member number two will perform aircraft preparation, load munitions, and assist as required. **(T-1)**.

10.10.5.2.3. Crew member number three will perform munitions preparation, operate the bomb lift truck, and assist as required. **(T-1)**.

10.10.5.3. Four member load crews. (B–1, B–2, and B–52).

10.10.5.3.1. Crew member number one will be the load crew chief and is in charge of the loading operation. **(T-1)**.

10.10.5.3.2. Crew member number two will perform the aircraft preparation and assist as required. **(T-1)**.

10.10.5.3.3. Crew member number three will perform munitions preparation and assist as required. **(T-1)**.

10.10.5.3.4. Crew member number four will operate the bomb lift truck and assist as required. **(T-1)**.

10.11. Munitions Aircraft Loading Certification/Decertification.

10.11.1. Certification. These guidelines are used to establish the weapons standardization program. Only individuals with 2W1X1 AFSC (contractor or civilian equivalent) are certified/qualified to load/unload munitions items on aircraft except for those weapons task qualifications outlined in **paragraph 10.16.7**. **(T-1)**. A minimum of one certifying official is required for two-person load crews. **(T-1)**. A minimum of two certifying officials are required to evaluate three and four-member load crews. **(T-1)**. Certification and training requirements are as follows:

10.11.1.1. LSC, lead crew and load crew personnel will be certified by position. **(T-1)**.

10.11.1.2. Personnel must be certified before loading live conventional munitions, unless loading under the direct supervision of a minimum of two certifying officials. **(T-1)**. 10.11.1.3. Personnel must be certified before loading war reserve nuclear weapons. **(T-0)**.

10.11.1.3.1. Certified load crews may be evaluated by using war reserve weapons if the weapons are scheduled for loading or movement.

10.11.1.4. LSC, lead crews, and load crews will be certified on all PMs. **(T-1)**. Exception: AFGSC units follow **Paragraph 2.7.5** for nuclear PM requirements.

10.11.1.4.1. The LSC and lead crews are certified on all SMs to provide the cadre for future certification of unit load crews. **(T-1)**.

10.11.1.4.2. The LSC is certified (or qualified for items so identified by unit tasking) on unit LMs. **(T-1)**.

10.11.1.5. Load crews can only be certified on up to 15 total MFGs (primary, support, limited). **(T-1)**.

10.11.1.6. Dual position (LSC and lead crews) or multiple MDS (LSC, F-15C/D/E lead crews, Test Wing personnel, 174 ATKW Det 1, and AFSOC only) certification is authorized; however, personnel will not be certified on more than 15 UCML/TTML primary MFGs. **(T-1)**.

10.11.1.6.1. Proficiency requirements are accomplished on all aircraft IAW this **Chapter**.

10.11.1.6.2. Personnel who are dual position certified will ensure they comply with MRPL and SAE requirements in both positions for which they are certified; they will not alternate between the two. **(T-1)**.

10.11.1.6.3. In the dual or secondary position, personnel will only load munitions for which they are certified, and will comply with requirements stated above. **(T-1)**.

10.11.1.6.4. Only dual certify in the MFGs required to meet mission requirements. **(T-1)**. **Note:** MQ-1/MQ-9 personnel are exempt from the dual MDS/position restrictions imposed by this **Paragraph**; crews may be certified on both MDS, and #2 and #3 members may be certified in both positions.

10.11.1.7. Load crew member certification is valid worldwide with gaining WWMs concurrence. Reassignment does not necessarily require recertification by the gaining unit if the individual is certified on the same munitions, aircraft, and load crew position; and if MRPL or SAE requirements are current.

10.11.1.7.1. Units will develop procedures to ensure load crew certification status is provided to the individual prior to Permanent Change of Station (PCS) departure. **(T-3)**.

10.11.1.8. Units will alternate loading operations on different AME configurations for same munitions. **(T-2)**.

10.11.1.8.1. Units with GBU-39 on UCML/TTML will train Bomb Rack Unit-61 asymmetrical or unbalanced center of gravity loadouts, for example, with 1-3 GBU-39/53s loaded. **(T-1)**.

10.11.1.9. Personnel certified to load nuclear weapons on aircraft, will perform weapons transfer and tie-down procedures to and from trailers, Weapons Storage and Security System vaults, and support stands for which load standardization training has been

established and conducted IAW this instruction. **(T-2)**. These actions are not required as separate certification items.

10.11.2. Decertification. Document decertification and/or disqualification actions in the WLCMT or MAJCOM-approved equivalent. **(T-1)**. Decertify and disqualify individual load crew members if they:

10.11.2.1. Fail to complete a required evaluation (SAE, MRPL, Qualification). **(T-1)**.

10.11.2.1.1. If a load crew member is on TDY, emergency leave, incapacitated, or involved in an unannounced local or higher headquarters exercise/contingency operation, do not decertify or disqualify the member providing the current SAE/MRPL/Qualification requirements (plus all past-due evaluations) are completed within one month of returning to duty (two months for Traditional Reservist/Drill Status Guard members).

10.11.2.2. Fail to accomplish recurring academic training. **(T-1)**.

10.11.2.2.1. All personnel exceeding the 15-month interval will not operate, handle, transport, maintain, or load munitions until academic training is accomplished. **(T-1)**.

10.11.2.3. Fail an evaluation due to the following criteria:

10.11.2.3.1. Safety Error. **(T-1)**. A violation of safety publications, TO warnings, any unsafe act (personal injury or death). Evaluators will immediately intervene to prevent such acts. **(T-1)**.

10.11.2.3.2. Reliability Error. **(T-1)**. A violation of TO requirements that could reasonably lead to damage/premature failure of equipment, prevent safe reliable operation of weapons system or weapon release, or intervention by the evaluator to prevent such violations.

10.11.2.3.3. Lack of technical proficiency. **(T-1)**. Any load crew member failing to demonstrate technical proficiency results in a failed rating.

10.11.2.3.3.1. A crew member exceeding three technical order errors results in a fail rating for lack of technical proficiency.

10.11.2.3.4. Time standard. **(T-1)**. Exceeded time standard results in a failed rating for the load crew chief.

10.11.2.3.4. **(AFMC)** [DEV] Civilian load crews will follow WWM-established weapons load time goals.

10.11.2.3.4.1. If the time standard is exceeded for other load crew member's lack of technical proficiency, the Load Team Chief does not need to be decertified. Time standard will not be applied to flightline evaluations. **(T-1)**.

10.11.2.4. When a member is decertified on a munition, the member will be decertified on all items within the MFG. **(T-1)**. Personnel may recertify on any MFG item. **Note:** Bomber units may certify by loading methods for nuclear munitions. This will be accomplished by documenting the munition method in block seven of the AF Form 2435. EXAMPLE, AGM-86/B Pylon, AGM-86/B Conventional Stores Rotary Launcher, B-61/83 Rotary Launcher Assembly, B-61/83 S/B.

10.11.2.4.1. For integrated loads, the evaluator may decertify on all munitions or a specific munition loaded. When the same rating is not applied to all munitions loaded during an integrated load, the load crew records will be annotated accordingly. **(T-2)**.

10.11.2.4.2. A failure for safety or reliability does not result in complete retraining/recertification for the loading task. At the discretion of the evaluator, sub-task retraining or thorough critique may be used to satisfy retraining/recertification requirements.

10.12. Proficiency Review Period. Immediately following initial certification, crews will load one-third of all munitions monthly for a minimum of three months, after which the LSC or lead crew will recommend to the WS SUPT to place them in the normal bi-monthly evaluation cycle (N/A for short tour locations and Traditional Reservist/Drill Status Guard members). **(T-1)**.

10.13. Minimum Required Proficiency Load. All certified load crews will perform proficiency loads and be evaluated by the LSC or a lead crew. **(T-1)**.

10.13.1. Each munition an individual is certified to load, regardless if it is a primary, support or limited use munition, will be loaded at least once within a six month period (three month period for short tour locations and twelve month period for Traditional Reservist/Drill Status Guard members). **(T-1)**.

10.13.1.1. One third of the required munitions will be loaded bi-monthly (monthly for short tour locations), and one quarter of required munitions will be loaded quarterly for Traditional Reservist/Drill Status Guard members to demonstrate crew proficiency. **(T-1)**.

10.13.2. MRPL credit may be given during any certified loading operations on the flightline provided complete MRPL requirements are performed and evaluated by WS personnel. MRPL credit during flightline evaluations is only authorized when loading live munitions, Dummy Air Training Missiles, or D-2 type inert munitions.

10.13.3. In units where no munition training assets exist (Cluster Bomb Unit CBU-105, M129) difference training will be provided prior to initial certification and during recurring academics training. **(T-1)**.

10.13.4. Load crews in air defense/air superiority units perform proficiency loads bi-monthly using all committed primary munitions. **(T-1)**.

10.13.5. Nuclear-tasked units. LSC, lead crews, and load crews will load nuclear PMs monthly. **(T-1)**.

10.13.5.1. Only one type of munition within a MFG requires loading each month.

10.13.6. Load crew integrity must be used to the maximum extent possible. **(T-3)**.

10.13.6.1. Certified Load Team Chiefs may perform MRPLs in any position provided they load under the supervision of LSC or lead crew using inert conventional training munitions only. This requirement applies at home station only. No MRPL credit is given to those individuals during evaluations unless loading in the position for which they are certified.

10.13.7. Load crews will annually perform an evaluated load while wearing the ground crew Chemical Warfare Defense Equipment using 33-1-2/33-2-1 procedures as determined by the WWM. **(T-3)**. Credit may be given during exercises provided operations are evaluated by WS personnel. **(T-2)**.

10.14. Load Crew Semi-Annual Evaluations (SAE). The LSC evaluates each load crew once semi-annually on at least one of the unit PMs (SM or LM if no PM listed); all unit PMs will be used on a rotating basis. **(T-1)**.

10.14.1. SAE's are not required for lead crews.

10.14.2. Load crews failing to accomplish semi-annual evaluations on all munitions will be decertified unless exempted IAW provisions in this **Chapter**. **(T-1)**.

10.14.3. If an integrated load is accomplished as the SAE (such as, AIM-9, -120), document the SAE accordingly.

10.14.4. There is no need to document both SAE and MRPL.

10.14.5. Certified Load Team Chiefs may perform SAEs in any position provided they load under the supervision of LSC or lead crew using inert conventional training munitions only. This requirement applies at home station only.

10.14.6. No SAE credit will be given to those individuals during evaluations unless loading in the position for which they are certified. **(T-1)**. This enables units the flexibility to evaluate remaining crew members when a member may not be available to form a full crew and will only be used as necessary.

10.14.7. The letter "E" will be placed after the date for the semi-annual evaluation regardless of rating. **(T-1)**.

10.15. Documenting Load Crew Certification/Decertification/Qualification.

10.15.1. The LSC will manage load crew certifications, qualifications, SAEs (quarterly evaluation (QE) for short tour locations), and MRPLs by means of the WLCMT or MAJCOM approved equivalent. **(T-1)**.

10.15.1.1. All decertification and subsequent recertification actions must be documented on AF Form 2435 via WLCMT or MAJCOM approved equivalent process. **(T-1)**.

10.15.1.2. Aircraft parent station, multiple carriage, difference training and asymmetrical loads will be documented on AF Form 2419, AF Form 2435, or MAJCOM approved equivalent. **(T-1)**.

10.15.2. Enter one of the following codes in the month column, as applicable, if required loads are not completed and provisions of this **Chapter** apply: Temporary Duty (TD), Emergency Leave (LV), Incapacitated (ED), Exercises/Contingency (EX), or Weather (WX). **(T-1)**.

10.15.2.1. Code outs will not be used as a substitute for ineffective scheduling. **(T-1)**. WWM has final decision authority on coding disputes.

10.15.2.2. RPA contractor personnel who deploy immediately after weapons load certification are not required to be coded out monthly.

10.15.3. Route AF Form 2419 after semi-annual evaluations (quarterly for short tour locations) to the Weapons Section NCOIC/Chief, Operations Officer/MX SUPT, WWM, and the WS SUPT. **(T-1)**.

10.15.4. When internet connectivity will not be present, send printouts from the WLCMT or MAJCOM-approved equivalent product with the crew to deployed/TDY locations if loading tasks are to be performed. **(T-1)**.

10.15.4.1. The following statement will be added after the last entry on each product: "AF Form 2435 reviewed; the member is certified/qualified on the items listed on this product." **(T-1)**. This statement is followed by the signature and date of a WS certifying official.

10.15.5. Academic and practical training will be tracked and documented in a MIS, however the WLCMT or MAJCOM-approved equivalent may be used for this purpose. **(T-2)**.

10.16. Weapons Task Qualification. A weapons task qualification is a munitions-related task that does not require certification to include inert/training munitions. Individuals require both initial/recurring weapons academics and initial/annual practical qualification training for these tasks.

10.16.1. All individuals will receive full task qualification training to include use of the checklist. **(T-1)**.

10.16.2. Recurring practical training should be conducted during normal flightline operations to the maximum extent possible.

10.16.3. Training is provided, documented and tracked by WS.

10.16.4. Checklist Qualification. Indicates that the person with the checklist is trained, knowledgeable and in-charge of the overall operation or task.

10.16.4.1. Members must possess a minimum 5-skill level to be checklist qualified. **(T-1)**.

10.16.5. Full scale inert/training munitions (such as, BDU-50/TGM-65/Captive Air Training Munitions -120/M129). If load crew personnel are certified on a munition, they are considered qualified (by position certified, except #1 position) on its inert version.

10.16.6. Two or more qualified personnel in AFSC 2W1X1 (or civilian equivalent) shall be required to perform the following tasks:

10.16.6.1. Practice Bombs: load and unload BDU-33, BDU-48 and MK-106. **(T-2)**.

10.16.6.2. Load and unload ammunition in internal and external gun systems (the GAU-8 requires three people). **(T-2)**. Exception: Personnel do not load GAU-2, GAU-18, GAU-21, or M240 machine guns and are authorized to unload ammunition only during Hot Gun emergency or gun jams that require safing prior to maintenance actions.

10.16.6.3. Load and unload single 2.75 rockets. **(T-2)**.

10.16.6.4. Load and unload Miniature Air Launched Decoy (three person minimum). **(T-2)**.

10.16.6.5. Load and unload captive AGM-114 missiles (M36). **(T-2)**.

10.16.7. Two or more qualified personnel in any aircraft maintenance AFSC shall be required to perform the following tasks (members must be qualified in all aspects of task to be performed; for example, aircraft prep, rack/launcher prep, munitions prep.

10.16.7.1. Install and remove impulse cartridges if the task is not accomplished as a part of a loading operation. **(T-2)**.

10.16.7.2. Load/unload pyrotechnics. **(T-2)**.

10.16.7.3. Install and remove chaff and flare magazines and other defensive countermeasures. **(T-2)**.

10.16.7.4. Perform portions of the conventional loading checklist pertaining to delayed-flight or alert, and Immediate Prior to Launch/Safing procedures. **(T-2)**. **Note:** Removal of dome/Target Designator cover(s) is not considered Immediate Prior to Launch and does not require initial/recurring academics.

10.16.7.5. Perform munitions/missile isolation procedures to facilitate other maintenance on conventional loaded aircraft only. **(T-2)**.

10.16.7.6. Install and remove Captive Air Training Munitions/ Dummy Air Training -9 missiles (must have three personnel minimum and one person must be checklist qualified). **(T-1)**.

10.16.7.7. Install and remove Acceleration Monitor Assemblies and Airborne Instrumentation System pods. Academics are not required for Acceleration Monitor Assemblies and Airborne Instrumentation System pods. (Minimum crew size per TO directives). Acceleration Monitor Assemblies and Airborne Instrumentation System qualification training is a one-time trained item that will be entered on an AF Form 797. **(T-1)**.

10.16.8. A Load Team Chief may perform in any crew member position when loading inert/training munitions if certified on the parent munition. **(T-1)**.

10.16.8.1. The two and three members can only perform those positions for which they are certified or qualified. **(T-1)**.

10.16.9. Cross-loading Operations will be trained and documented as a Qualification. Cross-loading operations are only applicable to conventional loading operations and are only authorized upon MXG/CC approval and WS program implementation.

10.16.9.1. The following minimum conditions will be included in the Cross-loading training plan (if implemented) **(T-2)**.

10.16.9.1.1. Procedures for clearly identifying aircraft involved in cross-loading operations.

10.16.9.1.2. A list of MXG/CC authorized munitions eligible for cross-loading operations.

10.16.9.1.3. Local procedures, restrictions and safety requirements as determined by the WWM and MXG/CC.

10.16.9.1.4. Procedures for annotating loading checklist within the cross-loading program to ensure compliance, for example, emergency data page info, when to check steps.

10.17. Munitions Load Time Standards. All munitions listed in a single block comprise a MFG for the respective aircraft mission type. The load time standards apply to all operational users of the munitions or aircraft listed and are the minimum proficiency requirements for weapons load crews.

10.17. (AFMC) [DEV] Munitions Load Time Standard. The WWM or WS Supt shall determine and set load time standards for items that are not listed in **Tables 10.1**, **10.2** or **10.3** Within the 412 MXG. The Wing Weapons Manager will establish time goal for civilians. **(T-3).**

10.17.1. Units may establish more restrictive standards for local use.

10.17.2. Unless otherwise noted in **Table 10.1**., **Table 10.2**., or **Table 10.3**., the WS SUPT shall determine and set load time standards for qualification items, for integrated loads (including nuclear, if tasked), and for loads performed wearing the Chemical Warfare Defense Equipment **(T-3)**.

10.17.3. All items require certification IAW this **Chapter**, unless otherwise indicated.

10.17.4. The standard load times, from the MFG **Table 10.1**, **Table 10.2**, and **Table 10.3** are standard load times for initial and recurring training and evaluations for the respective single store (including full munitions preparation) and installation of impulse cartridges, if required.

10.17.4.1. Except for Bomb Rack Unit-57, an additional 10 minutes is allowed for each added aircraft station check on fighter aircraft, if performed as part of an evaluated load.

10.17.4.2. An additional 7 minutes is allowed for each like store added to fighter aircraft loads.

10.17.4.3. Load times are additive when more than one type of munition is loaded on fighter aircraft. For example, if an F-16 is to be loaded with two AIM-9s and a MK-82, the load crew shall be allowed 20 minutes for the first AIM- 9, 7 minutes for the second AIM-9, and 25 minutes for the MK-82, for a total of 52 minutes.

10.17.4.4. Units may develop optimum time standards for integrated loads (including nuclear, if tasked).

Table 10.1. Fighter Aircraft Munitions Family Group and Munition Load Time Standards (in minutes).

MUNITIONS FAMILY GROUP	A-10	F-15	F-16	F-22	F-35	REMARKS
AIM-9 L/M/X	20	20	20	30	20	Note 6
AIM-120		25	25	40	25	Note 6
AGM-65	25	25	25			Note 1, 2, 6
AGM-88			25			Note 6
AGM-154 (JSOW)		25	25			Note 1, 5, 6
AGM-158 (JASSM)		25	25			Note 1, 6, 8

B-61		90	90			Note 3
CBU-87/89	25	25	25			Note 6
CBU-103/104/105/107 (WCMD)	25	25	25			Note 5, 6
GBU-10/12/51	25	25	25		30	Note 1, 6
GBU-24/27, EGBU-24/27		30	25			Note 1, 6
GBU-28, EGBU-28		35				Note 1, 6, 8
GBU-31/32/38/54/56 (JDAM)	25	25	25	35	25	Note 5, 6
GBU-39/53 (SDB)		25	25	40	25	Note 6, 7
MK81/82/83/84/110 Low Drag (LD)	25	25	25	25		Note 4, 6
MK82/MK84 High Drag (HD)	25	25	25			Note 4, 6
QUALIFICATIONS	**A-10**	**F-15**	**F-16**	**F-22**	**F-35**	**REMARKS**
20MM/30MM/25MM	X	X	X	X	X	
ADM-60			X			
ALE-50/70			X		X	
CHAFF/FLARES	X	X	X	X	X	
M129/PDU-5B	X	X	X			

ROCKETS (2.75)	X		X			
SUU-25	X		X			

Notes:

1. Add 15 minutes for each additional store or LAU-117.

2. Time is for one LAU-117. The time for loading one pre-loaded LAU-88 is 45 minutes; two LAU-88s, 60 minutes; single missile out of container, 35 minutes; for a single missile that must be transferred out of the container, 50 minutes; for three missiles out of the container, 60 minutes; for three missiles in their containers, 90 minutes.

3. Includes a short flight circuit test, such as F-16, 75060/W-11; or F-15E, A/E24T-199 check. When a long flight circuit test is to be included in a loading operation, add the time standard listed in the applicable -6 tech order to the time standard.

4. Add 5 minutes for each fuse extender used.

5. F-16 add 35 minutes if BRU-57 functional check is performed as part of the load.

6. Add 10 minutes if functional check is to be accomplished as part of the load evaluation.

7. Time standard for a preloaded carriage system is 40 minutes.

8. Add 5 additional minutes when loading AGM-158/GBU-28 on F-15E Station 5

Table 10.2. Bomber Aircraft Munitions Family Group and Munition Load Time Standards.

MUNITIONS FAMILY GROUP	B-1	B-2	B-52 INT	B-52 EXT	REMARKS
AGM-86			85	95	Note 1, 2, 5
AGM-158	50	50	50	50	Note 1, 4, 7
B-61/B-83		45			Note 1, 2, 6
CBU-87/89	40		40	40	Note 1, 3, 7
CBU-103/104/105/107 (WCMD)	40			40	Note 1, 4, 7

GBU-10/12				40	Note 3, 7
GBU-28		50		40	Note 3, 4, 7
GBU-31/38/54 (JDAM)	40	40	45	45	Note1, 4, 7
GBU-57 (MOP)		70			Note 4, 7
MK-56/60/62/63/65 (Mines)	40	40	25	40	Note 1, 3, 7
MK-82LD/83LD/84LD/M117/BLU-109/110 (GP LD)	40	40	25	40	Note 1, 3, 7
MK82A, MK84A (GP HD)	40	40		40	Note 1, 3, 7
QUALIFICATIONS	**B-1**	**B-2**	**B-52-I**	**B-52-E**	**REMARKS**
ADM-160				X	
ALE-50	X				
CHAFF/FLARES	X			X	
M129/PDU-5			X	X	

Notes:

1. Pre-load; time standard 40 minutes for preloaded B-1 CBM+, MRPL and SECBM. B-52/B-2 add 40 minutes for each additional preload Conventional Stores Rotary Launcher//Rotary Launcher Assembly or Pylon on the B-52.

2. B-52 post-load for one missile: Add 50 minutes for AGM-86B, 60 minutes for AGM-86D, and 70 minutes for AGM-86C. Add 5 minutes for each additional missile. B-2 post-load check add 20 minutes if accomplished as part of the load.

3. Add 3 minutes for each additional store Non MIL-STD-1760E capable store. Exception: Add 10 minutes per store for GBU/EGBU 10/12/28.

4. MIL-STD-1760E; Add 5 minutes per additional store. Exception: B-52 add an additional 5 minutes per store if MIL-STD-1760E cable installation is required. B-52 (internal) for AGM- 158 load add 20 minutes per additional store. The LSC will develop a local time standard for the

8th weapon. B-52 add an additional 10 minutes per additional store for CRL loading. B-1 and B-52 (external), for AGM-158 load, add 20 minutes per additional store. B-2, for the AGM-158 load, the first store is 50 minutes; add 20 minutes per additional store. The LSC will develop a local time standard for the 8th weapon.

5. Time for single missile loading is 70 minutes per store.

6. Time for single bomb is 40 minutes, add additional 15 minutes per store; B-2 add 20 minutes if post-load check is performed as part of the load.

7. B-2 add 20 minutes if post load checks are performed part of the load. B-1 add 45 minutes if status checks are performed as part of the load. N/A for B-52.

Table 10.3. Remote Piloted/Special Mission Aircraft Munitions Family Group and Munition Load Time Standards

	MQ-1	**MQ-9**	**AC-130U, W, and J**	**REMARKS**
AGM-114	20	20		Note 1, 2
AGM-176 (SOPGM)			30	
GBU-12		25		Note 1, 2
GBU-38/GBU-54		25		Note 1, 2
GBU-39			45	

QUALIFICATIONS				REMARKS
25MM/30MM			X	
CHAFF/FLARES			X	

Notes:

1. Add 15 minutes for each additional store or M299.
2. Add 10 minutes if functional check is to be accomplished as part of the load evaluation.

Chapter 11

ADDITIONAL MAINTENANCE REQUIRMENTS AND PROGRAMS

11.1. Facility Housekeeping and Contamination Control. Units will publish housekeeping and contamination procedures which protect the health of workers and maintain areas as free as practical from surface contamination. **(T-1)**. Units will:

11.1.1. Ensure Bioenvironmental Engineering approved workplace-housekeeping procedures are employed to prevent the spread of contamination within a work center. **(T-1)**.

11.1.2. Emphasize controlling the source of the contamination and ensure workplace personnel follow proper work procedures, PPE use, and hygiene practices. **(T-1)**.

11.1.3. Ensure housekeeping procedures will account for the dangers and hazard exposures found in the work center and will be consistent with mitigation methods outlined in AFMAN 91-203. **(T-1)**.

11.2. Personal Wireless Communications Systems Management.

11.2.1. Maintenance Communications. The MXG/CC has the overall responsibility to ensure Personal Wireless Communications Systems communication resources are available to support mission requirements. Reliable, redundant, cyber resilient, and effective communications systems are essential for efficient maintenance operations. These systems shall provide accurate, timely, secure, programmable frequency and jam resistant communications needed to securely accomplish the maintenance mission in a fully deployed and isolated mode.

11.2.2. Commanders or designated representative will coordinate base Communication Squadron or equivalent to ensure compliance with Personal Wireless Communications Systems management requirements IAW AFI 17-210, AFI 17-220, *Spectrum Management*, AFI 17-130, and AFMAN 17-1203. **(T-1)**. The following general guidelines apply:

11.2.2.1. Allowance for specific radios is shown in AS 660, *Equipment Allowances for Non-Weapon Systems Communications Requirements*, Repair Cycle Data Listing. Process requests for specific radio equipment to support maintenance activities IAW AFI 23-101, AFI 17-210, AFI 17-220, AFI 17-130, and AFH 23-123 V3, *Air Force Equipment Management*.

11.2.3. A VHF/UHF radio is authorized for use in maintenance operations to facilitate communications between aircraft and maintenance personnel. Additionally, aircrews may relay advance aircraft status information to maintenance personnel using VHF/UHF channels.

11.2.3.1. Maintenance Operations will coordinate procedures for use of these radio communications with operations and other essential wing organizations. **(T-1)**.

11.2.3.2. For effective flightline operations, more than one non-tactical radio nets are authorized when large numbers or different types of weapon systems are assigned or when Allowance Standards specify.

11.3. MAJCOM/ANG Special Certification Rosters (SCR). The SCR is a management tool providing supervisors a clear and concise listing of personnel who have been appointed to perform, evaluate, and/or inspect work of a critical nature. Normally, only maintenance requirements that have a definite potential for personal injury or damage to equipment will be included in the SCR.

Other tasks requiring special training or qualifications may be managed on the SCR. The SCR is used to build personnel rosters for deployments, shift schedules, and assess workforce capability. AF/A4LM establishes mandatory SCR Item Titles in Column A of **Table 11.1** **(T-1)**. Based on the evolving complexity of weapon systems and the associated task diversity the process of assigning prerequisite to SCR tasks are assigned to using MAJCOMs/ANG as follows: MAJCOMs/ANG A4s will coordinate with their applicable Lead Commands to develop and document SCR item "Prerequisite" criteria in Column B of **Table 11.1** based on task complexity of their assigned weapons systems. MAJCOMs/ANG may add additional items and remove non-applicable Items on their SCR using the standardized **Table 11.1** format provided. MAJCOM/ANG Supplements must include their complete SCR table when coordinating supplement approval with AF/A4LM as described in the opening **Paragraph**. Special Certification approval authority will be accomplished IAW notes at the bottom of the SCR. **(T-1)**. The MXG/CC and CD are not required to be on the SCR by virtue of their position as the SCR approval authority.

11.3.1. MXG/CC will approve items identified in **Table 11.1**, Note 1. **(T-1)**. The MXG/CC at their discretion, may delegate approval authority to MXG Squadron Commanders.

11.3.1.1. The Squadron Operations Officer/MX SUPT approves individuals in their primary AFSC based on their experience and technical expertise regardless of their assigned skill or position. 7-skill level personnel may be certified outside their primary AFSC only when specific Cross Utilization Training task qualification is documented in their training records.

11.3.1.2. MXG/SUPT will review and sign SCR actions for those individuals administratively assigned to MXO (QA, AFREP). **(T-1)**.

11.3.1.2.1. MXG/SUPT will coordinate with the Field Training Detachment (TD) CC/SUPT to validate currency of Field TD personnel on the SCR. **(T-1)**.

11.3.1.3. WWM will review and sign WS SCRs. **(T-1)**.

11.3.2. TFI units will establish a process for approving SCR additions in a MOA/MOU to provide visibility across participating organizations. **(T-1)**.

11.3.3. The MXG/CC may waive selected 5-skill level personnel, in the rank of SrA or higher, for tasks normally requiring a 7-skill level requirement to facilitate the production effort. Waived 5-skill level personnel should be closely monitored and kept to the minimum required to accomplish mission generation.

11.3.3.1. Operations Officer/MX SUPT or equivalent will retain file copies of approved waivers. **(T-1)**.

11.3.3.1.1. Approved waiver file copies may be discarded if SCR specifically identifies task as waived in the Maintenance Information System.

11.3.3.2. Certified weapons load crew chiefs (load crew member position number 1) by virtue of their task certification and position, serve as inspectors for weapons loading tasks only and do not require a waiver. **Note:** 2W0XX certified munitions inspectors are exempt from these requirements.

11.3.4. MAJCOM Waiver Policy. If local conditions require assignment of other than MAJCOM approved mandatory SCR grade (to include civilian equivalents) and skill level prerequisite requirements, and cannot be fulfilled using the MXG/CC authority stated in

Paragraph 11.3.3 then the MXG/CC (or equivalent) must request a waiver from the MAJCOM. **(T-2)**.

11.3.5. MAJCOMs may add additional mandatory critical tasks or inspections they deem necessary.

11.3.5.1. Identify each task on the SCR by a specific course code.

11.3.6. SCR Documentation. Flight CCs/SUPTs and Section NCOICs/Chiefs will review each individual's qualifications prior to recommending approval to perform SCR tasks to the appropriate approval level. **(T-1)**.

11.3.6.1. AF Form 2426, *Training Request and Completion* or MAJCOM-approved (ANG locally approved) form is used by the work center supervisor to add or remove an individual to the SCR. Additionally, removal from the SCR may be accomplished by lining through the task on the SCR and notifying the training section to update the MIS.

11.3.6.1. **(AFMC)** AFMC Form 64, *Request for Placement on Special Certification Roster*, may be used in lieu of AF Form 2426.

11.3.6.2. The appropriate level of authority approves the individual for addition to the SCR as listed in **Table 11.1**

11.3.6.3. On approval, the UTM IAW AFI 36-2650, loads the approved name into the Maintenance Information System.

11.3.6.4. Flight CCs/SUPTs and Section NCOICs/Chiefs will retain their copy of AF Form 2426 or MAJCOM-approved form until they verify proper loading. **(T-1)**.

11.3.6.5. Appointment letters are not required if loaded in the MIS.

11.3.6.6. Work center supervisor, AMU/Flight supervision, Operations Officer/MX SUPT, SQ/ CC, or MXG/CC may decertify individuals at any time and remove them from the SCR.

11.3.7. Units will ensure a current copy of the SCR is taken on all deployments. **(T-2)**.

Table 11.1. Mandatory Special Certification Roster and Prerequisites.

	A	**B**
ITEM	**Mandatory SCR Item Titles**	**MAJCOM/ANG Prerequisites**
1	All Systems "Red-X" (no egress, welding, munitions, fuel cell (in-tank work)) (Note 1)	Refer to MAJCOM Supplement
2	Exceptional Release (ER) (Note 1)	Refer to MAJCOM Supplement
3	"Red-X" Downgrade (Note 1)	Refer to MAJCOM Supplement
4	All Systems In Process Inspection (no egress, welding, munitions, fuel cell in-tank work) (Note 1)	Refer to MAJCOM Supplement

5	Installed Engine Run Certifying Officials (Note 1)	Refer to MAJCOM Supplement
6	Aircraft Inlet/Intake/Exhaust Certifying Officials (Note 1)	Refer to MAJCOM Supplement
7	Flexible Borescope Certifying Officials (Note 1)	Refer to MAJCOM Supplement
8	Engine Blade Blending Certifying Officials (Note 1)	Refer to MAJCOM Supplement
9	“Red-X” by Primary AFSC (PAFSC) and Mission Design Series (For multiple Mission Design Series, list separately) (Note 2)	Refer to MAJCOM Supplement
10	IPI by PAFSC and Mission Design Series (For multiple Mission Design Series, list separately) (Note 2)	Refer to MAJCOM Supplement
11	“Red-X” and/or In Process Inspection - Limited (Note 2)	Refer to MAJCOM Supplement
12	“Red-X” and/or In Process Inspection - Cross Utilization Training (For multiple MDSs, list separately), for tasks outside PAFSC (Note 2)	Refer to MAJCOM Supplement
13	NWRM packaging (Notes 4 and 5)	Refer to MAJCOM Supplement
14	Installed Engine Run by Mission Design Series (Note 2)	Refer to MAJCOM Supplement
15	Engine Blade Blending	Refer to MAJCOM Supplement
16	QA hot pit certifying officials and QA hot pit certifier augmentees (squadron certifying officials) (Note 1)	Refer to MAJCOM Supplement
17	Hot Refueling PAD Supervisor/"A" Member (Note 2)	Refer to MAJCOM Supplement
18	Hot Refueling Team Member (“B” or “D” member) (Note 2)	Refer to MAJCOM Supplement
19	Aircraft to Aircraft Refueling Supervisor (Note 2)	Refer to MAJCOM Supplement
20	Uninstalled Engine Operations (Test Stand and ETS) Run by TMS (Note 2)	Refer to MAJCOM Supplement

21	Uninstalled Engine Run Certifying Officials by TMS (Note 1)	Refer to MAJCOM Supplement
22	Aircraft Inlet/Intake/Exhaust Inspection/Certification (Note 2)	Refer to MAJCOM Supplement
23	Engine Flexible Borescope Inspections (Note 2)	Refer to MAJCOM Supplement
24	Chief Servicing Supervisor (Heavy Aircraft/Commercial Derivative Aircraft) (Note 2)	Refer to MAJCOM Supplement
25	Concurrent Servicing Supervisor (Fighter Aircraft) (Note 2)	Refer to MAJCOM Supplement
26	W&B Certified/Clear Red X (refer to TO 1-1B-50) (Note 2)	Refer to MAJCOM Supplement
27	Impoundment Official (refer to **Chapter 7** of this instruction) (Note 2)	Refer to MAJCOM Supplement
28	Impoundment Authority (refer to **Chapter 7** of this AFI) (Note 1)	Refer to MAJCOM Supplement
29	CANN Authority (Note 1)	Refer to MAJCOM Supplement
30	Auxiliary Power Unit (APU) Operation (In Cockpit) (Note 2)	Refer to MAJCOM Supplement
31	Calibration Limitation Approval (refer to TO 00-20-14) (Notes 2 and 3)	Refer to MAJCOM Supplement
32	CDDAR Team Chief (Note 1)	Refer to MAJCOM Supplement
33	Weapons Task Qualification Manager (WTQM) (Note 1)	Refer to MAJCOM Supplement
34	Weapons Task Qualification Crew (WTQC) (Note 2)	Refer to MAJCOM Supplement
35	NSS and T-9/T-10/T-11/T-12/T-20 sound suppressor Fire Control Panel (Note 2)	Refer to MAJCOM Supplement
36	Aircraft Rapid/Hot Defueling Supervisor (Note 2)	Refer to MAJCOM Supplement
37	Clear Red X when a lost item/tool cannot be located (refer to **Chapter 8** of this instruction) (Note 1)	Refer to MAJCOM Supplement
38	Aircraft APU Run Certifying Officials (In Cockpit) (Note 1)	Refer to MAJCOM Supplement

Notes:

1. Approved by MXG/CC or equivalent may be delegated IAW **Paragraph 11.3.1.**

2. Approved by Operations Officer/MX SUPT or equivalents.

3. Operations Officer/MX SUPT may delegate approval authority to the AMU OIC/SUPT or Flight CC/SUPT.

4. Munitions inspectors who are trained and certified may annotate serviceability tags for munitions items (TO 11A-1-10).

5. Appointed by the unit commander (or equivalent) of units possessing NWRM.

Table 11.1. (AFMC) Mandatory Special Certification Roster and Prerequisites.

	A	**B**
ITEM	**Mandatory SCR Item Titles**	**MAJCOM/ANG Prerequisites**
1	All Systems "Red-X" (no egress, welding, munitions, fuel cell (in-tank work)) (Note 1)	MSgt or higher (or civilian equivalent).
2	Exceptional Release (ER) (Note 1)	
3	"Red-X" Downgrade (Note 1)	
4	All Systems In Process Inspection (no egress, welding, munitions, fuel cell in-tank work) (Note 1)	
5	Installed Engine Run Certifying Officials (Note 1)	MSgt or higher (or civilian equivalent), or a fully qualified/certified contractor or AFETS/CETS representative and possess one of the following AFSCs: 2A671, 2A571/2/4, and 2A373/7/8. One year minimum engine-run experience on applicable MDS. MXG/CC may waive qualified TSgts.
6	Aircraft Inlet/Intake/Exhaust Certifying Officials (Note 1)	Qualified/certified 7 or 9- skill level(or civilian equivalent), or a fully qualified/certified contractor, AFETS or CETS representative and possess one of the following AFSCs: 2A6X1, 2A5X1/2/4, 2A3X3/7/8. One year minimum experience on applicable MDS/TMS.
7	Flexible Borescope Certifying Officials (Note 1)	
8	Engine Blade Blending Certifying Officials (Note 1)	
9	"Red-X" by Primary AFSC (PAFSC) and Mission Design Series (For multiple Mission Design Series, list separately)	SSgt or higher, minimum 7-skill level or civilian equivalent (includes MXG/CC-appointed exceptional SrA

	(Note 2)	per **paragraph 11.3.3.**).
10	IPI by PAFSC and Mission Design Series (For multiple Mission Design Series, list separately) (Note 2)	
11	“Red-X” and/or In Process Inspection - Limited (Note 2)	5-skill level personnel certified on limited tasks as determined by the unit (Note 1); 5-level Certified Weapons Load Crew Chiefs on loading tasks only.
12	“Red-X” and/or In Process Inspection - Cross Utilization Training (For multiple MDSs, list separately), for tasks outside PAFSC (Note 2)	SSgt or higher, minimum 7-skill level (or civilian equivalent), Use for personnel certified on tasks in other AFSCs through CUT training.
13	NWRM packaging (Notes 4 and 5))	Refer to AFI 20-110, Chapter 2.
14	Installed Engine Run by Mission Design Series (Note 2)	SrA or higher, minimum 5-skill level (or civilian equivalent), with at least 6 consecutive months experience on MDS for which engine run training is required. (Experience must have occurred immediately prior to course enrollment). The MXG/CC may waive the weapons system experience. MXG/CCs may waive qualified 5-skill level A1C for critical manpower shortages. The time on weapon system may also be waived by MXG/CC.
15	Engine Blade Blending	Minimum 5-skill level 2A3X3/7/8, 2A5X1/2/4, and 2A6X1 or civilian equivalent. (Note 2).
16	QA hot pit certifying officials and QA hot pit certifier augmentees (squadron certifying officials) (Note 1)	Fully qualified/certified TSgt or higher 2AX7X AFSC (or civilian equivalent) with a minimum of one year hot pit experience on the applicable TMS. MXG/CC may waive time requirement.
17	Hot Refueling PAD Supervisor/"A" Member (Note 2)	Minimum 5-skill level, 2AX5X (or civilian equivalent), with a minimum of 1 year flightline maintenance experience.
18	Hot Refueling Team Member (“B” or “D” member) (Note 2)	Flightline maintenance AFSC, with a minimum of 1 year flightline

		maintenance experience.
19	Aircraft to Aircraft Refueling Supervisor (Note 2)	Minimum 5-skill level with a minimum of 1 year weapon system experience.
20	Uninstalled Engine Operations (Test Stand and ETS) Run by TMS (Note 2)	SSgt or higher 7-skill level 2A6X1 (or civilian equivalent) with a minimum of 6 months current experience on each applicable TMS, unless previously qualified (N/A to short tour assignments). If previously qualified on a different TMS, the 6-month experience requirement may also be waived. MXG/CC may waive 5-skill level SrA with minimum of 6 months' time on applicable TMS.
21	Uninstalled Engine Run Certifying Officials by TMS (Note 1)	Fully qualified/certified TSgt or higher 2A671 AFSC, civilian equivalent, contractor, or AFETS/CETS personnel with a minimum of one year engine run experience on the applicable TMS. (One year run experience not applicable to short tour assignments). The MXG/CC may waive qualified SSgts and may authorize MT uninstalled engine run instructors as certifying officials.
22	Aircraft Inlet/Intake/Exhaust Inspection/Certification (Note 2)	Minimum 5-skill level, 2A3X3/7/8, 2A5X1/2/4, and 2A6X1 (or civilian equivalent).
23	Engine Flexible Borescope Inspections (Note 2)	Minimum 5-skill level 2A3X3/7/8, 2A5X1/2/4, and 2A6X1 (or civilian equivalent).
24	Chief Servicing Supervisor (Heavy Aircraft/Commercial Derivative Aircraft) (Note 2)	Minimum 5-skill level with 1 year weapons system experience.
25	Concurrent Servicing Supervisor (Fighter Aircraft) (Note 2)	For A-10, F-15, F-16, F-22A aircraft, minimum 7-skill level with a minimum of 1 year weapons system experience.
26	W&B Certified/Clear Red X (refer to TO 1-1B-50) (Note 2)	7-Skill level (or civilian equivalent), with a minimum of 1 year time on

		weapon system. For units that maintain multiple weapon systems, as long as the technician is certified on one airframe they do not require an additional year of experience for every subsequent airframe W&B certification. Time requirement may be waived by MXG/CC.
27	Impoundment Official (refer to **Chapter 7** of this instruction) (Note 2)	
28	Impoundment Authority (refer to **Chapter 7** of this AFI) (Note 1)	
29	CANN Authority (Note 1)	
30	Auxiliary Power Unit (APU) Operation (In Cockpit) (Note 2)	SrA or higher, minimum 5-skill level (or civilian equivalent), with at least 6 consecutive months experience on MDS for which APU Operation training is required. The MXG/CC may waive the weapons system experience if member proficiency/performance supports this action and may waive qualified 5-skill level A1C to fill critical manpower shortages. MXG/CCs may also institute more stringent requirements as necessary (e.g. must be engine run qualified).
31	Calibration Limitation Approval (refer to TO 00-20-14) (Notes 2 and 3)	SSgt or higher, minimum 7-skill level (or civilian equivalent).
32	CDDAR Team Chief (Note 1)	MSgt or higher or civilian equivalent. MXG/CC may waive grade requirement.
33	Weapons Task Qualification Manager (WTQM) (Note 1)	TSgt or higher, minimum 7-skill level AFSC 2A871X or 2AX7X (or civilian equivalent).
34	Weapons Task Qualification Crew (WTQC) (Note 2)	Lead will be SSgt or higher, minimum 7-skill level 2AX7X (or civilian equivalent); other crew member minimum 5-skill level 2AX5X (or civilian equivalent).
35	NSS and T-9/T-10/T-11/T-12/T-20 sound suppressor Fire Control Panel (Note 2)	SrA or higher, (or civilian equivalent) with AFSC 2A6X1 must have a

		minimum 6 months experience.
36	Aircraft Rapid/Hot Defueling Supervisor (Note 2)	Minimum 5-skill level, 1 year of flightline experience, with 6 months weapon system experience.
37	Clear Red X when a lost item/tool cannot be located (refer to **Chapter 8** of this instruction) (Note 1)	Operations Officer/MX SUPT or above.
38	Aircraft APU Run Certifying Officials (In Cockpit) (Note 1)	7-skill level (or civilian equivalent), or a fully qualified/certified contractor or AFETS/CETS representative. MXG/CCs may also waive qualified 5-skill level SSgts.
39	T-38 Flight Control /System Rig Certifier	Minimum 7-skill level or civilian equivalent, 12 months experience adjusting system rigging. Certifies specialized MX rig teams to accomplish flight control, canopy, landing gear, door and other systems rigging. (Note 1)
40	T-38 Flight Control/System Rig Team Member	Minimum 7-skill level or civilian equivalent, 12 months experience performing system rigging. Performs flight control, canopy, landing gear, door and other system rigging as team member when directed. Member may be CUT trainee (Note 1)
Note: For tankers, airlift, bomber and passenger aircraft include the following items 41-47 on SCR.		
41	Landing Gear Retraction Supervisor	(Supervisor) SSgt or higher or civilian equivalent, minimum 7-skill level.
42	Landing Gear Retraction Member	(Gear handle operator) minimum 5-skill level, and 1 year flightline experience.
43	Jacking Supervisor	Minimum 7-skill level or civilian equivalent, 6 months system experience.
44	Jacking Manifold Operator	Minimum 5-skill level or civilian equivalent, 6 months system experience.

45	Integral Jacking Member (C-17)	Minimum 6 months C-17 experience (Note 2)
46	Integral Jacking Supervisor (C-17)	Minimum SSgt (or civilian equivalent), 6 months minimum C-17 system experience (Note 2)
47	Integral Jacking Certifying Official (C- 17)	Minimum 7-skill level or civilian equivalent, with minimum 1 year C-17 experience

Note:

1. Approved by MXG/CC or equivalent may be delegated IAW **Paragraph 11.3.1.**

2. Approved by Operations Officer/MX SUPT or equivalents.

3. Operations Officer/MX SUPT may delegate approval authority to the AMU OIC/SUPT or Flight CC/SUPT.

4. Munitions inspectors who are trained and certified may annotate serviceability tags for munitions items (TO 11A-1-10).

5. Appointed by the unit commander (or equivalent) of units possessing NWRM.

11.4. Aircraft Grounding.

11.4.1. Definition. Aircraft grounding is an administrative action taken to prohibit aircraft from flying because of a specific condition related to the aircraft or based on requirements of a directive. Implemented from a higher echelon of command (MAJCOM/CC) when conditions in multiple aircraft, engines, missiles, munitions, or related installed flight equipment create a sufficient risk to personal injury or equipment damage which warrant fleet grounding until the matter can be properly investigated and resolved.

11.4.1.1. Communication of a grounding, or a potential grounding event (TCTO, OTI, PM event) to weapon systems operating in a deployed environment and/or under the authority of an operational command must follow the grounding procedures outlined in AFI 11-401 and 63-101/20-101. **(T-1)**.

11.4.1.1.1. Units must not directly communicate home station requirements to its deployed forces but provide communication through their respective MAJCOM. **(T-1)**. **Note:** This section does not apply to conditions which are clearly limited to the affected unit/base (such as, lost tool, fluid contamination, aircraft and equipment damage of known origin, or other strictly local event). In these circumstances, the affected unit follows the impoundment procedures specified in **Chapter 7**.

11.4.2. Initial Investigation. The owning MXG/CC or equivalent will direct QA to develop a local OTI IAW TO 00-20-1 and this instruction. **(T-1)**.

11.4.2.1. The OTI will require an inspection of a representative number of systems or units (aircraft, engines, missiles, or munitions) of the same mission and design to determine if

the condition exists on other aerospace equipment within the wing's assigned aircraft/systems or equipment. **(T-1)**.

11.4.2.1.1. If initial sampling indicates the discrepancy is widespread and has the potential for personal injury and/or further equipment damage, the MXG/CC will discuss aircraft grounding with the WG/CC and forward a recommendation to the MAJCOM. **(T-1)**.

11.4.2.2. If there is no repair or corrective action specified in technical data, QA will also submit a technical assistance request through the MAJCOM to the appropriate weapon system program manager IAW TO 00-25-107 or equivalent process. **(T-1)**.

11.4.3. Grounding Authority. The approved procedures for grounding aircraft or stand-down for operational reasons are determined and executed IAW AFI 11-401 and AFI 63-101/20-101. **(T-1)**.

11.4.3.1. Notification and final reporting for grounding and release status will be accomplished IAW AFMAN 10-206, *Operational Reporting*. **(T-1)**.

11.4.3.2. Annotate aircraft grounding in the aircraft forms IAW TO 00-20-1. **(T-1)**.

11.5. Ramp Inspection Program. Public Law 99-661 requires a pre-flight safety inspection of all internationally scheduled charter missions for the transportation of members of the Armed Forces departing the United States. **(T-0)**.

11.5.1. Air Mobility Command (AMC) is lead for the DoD in the management and administration of the Ramp Inspection Program.

11.5.1.1. AMC will publish specific guidance for this Program in a supplement/addendum/or equivalent publication IAW AFI 33-360 to communicate requirements and processes necessary for MAJCOMS to effectively comply with public law requirements in all using commands.

11.5.1.2. AMC will coordinate with other MAJCOMs as required to accomplish ramp inspections to ensure the maximum efficiency and utilization of resources.

11.5.1.3. When requested by AMC, MAJCOMs if able should provide support to reduce the TDY and manpower impact associated with the execution of this program.

11.5.1.3. **(AFMC)** Send request to HQ AFMC/A4M at **AFMC.A4M.workflow@us.af.mil**.

11.6. Red Ball Maintenance. The term "Red Ball" is a traditional descriptor, recognized throughout aircraft maintenance, and defines a situation requiring a sense of urgency and priority actions. Red Ball maintenance normally occurs two hours prior to launch and until aircrew have released the aircraft back to maintenance. The Red Ball maintenance concept is intended to prevent late takeoffs and aborts by having qualified maintenance personnel available (such as, in a truck or standby in the shop) during launch and recovery operations to troubleshoot, isolate, and repair system malfunctions. Red Ball maintenance does not authorize technicians to take shortcuts or deviate from TOs, disregard personnel safety requirements or fail to properly document the aircraft forms and the MIS for all completed repair actions.

11.6.1. Units will ensure all maintenance repair actions (does not apply to incorrect switch settings due to operator error) are documented in the aircraft forms and MIS during Red Ball, launch, or EOR operations and cleared from the aircraft forms prior to flight. **(T-1)**.

11.6.2. Maintenance repair actions must be cleared in the MIS as soon as possible. **(T-1)**. It is imperative that maintenance documentation is performed regardless of the timing of the action in the generation and launching of the aircraft.

11.6.3. All grounding inputs must be cleared from the forms prior to flight. **(T-1)**.

11.6.4. If aircraft status changes, an ER must be re-accomplished by a certified individual upon completion of maintenance and before the aircraft is released for flight IAW TO 00-20-1. **(T-1)**.

11.6.5. Units will develop written procedures to capture, document, and clear Red Ball maintenance actions in the event the MIS is down. **(T-1)**.

11.6.5.1. Procedures must require MIS entry of Red Ball maintenance actions as soon as the MIS becomes operable. **(T-1)**.

11.7. Maintenance Recovery Team: MAJCOMs will publish standardized procedures to recover assigned aircraft at remote locations.

11.7.1. Procedures at a minimum will identify how resources, including personnel, supplies, and equipment will be made available to support transient aircraft recovery.

11.7.2. If required, establish multiple command MOUs/MOAs/collaboration necessary to achieve efficient aircraft recovery and MIS documentation.

11.7.3. **(Added-AFMC)** The MXG/CC is responsible for deploying MRTs and equipment to recover aircraft at remote locations, as directed by this instruction. Units will develop checklists. Unit resources, including personnel, supplies, and equipment, will be made available to support en route aircraft recoveries. **(T-2).** The MXG/CC will:

11.7.3.1. **(Added-AFMC)** Ensure adequate equipment resources, as authorized by applicable AS, are available to perform remote aircraft recoveries. **(T-2).**

11.7.3.2. **(Added-AFMC)** Ensure enough individuals are qualified to perform and complete all anticipated tasks, including MIS documentation, IPIs, and Red X sign-offs. Consider the experience level of the individuals you select when the need is identified to troubleshoot repeat/recurring discrepancies, especially those that caused in-flight emergencies or involve safety of flight. The MXG/CC has the authority to grant approval for a single person to sign off their own work when only one individual deploys on an MRT IAW TO 00-20-1. **(T-2).**

11.8. Foreign Object Damage (FOD) Prevention Program. All personnel (military, civilian, and contractors) working in, on, around, or traveling through areas near aircraft, flightline munitions, AGE, engines, or components thereof will comply with FOD prevention. **(T-1)**. FOD prevention training requirements are outlined in AFI 36-2650. This section establishes minimum requirements for a FOD Prevention Program.

11.8.1. The WG/CV is responsible for ensuring an effective FOD prevention program is established.

11.8.2. Definition. FOD: Any damage to an aircraft, engine, aircraft system, component, tire, munitions, or SE caused by a foreign object(s) (FO) which may or may not degrade the required safety and/or operational characteristics of the aforementioned items.

11.8.3. FOD Prevention.

11.8.3.1. On aircraft, uninstalled engines, LRUs and AGE. Openings, ports, lines, hoses, electrical connections, and ducts will be properly plugged or capped to prevent FO from entering the systems. **(T-1)**. **Note:** Do NOT place items (such as, trash bags, rags, cloths) inside open cavities or ducts. When no approved manufactured coverings and/or caps are available for use, securely cover open ducts and/or cavities externally to prevent foreign objects from being introduced. Prior to installation, inspect openings, cavities and ducts for FO.

11.8.3.1.1. Items that are actively being disconnected, installed, and/or removed will be capped IAW technical data or at completion of the task. **(T-1)**.

11.8.3.1.2. At no time will items, (such as, aircraft forms binders, video tape recorder tapes, checklists, tools.), be placed in or on engine intakes. **(T-1)**. **Note:** Does not apply to technicians performing inlet maintenance, inspections and blade blending requiring lights, files, or other tools inside aircraft inlets.

11.8.3.1.3. Inventory all items IAW **Chapter 8** **(T-1)**.

11.8.3.2. MAJCOMs in coordination with Safety, applicable MDS Lead Commands and Weapon System Teams will review FOD, Incident, and Mishap reports to determine if MAJCOM directed IPI or KTL additions are needed to mitigate identified FOD trends.

11.8.3.2.1. Units will establish MDS specific procedures that ensure pre-launch removal and post-recovery installation of intake/inlet plugs and covers (such as, pitot tubes to include ejection seats as required) remain installed on aircraft as close to crew show as possible to prevent FOD, as determined by MXG/CC guidance. **(T-3)**.

11.8.3.2.2. Units will establish MDS specific FOD prevention guidance that standardizes mitigation procedures when performing high FOD risk maintenance task (use of plugs/barrier paper, tape, inlet/intake/ECS maintenance or equivalent tasks). **(T-2)**.

11.8.3.2.3. Technicians will ensure engine inlet run-up screens and anti-personnel guards are used IAW applicable weapon system TOs. **(T-1)**.

11.8.3.3. Covers (such as, engine, pitot tube(s) to include ejection seat) need to remain installed on aircraft as close to crew show as possible to prevent FOD, as determined by MDS/local MXG/CC guidance.

11.8.3.4. Technicians should use a light source of sufficient illumination to inspect the aircraft intakes and exhaust for FO/FOD.

11.8.3.5. Whenever physical entry into an aircraft intake or exhaust is required technicians will wear a pocket-less, zipper-less, button-less, bunny-suit marked "Intakes Only" and cloth over-booties or stocking feet, (Boots may be worn if not restricted for use by TO/MAJCOM and are authorized by the MXG or equivalent), boots if worn must be inspected and FOD removed from boots prior to installing cloth over-booties. **(T-2)**.

11.8.3.5.1. When performing intake inspections while wearing a Chemical Warfare Defense Equipment, pockets will be emptied and all accessories removed. **(T-1)**.

11.8.3.5.1.1. During exercises/inspections, the Chemical Warfare Defense Equipment will be removed and the bunny-suit will be utilized. **(T-1)**.

11.8.3.5.1.2. Chemical Warfare Defense Equipment will only be worn during "real world" situations. **(T-1)**. To minimize the potential for FOD and intake damage where Chemical Warfare Defense Equipment zippers are exposed, cover them with any type of tape and account for the tape upon completion of the inspection. **(T-1)**.

11.8.3.6. Each base will develop a local flightline clothing policy that addresses wearing of hats, badges, and passes aimed at FOD prevention while considering climate and safety. **(T-1)**. As a minimum, it will include the following requirements:

11.8.3.6.1. Restricted area badges will be secured with a subdued non-metallic cord or plastic armband when worn on the flightline. **(T-1)**.

11.8.3.6.2. Restricted area badges will be removed when performing intake/inlet/exhaust inspections if personnel physically enter these areas. **(T-1)**.

11.8.3.6.3. Metal insignias/badges will not be worn on the flightline. **(T-1)**.

11.8.3.6.4. Wigs, hairpieces, metal hair fasteners, earrings, or any other jewelry/loose items that may fall off without notice, are not authorized on the aircraft and industrial work areas. **(T-1)**.

11.8.3.6.5. Escorts of visiting personnel will ensure FOD prevention measures are taken. **(T-1)**.

11.8.3.7. All maintenance production areas must have FO containers readily accessible. **(T-1)**.

11.8.3.7.1. All vehicles driven primarily on the flightline for direct aircraft maintenance support activities must be equipped with secured and lidded FO containers. **(T-1)**. **Note:** Permanently affixed FO containers must be approved by Vehicle Management prior to installation IAW AFI 24-302.

11.8.3.8. Control all work order residue used on or around aircraft, uninstalled engines, and AGE. **(T-1)**.

11.8.3.8.1. **(Added-AFMC)** Establish and tailor rivet replacement procedures for local operation of assigned weapons systems. Include the procedures as part of the FOD orientation/familiarization for personnel working in these areas. Include work order residue control procedures for all maintenance performed in and around intake areas. **(T-2).**

11.8.3.8.2. **(Added-AFMC)** Aircraft Structural Maintenance shops and Low Observable Aircraft Structural Maintenance shops will develop LCL for intake repairs IAW **Chapter 6** and TO 00-5-1. All parts and pieces installed and removed from the aircraft will be documented and verified by a 7-level. The checklist will be completed on the job site and turned into QA, or equivalent, within 24 hours of repair completion. Aircraft Structural Maintenance and Low Observable Aircraft Structural Maintenance

technicians are not required to meet the training requirements of **paragraph 11.16** **(T-2).**

11.8.3.9. Rags will be controlled and accounted for IAW **Chapter 8** **(T-1)**.

11.8.3.9.1. Rag control applies to all organizations and personnel performing aircraft, missile, munitions, and equipment maintenance.

11.8.3.10. FOD walks are mandatory to remove FO from ramps, runways, maintenance areas and access roads.

11.8.3.10.1. In addition, mechanical/vacuum sweepers, magnetic bars or sweeping by hand are highly encouraged to supplement FOD walks.

11.8.3.11. When FOD is discovered on a transient aircraft, depot input/output or CRF engine, the host FOD monitor or aircrew must notify the owning organization within 24 hours. **(T-1)**.

11.8.3.11.1. An informational copy of the FOD report must be provided to the owning organization's safety office/FOD monitor to ensure compliance with AFI 91-204. **(T-1)**.

11.8.3.11.2. For depot input/output or CRF engine. If the FOD is found during the receiving inspection at one of the aforementioned locations, it will be tracked/charged (if necessary) to the owning MAJCOM unit. **(T-1)**. If discovered any other time at one of the aforementioned locations, it will be tracked/charged to the ALC or CRF. **(T-1)**.

11.8.3.11.3. **(Added-AFMC)** When transient/deployed aircraft incur FOD, the host unit will conduct the investigation and notify the owning organization using command-reporting procedures. **(T-2).**

11.8.3.11.4. **(Added-AFMC)** The owning organization is responsible for FOD incidents and investigations on transient aircraft/engines when one of the following conditions apply:

11.8.3.11.4.1. **(Added-AFMC)** When the owning organization's maintainers are deployed with the aircraft and the FOD is a direct result of transient/deployed unit negligence. **(T-2).**

11.8.3.11.4.2. **(Added-AFMC)** FOD discovered by transient alert or by contractor personnel during acceptance inspections will be charged to the base from which the aircraft last departed if a FOD inspection was not accomplished/documented and there were no intermediate stops. (**T-2).**

11.8.3.12. Ensure local FOD Prevention Program addresses the elimination of FOs to include aircraft cockpits and flight decks before and after flight. **(T-1)**.

11.8.3.12.1. When an item is lost on or in the vicinity of aircraft or equipment, lost item/tool procedures in **Chapter 8** will be followed. **(T-1)**.

11.8.3.12.2. The MXG/CC will coordinate with the OG/CC to develop procedures to ensure pilots and aircrew members account for all equipment and personal items after each flight and ensure any items that become lost during flight are documented in the aircraft AFTO Form 781A. **(T-1)**.

11.8.3.12.3. These procedures will be documented in the wing tool/equipment management publication referenced in **Paragraph 8.2** **(T-1)**.

11.8.3.13. Use extreme care during engine ground runs. Jet blast and helicopter hover power check areas need to be free of debris that could cause FOD.

11.8.3.14. Special emphasis is required for items such as: remove before flight streamer attachment, safing pin condition, hinge pin security, dust and FO prevention cover condition/security, and aircraft forms binder condition. Periodically check these types of items for FO prevention compliance.

11.8.3.14.1. Units will account for -21 equipment and covers IAW AFI 21-103. **(T-1)**.

11.8.3.14.2. Weapons Expediters must ensure all mission specific safing gear is controlled and accounted for to preclude loss and potential FOD. **(T-1)**.

11.8.3.15. Vehicle operators will stop and perform a visual FOD inspection on all vehicles, equipment and tires prior to entering the flightline. **(T-1).** Refer to AFI 13-213, *Airfield Driving*, and AFMAN 91-203 for additional requirements, restrictions and exemptions.

11.8.3.16. Grounding wires/points:

11.8.3.16.1. Two allen head screws, or equivalent, will be utilized to secure cable to grounding clip. **(T-1)**.

11.8.3.16.1.1. Screw heads will be coated with sealant or screws will be staked in order to prevent screws from backing out. **(T-1)**.

11.8.3.16.1.2. Unused screws will be removed. **(T-1)**.

11.8.3.16.2. All grounding points will be kept clean of debris at all times and shall be a high interest item for FOD walks. **(T-1)**.

11.8.3.17. Use of magnetic bars on the flightline is optional. If used, the magnetic bars will be towed by, or attached to vehicles primarily used on the flightline and will be inspected and made FOD free daily. **(T-2)**.

11.8.3.18. A locally manufactured tool for removing debris from tire treads is authorized for use and will be identified to the vehicle by using the vehicle ID number. **(T-2)**.

11.8.3.19. Remove metal identification bands from all tubing (except aircraft installed egress system components) and cables on the aircraft.

11.8.3.19.1. With the exception of factory-installed ID tags attached to cargo chains/devices to identify the type being used, remove metal identification bands from cargo tie-down chains/devices prior to use around aircraft.

11.8.3.19.2. Do not remove manufacturer installed metal identification bands from hydraulic hoses.

11.8.3.19.3. Mark hydraulic lines IAW TO 42E1-1-1, *Aviation Hose and Tube Manual*.

11.8.3.19.4. **(Added-AFMC)** Leave inspection and load tolerance tags attached. (T-2).

11.8.3.20. Use X-ray, borescope, and other equipment to locate FO in inaccessible areas.

11.8.4. FOD Prevention Responsibilities.

11.8.4.1. The WG/CV will be assigned as the FOD Prevention Program Manager and will appoint a qualified maintenance AFSC, civilian equivalent or contractor if designated by SOW or PWS, to the position of FOD Monitor. **(T-1)**.

11.8.4.1.1. The appointed individuals name will be posted in a prominent place within the unit on a locally-developed visual aid which also provides contact information. **(T-1)**.

11.8.4.2. The WG/CV will:

11.8.4.2.1. Ensure all personnel actively support the FOD Prevention Program. **(T-1)**.

11.8.4.2.2. Provide local guidance to ensure each FOD mishap is investigated and action taken to solve any underlying problems. **(T-1)**.

11.8.4.2.3. Review all unit FOD mishap reports and analyze the reports and other data for trends identifying areas requiring management action. **(T-1)**.

11.8.4.2.4. Coordinate FOD prevention needs with the airfield manager and other agencies when construction is in progress on or near the flightline, or other areas where FOD incidents could occur. **(T-1)**.

11.8.4.2.5. Ensure FOD prevention is part of QA inspections. **(T-1)**.

11.8.4.2.6. Coordinate with the airfield manager to identify and properly mark FOD checkpoints. **(T-1)**.

11.8.4.2.7. **(Added-AFMC)** Develop and implement a FOD awareness and prevention training program. **(T-2).** At a minimum, the training program must address the following:

11.8.4.2.7.1. **(Added-AFMC)** Standardized training documentation requirements. **(T-2).**

11.8.4.2.7.2. **(Added-AFMC)** FOD awareness and prevention practices. **(T-2).**

11.8.4.2.7.3. **(Added-AFMC)** Initial FOD training. Ensure newcomers are trained on work center specific FOD awareness and prevention practices prior to starting work in their assigned work area. **(T-2).**

11.8.4.2.7.4. **(Added-AFMC)** Annual FOD training. Ensure personnel receive annual FOD awareness and prevention training. **(T-2).**

11.8.4.2.7.5. **(Added-AFMC)** Ensure all maintenance, operations, base support, and contractor personnel who work in, around, or drive through maintenance and/or operational areas are trained on FOD prevention. **(T-2).**

11.8.4.3. Tenant Unit FOD Prevention Responsibilities. The host base FOD Prevention Program Manager will incorporate tenant units in the host unit program. **(T-1)**.

11.8.4.3.1. Tenant units shall establish their own FOD Prevention Program, but will still participate in the host program and comply with host program requirements. **(T-1)**.

11.8.5. FOD Monitor. The Wing FOD Monitor's office shall be located within QA or at the discretion of the WG/CV. **(T-3)**. The Wing FOD Monitor, at a minimum, will:

11.8.5.1. Inform all wing agencies of FOD hazards. **(T-1)**.

11.8.5.2. Develop wing procedures to document and perform spot checks of selected areas weekly. **(T-1)**.

11.8.5.3. Be involved in each FOD investigation and help ensure corrective actions are sound. **(T-1)**.

11.8.5.4. Monitor and recommend changes to FOD prevention training. **(T-1)**.

11.8.5.4.1. Those units having several types of aircraft assigned will have their FOD prevention training incorporated into one wing/center training program. **(T-1)**.

11.8.5.4.2. Units will ensure an initial FOD awareness and responsibilities briefing is given to all newly assigned personnel. **(T-1)**.

11.8.5.5. Periodically inspect and report damaged pavement, flightline construction, or other hazards in or near aircraft parking ramps or taxiways to the airfield manager and monitor status to ensure timely repairs. **(T-1)**.

11.8.6. FOD Investigation and Reporting.

11.8.6.1. When suspected or confirmed FOD is discovered, the MOC will be notified immediately. **(T-1)**.

11.8.6.1.1. Upon notification, the MOC will immediately notify the Wing FOD Monitor, and Wing Safety as required, IAW AFMAN 91-223. **(T-1)**.

11.8.6.1.2. **(Added-AFMC)** MOC will immediately notify Airfield Management when cut or damaged tires are discovered after taxiing or aircraft tows. **(T-2).**

11.8.6.2. Units must make every attempt to determine the root cause of FOD-related mishaps before returning engines and modules to the depot for investigation. **(T-1)**.

11.8.6.2.1. If engines/modules are returned to the depot, an information DR will be completed and forwarded IAW procedures outlined in AFI 91-204 and TO 00-35D-54. **(T-1)**.

11.8.6.2.2. All FOD-mishap engines and modules returned to the depot must be properly marked on the outside of the packaging as a FOD-mishap asset. **(T-1)**.

11.8.6.2.3. Mark container or package in red with the following statement, "FOD mishap investigation required." **(T-1)**.

11.8.6.3. FOD incidents are classified as preventable and non-preventable. Only preventable FOD over $50K (parts and labor) are to be chargeable to the FOD rate. FOD is considered preventable except when the damaged can be attributed to the following:

11.8.6.3.1. Caused by natural environment or wildlife. This includes hail, ice, animals, insects, sand, and birds. Report this type of damage IAW AFI 91-204. Do not include these in the FOD rates.

11.8.6.3.2. From internal engine materiel failure, as long as damage is confined to the engine.

11.8.6.3.3. Caused by materiel failure of an aircraft component if the component failure is reported as a DR using the combined mishap DR reporting procedures of AFI 91-204 and TO 00-35D-54.

11.8.6.3.4. Found during depot overhaul for maximum operating time.

11.8.6.4. Additionally, the following apply:

11.8.6.4.1. Engine damage caused by improper anti-ice/de-ice procedures by either flight or ground crews are considered preventable.

11.8.6.4.2. Engine or airframe damage caused by gunnery or rocket mission ricochets are considered non-preventable provided mission parameters were not exceeded and range cleaning was sufficient.

11.8.6.4.3. Engine and propeller damage caused by rocks, stones, wood, or other objects ingested during low hover operations or unimproved runway landings are considered non-preventable, provided mission parameters were not exceeded.

11.8.6.4.4. MAJCOMs will determine reporting criteria for FOD incidents that result in a blade blending requirement IAW applicable tech-data.

11.8.6.4.4. **(AFMC)** Damage beyond blend repair, where hardware may be suspect for cause, and/or further unserviceable damage exists beyond the 1st stage fan will be considered reportable FOD. FOD found on the 1st stage fan which can be blended IAW with applicable tech-data may be considered non-reportable. **(T-2).**

11.8.6.5. Preventable FOD over $50K incurred at ETS or on trim pad will be chargeable. **(T-1)**.

11.8.6.6. Appropriate MAJCOM offices will assist in resolving any questionable FOD issues, preventable or non-preventable.

11.8.6.6. **(AFMC)** HQ AFMC/A4M Propulsion Functional Manager shall assist in resolving questionable FOD issues.

11.8.6.7. The Wing FOD Monitor will provide an initial report of all FOD incidents to the MAJCOM FOD monitor within 24 hours of occurrence. **(T-1)**.

11.8.6.7.1. A follow-up report will be required every 45 days until closeout. **(T-2)**. Use the FOD report format as listed in **Attachment 6**.

11.8.6.7.2. MAJCOMs will determine FOD standards, MDS specific flying hour source data, period of time for calculation, reporting procedures, and meeting frequency for units that exceed standards in their supplement to this AFI.

11.8.6.7.2. **(AFMC)** Wing FOD monitor shall provide initial FOD reports via the HQ AFMC/A4M Propulsion Management SharePoint Site as soon as the damage is known, but NLT 24 hours after occurrence.

11.8.6.7.2.1. **(Added-AFMC)** FOD standard for fighter/rescue/bomber aircraft (F-15, HH60, B-1) is 1.0 and airlift/tanker aircraft (C-17, C-130, KC-135) is 3.0. **(T-2)**

11.8.6.7.2.2. **(Added-AFMC)** MDS specific flying hours source data is defined

as the flying hours flown as identified in the Maintenance Information System (MIS). **(T-2)**

11.8.6.7.2.3. **(Added-AFMC)** Units will conduct monthly FOD Prevention Committee Meetings, whenever the unit exceed the MAJCOM standard. Meetings will continue until the unit completes three consecutive months without exceeding the standard. The FOD meeting may be combined with other meetings. **(T-2)**

11.8.6.7.2.4. **(Added-AFMC)** Wing FOD monitor shall submit FOD calculations monthly for each MDS using the HQ AFMC/A4M Propulsion Management SharePoint site: **https://usaf.dps.mil/teams/22355/Lists/FOD%20Rate/Test%20Wing.aspx**, no later than the 15th of the month following the reporting month.

11.8.6.7.2.5. **(Added-AFMC)** Wing FOD monitor shall provide a final report the HQ AFMC/A4M Propulsion Management SharePoint site: **https://usaf.dps.mil/teams/22355/Lists/ALC%20FOD%20Incident%20Report/Standard%20View.aspx** upon completion of the FOD investigation. **(T-2)**

11.8.6.7.2.6. **(Added-AFMC)** If the FOD incident is deemed a mishap IAW AFI 91-204, the Wing FOD monitor will still report the FOD incident then work in tandem with the Wing SE office to properly report the mishap. **(T-2).**

11.8.6.8. FOD rates are computed by MDS as follows: Number of Preventable FODs (damage exceeding $50K) ÷ Aircraft Flying Hours X 10,000 = FOD Rate. **Note:** ALCs compute FOD rates as follows: Number of Preventable FODs (damage exceeding $50K) ÷ Aircraft Flying Hours X 1,000 = FOD Rate. ALCs compute aircraft flying hours by using acceptance flights, functional check flights, ground runs, and the number of un-installed ETS starts.

11.8.7. FOD Prevention Committee Meeting. This meeting is mandatory for units that exceed the MAJCOM-established standard. **(T-1)**.

11.8.7.1. The WG/CV will chair the meeting, if required, and will determine minimum required attendees. **(T-1)**. The purpose of this meeting is to identify negative trends and develop and execute action plans to resolve them.

11.8.7.1.1. The MXG/CC (or equivalent) will chair the meeting in the absence of the WG/CV. **(T-2)**.

11.8.7.1.2. **(Added-AFMC)** Additionally, the following will be considered for minimum attendance at the FOD Prevention Committee Meeting: Center FOD Monitor, the designated Union representative, Center or Wing Maintenance Training, Flight test representative, Contracting (As applicable), Center tool control manager, and the ABW/CV. **(T-2).**

11.8.7.2. Meeting agenda items should include issues that resulted in the wing exceeding the FOD standard, such as:

11.8.7.2.1. Total number of airframe, engine, and tire FOD incidents during the reporting period. Indicate quantity and cause. Current status of all other pending incidents will be discussed.

11.8.7.2.2. Mechanical/vacuum sweeper status.

11.8.7.2.3. Review and refinement of the existing FOD prevention program.

11.8.7.2.4. New directives/actions established to minimize FOD.

11.8.7.2.5. Status and condition of engine run-up screens as applicable.

11.8.7.2.6. Results of X-rays for FOs during engine bay inspections, acceptance inspections, and PH inspections. Maintenance trends should be discussed when an increase in FO is discovered during these X-rays.

11.8.7.2.7. Identification of potential FOD sources.

11.8.7.2.8. Lost tools/items.

11.8.7.2.9. Increased potential for FOD within the next 30-60 days.

11.8.7.2.10. Dropped objects. Pay particular attention to those that result in downstream FOD.

11.8.7.2.11. Breakdown of FOD inspections/assessments.

11.8.7.2.12. Cockpit FO incidents.

11.8.7.2.13. Recognition of personnel making significant contributions to FOD prevention (such as, golden bolt program, FOD poster contests, or other FOD recognition programs locally-developed at each unit).

11.8.7.2.14. **(Added-AFMC)** In addition to the agenda items, the minutes will include as a minimum a list of attendees and absentees. Attendees list will identify the wing FOD monitor and provide functional address symbol and duty phone number for all personnel. Meeting minutes will be made available to FOD committee members. **(T-2).**

11.8.8. Bird Strikes. Consult TO 1-1-691 for bird strike clean-up procedures and AFMAN 91-223 for bird strike reporting procedures.

11.9. Dropped Object Prevention (DOP) Program. A dropped object is any aircraft part, component, surface, LO coating exceeding 8 inches in any dimension or other item lost during aircrew operations (unless intentionally jettisoned) from engine start to engine shutdown. Inadvertently released munitions are not considered dropped objects and will be reported IAW AFI 91-204. **Note:** Missing Chaff/Flare/Decoy end-caps are not reportable dropped objects.

11.9.1. Responsibilities. All units, which fly, service, or maintain aircraft, will develop a DOP Program with the following provisions: **(T-1)**.

11.9.1.1. MAJCOM DOP monitors or aircraft functional managers will act as OPR for all dropped object inquiries IAW MAJCOM established standards.

11.9.1.2. The WG/CV serves as the Wing DOP Program Manager and will appoint a Wing DOP Monitor. **(T-1)**.

11.9.2. Investigation. The DOP Monitor will investigate each dropped object incident. **(T-1)**.

11.9.2.1. Every effort needs to be made to determine the precise cause to ensure positive corrective action is accomplished. Anytime a materiel or design deficiency is the cause, or

suspected cause, a DR will be submitted IAW TO 00-35D-54, even when an exhibit is not available. **(T-1)**.

11.9.2.2. Investigation results will be distributed to each appropriate work center for inclusion in personnel training and education programs. **(T-1)**.

11.9.3. Reporting. Units will follow MAJCOM DOP Program reporting procedures. **(T-2)**.

11.9.3. **(AFMC)** Wing DOP monitor shall provide an initial dropped object report via the HQ AFMC/A4M Propulsion Management SharePoint site: **https://usaf.dps.mil/teams/22355/Lists/24%20hr%20Notification/Allitemsg.aspx** within 24 hours of occurrence. Moreover, the final dropped object report will be uploaded to **https://usaf.dps.mil/teams/22355/Lists/FOD%20Incident%20Report/Standard%20View.aspx** after occurrence. In addition, if it involves casualties, property damage, or if adverse publicity is likely, provide data to command post for reporting IAW AFMAN 10-206. The base/wing safety office shall be notified of all dropped objects within 24 hours of occurrence. (T-2).

11.9.3.1. Transient Aircraft. The host Wing DOP Monitor will be responsible to investigate dropped objects from a transient aircraft. **(T-1)**.

11.9.3.1.1. The host Wing DOP Monitor will provide the home station Wing DOP Monitor with sufficient data to generate a report for trending and tracking purposes. **(T-1)**.

11.10. Aircraft Structural Integrity Program (ASIP). The ASIP includes requirements for collection and evaluation of aircraft usage data to update or confirm the original design or baseline spectrum and to adjust maintenance intervals on an individual aircraft basis. The Loads/Environment Spectra Survey data is collected via flight data recorders of instrumented aircraft to evaluate the loads spectrum. The Individual Aircraft Tracking data is collected via flight data recorders or manual forms such as “bubble sheets” and the data is used to make maintenance/inspection/force structure decisions. Both the Loads/Environment Spectra Survey and Individual Aircraft Tracking usage data programs are established by applicable MDS-specific TOs and AFI 63-140 and require coordinated action by a number of base-level maintenance activities to achieve the required data capture rates. An effective ASIP aircraft usage data collection program is essential to establish, assess and support inspections, maintenance activities, repairs and required modification/replacement actions. MAJCOMs will:

11.10.1. Publish ASIP roles and responsibilities for each assigned weapon system IAW AFI 63-140.

11.10.1. **(AFMC)** For roles and responsibilities see AFI 63-140 paragraph 4.3.

11.10.1.1. **(Added-AFMC)** The POC for AFMC is AFMC/A4MM.

11.10.2. Ensure operational units continuously meet authorized reporting requirements established by Program Offices.

11.10.2. **(AFMC)** For operational requirements see AFI 63-140 paragraph 4.4.

11.10.3. Document causes and corrective actions for units that fail to meet reporting requirements and retain until resolved or relief of the reporting requirement is granted from the Program Office in writing.

11.11. Identification Friend or Foe (IFF) Program.

11.11.1. MAJCOMs will establish an Identification Friend or Foe Program for aircraft in their command (if equipped).

11.11.1. **(AFMC)** For IFF program see **paragraph 11.41**

11.11.1.1. MAJCOM programs will identify additional requirements necessary to ensure status of Identification Friend or Foe systems meets mission requirements.

11.11.2. The MXG/CC will appoint an Identification Friend or Foe Program Manager for Identification Friend or Foe systems cryptographically keyed by MXG personnel (if equipped, see **Paragraph 11.34.1.8**). **(T-2)**.

11.11.3. Equipped aircraft will be checked prior to its first sortie of the day during contingency operations. **(T-1)**.

11.12. Radar Warning Receiver/Radar Threat Warning Testing.

11.12.1. MAJCOMs will identify weapon systems with enhanced on-board diagnostics and internal testing capabilities which do not require external testing in their supplement to this instruction (if equipped).

11.12.1. **(AFMC)** B-1s, B-2s, F-22s, and F-35s have on-board diagnostic and internal testing capabilities.

11.12.1.1. MAJCOMs will determine non-contingency system functional check requirements necessary to ensure Radar Warning Receiver/Radar Threat Warning systems are maintained operationally ready to meet mission requirements IAW the MESL or MDS equivalent.

11.12.1.1. **(AFMC)** MXG/CC will determine non-contingency system functional check requirements.

11.12.2. The MXG/CC will designate a Radar Warning Receiver/Radar Threat Warning Manager (if equipped as required). **(T-2)**.

11.12.2.1. The Radar Warning Receiver/Radar Threat Warning Manager if assigned, will coordinate test procedures with the Wing Electronic Warfare Officer and the MXS, if applicable. **(T-2)**.

11.12.2.2. The Radar Warning Receiver/Radar Threat Warning Manager if assigned will ensure each unit accomplishes the required minimum number of checks as defined below. **(T-2)**.

11.12.2.2.1. For contingency missions, the Radar Warning Receiver/Radar Threat Warning Manager will coordinate with the Electronic Warfare Officer/Electronic Combat Officer who will determine system check requirements and specific threats to be simulated. **(T-3)**.

11.12.3. When an aircraft is found to have a malfunctioning Radar Warning Receiver/Radar Threat Warning system prior to flight, the Aircraft Commander (AC) determines the course of action based on operational needs and requirements.

11.13. Cannibalization Program.

11.13.1. General. CANN actions may be necessary when a condition prevents the accomplishment of a mission and the required assets are not immediately available from supply. Prior to performing a CANN action, verify the required component cannot be sourced from LRS, TNB or back shop. When authorizing a CANN, the expenditure of man-hours and potential damage to equipment need to be weighed against the expected benefit. High risk CANNs should not be performed unless priority aircraft are involved or lack of ready equipment will impede mission accomplishment. See **Table 1.2** (Reference AFTTP 3-4.21V1).

11.13.2. Definition. CANN is the authorized removal of a specific assembly, subassembly, or part from one weapon system, system, support system, or equipment end item for installation on another end item to satisfy an existing supply requisition and to meet priority mission requirements with an obligation to replace the removed item. Weapon systems, support systems, or equipment include: aircraft, missiles, drones, RPA, uninstalled engines, uninstalled engine modules, aircrew and/or launch crew training devices, Communications-Electronics equipment, AGE, TMDE, serviceable uninstalled pods, and guns.

11.13.3. Responsibilities. CANN Authorities (CA) will be approved by the MXG/CC or equivalent and tracked in the MIS and SCR (see **Table 11.1**). **(T-1)**.

11.13.3.1. CA will be SNCOs, officers or civilian equivalents. **(T-1)**. These personnel are typically Pro Supers.

11.13.3.2. Those who are authorized to approve CANNs will not further delegate their responsibility. **(T-1)**.

11.13.4. If an assembly is cannibalized to satisfy a condition caused by lack of bits and pieces (such as, washers, nuts, and bolts), the assembly is counted as a CANN and the bits and pieces are considered transfer actions. Bits and pieces removed from an end item (without removing the assembly) for installation on another end item are considered individual CANN actions.

11.13.5. When a required part cannot be delivered and installed on time, the CA may approve the CANN of parts before the initiation of CANN documentation (such as, Red Ball maintenance). The CA will give this approval only after confirming the part is not readily available in LRS, TNB, forward supply points, or back shops. **(T-1)**.

11.13.5.1. The CA will notify the appropriate supply activity to change the "mark-for" components in the document number. **(T-1)**.

11.13.5.2. The CA will also ensure complete documentation is accomplished for each CANN action. **(T-1)**.

11.13.6. When TCIs, serially-controlled items, items affecting compliance of a TCTO, or other components with inspection requirements that align to specific hourly, calendar, or event limits are considered for CANN, the CA will coordinate with PS&D or EM to ensure adequate time remains on the item to justify the CANN and to ensure appropriate records are updated. **(T-1)**.

11.13.6.1. If the CANN action takes place, the performing work center will update the MIS and notify PS&D or EM. **(T-1)**.

11.13.7. Installed engines are not end items; installed engines are considered a LRU (similar to a radar component, gun, seat, canopy, radio, multifunction display unit).

11.13.7.1. If a functional LRU is removed from one end item to put on another end item to fill a "hole" which was caused by a supply requisition, (the requisition could be against the LRU), then this is considered a CANN.

11.13.8. Restrictions.

11.13.8.1. Egress system component CAD/PAD cannibalization actions are considered "High-Risk" and should not be performed unless priority aircraft are involved (example, higher headquarters/alert status), or lack of ready equipment will impede mission accomplishment.

11.13.8.1.1. To ensure system integrity and validation of the explosive CAD/PAD listing, cannibalization of egress explosive components and/or seats will not be accomplished without the approval of the MXG/CC or MXG/CD. **(T-3)**.

11.13.8.1.2. After cannibalization actions, Egress Red X discrepancies in the aircraft AFTO Form 781As will not be cleared until verification that CAD/PAD S/N content matches the S/N content entries in the MIS. **(T-1)**.

11.13.8.1.3. Only (2A6X3) Egress personnel will accomplish this action. **(T-1)**.

11.13.8.2. CANN actions involving parts from ABDR aircraft, AF Museum Aircraft, Maintenance Training Devices, GITA, TAA, or DLADS will not be accomplished without authorization from the Program Office. **(T-1)**.

11.13.8.2.1. Parts will not be removed from static display/AF Museum Aircraft except as authorized by AFI 84-103. **(T-1)**.

11.13.8.2.2. If the part is approved for CANN, it must not be put into service until all necessary inspections (such as, NDI, pressure checks, operational checks, TCTOs) have been accomplished using specific guidance from the item manager to ensure proper serviceability. **(T-1)**.

11.13.8.3. Units will not CANN parts from aircraft possessed by AFMC (B or D PIC) without first coordinating through the MAJCOM functional manager who will request approval from the applicable PM. **(T-1)**.

11.13.8.4. An aircraft that has been extensively cannibalized will not be launched on an overseas or cross-country sortie/mission on the first flight following CANN rebuild without the owning MXG/CC approval. **(T-2)**.

11.14. Hangar Queen Aircraft.

11.14.1. General. The objective of this program is to ensure the entire fleet remains healthy and all possible management actions are carried out to ensure aircraft do not remain inoperative for extended periods. MAJCOMs will establish a Hangar Queen Management Program.

11.14.1. **(AFMC)** See AFMC Sup **paragraph 11.14.5** through **11.14.7.2** for Hangar Queen Management Program

11.14.2. Definitions. A "Hangar Queen" is a unit-possessed aircraft that has not flown for at least 30 calendar days. Aircraft are exempt from accruing Hangar Queen time for up to 10 days immediately following DFT/CFT repair or maintenance; however, if an aircraft is not flown after the 10th day, the 10 days are included in the total number of days since last fly date to

determine the Hangar Queen category computation. Hangar Queen aircraft will be further defined by the following three categories:

11.14.2.1. Category 1: Aircraft that have not flown for 30 to 59 calendar days. **(T-1)**.

11.14.2.2. Category 2: Aircraft that have not flown for 60 to 89 calendar days. **(T-1)**.

11.14.2.3. Category 3: Aircraft that have not flown for 90 or more calendar days. **(T-1)**.

11.14.3. All aircraft placed on higher HHQ alert status are exempt from the Hangar Queen Management Program and reporting throughout the duration of alert status/posturing.

11.14.3. **(AFMC)** AF Test Center aircraft undergoing Temporary Modifications or De-Modifications for the purpose of Operational or Developmental testing are exempt from Hangar Queen Reporting for the duration of the modification efforts as long as the reason for not flying is based solely on the Temporary Modification efforts.

11.14.3.1. **(Added-AFMC)** When an aircraft becomes a Category 1 Hangar Queen, establish a maintenance recovery plan. Brief aircraft maintenance and supply status to the SQ/CC weekly to the MXG/CC and WG/CC. Category 1 aircraft are managed locally. **(T-2).**

11.14.3.2. **(Added-AFMC)** When an aircraft becomes a Category 2 Hangar Queen, assign a SNCO or officer (or civilian equivalent) to manage the Hangar Queen. The MXG/CC or designated representative must approve any further CANNs, transfer, and diversion actions from the Hangar Queen aircraft. Brief aircraft maintenance and supply status at the daily wing standup meeting. Units will report aircraft tail number(s) to MAJCOM. POC is HQ AFMC/A4MM. **(T-2).** Category II aircraft are managed locally.

11.14.3.2.1. **(Added-AFMC)** The minimum information required to report is **(T-2)**:

11.14.3.2.1.1. **(Added-AFMC)** Hangar Queen Management POC.

11.14.3.2.2. **(Added-AFMC)** Aircraft MDS and Tail #.

11.14.3.2.3. **(Added-AFMC)** Unit of Assignment/Possession.

11.14.3.2.4. **(Added-AFMC)** Date last flown.

11.14.3.2.5. **(Added-AFMC)** Reason for Hangar Queen status.

11.14.3.2.6. **(Added-AFMC)** Document number for parts on order for reason of Hangar Queen status with estimated delivery dates.

11.14.3.2.7. **(Added-AFMC)** Estimated next fly day.

11.14.3.2.8. **(Added-AFMC)** Identify if MAJCOM/WST Lead Command assistance is required.

11.14.3.3. **(Added-AFMC)** When an aircraft becomes a Category 3 Hangar Queen, units will report aircraft tail number(s) to MAJCOM and continue Category 2 Hangar Queen actions. Units will send an updated report to MAJCOM at least monthly. **(T-2).**

11.14.3.3.1. **(Added-AFMC)** MXG/CC will determine the need for an FCF/OCF (if not otherwise required by the aircraft specific TO). **(T-2).**

11.14.3.3.2. **(Added-AFMC)** QA will perform a final review of all aircraft forms initiated since the last flight prior to the first flight. **(T-2).**

11.14.4. An aircraft is released from Hangar Queen status after the first flight. The following examples are provided to clarify when an aircraft becomes a Hangar Queen:

11.14.4.1. A unit-possessed aircraft has not flown for 20 calendar days, enters depot status for 5 more calendar days, and then returns to unit possession on the 26th non-fly day; the unit has up to 10 calendar days to fly the aircraft to avoid Hangar Queen status. If this aircraft does not fly on the 10th calendar day (35th non-fly day), the aircraft will become 36-day Category 1 Hangar Queen on the next day.

11.14.4.2. A unit-possessed aircraft has not flown for 2 calendar days, then enters depot status for 1 calendar day and is returned to unit possession, the unit must fly the aircraft in the next 27 calendar days to avoid becoming a Category 1 Hangar Queen.

11.15. Ground Instructional Trainer Aircraft (GITA). GITA are permanently grounded aircraft declared excess to future operations or flying requirements by higher headquarters and will be re-designated by the addition of the prefix "G" to the basic MDS. **(T-1)**. GITA are not maintained in a flyable condition but maintain system/subsystem operational condition for purposes of maintenance training and will be carried in assignment/PIC outlined in AFI 21-103 and AFI 16-402. **(T-1)**. This section does not apply to ABDR training aircraft. ABDR training aircraft are managed by AFSC/LGPM (ABDR Program Office (PO)). This **Chapter** does not apply to training equipment maintained by Contract Logistics Support contracts administered by commands other than AETC.

11.15.1. Only those items requested by the PM are considered for removal. If the item does not affect training and if approved by MXG/CC, the part will be removed and turned in as per the ALC MXG/CC's (or equivalent) instructions. **(T-2)**.

11.15.1.1. Units are responsible for storing uninstalled or removed equipment that is not required for training. **(T-1)**.

11.15.2. Training Aid Aircraft (TAA). TAA are permanently grounded aircraft that, at a minimum, require an aircraft fuselage that was previously in the AF inventory as an aircraft.

11.15.2.1. Assigned TAA are not maintained in airworthy condition, and only the system/subsystem required for the specific training requirements will be maintained in operational condition for purposes of required maintenance/organizational training. **(T-2)**.

11.15.2.2. TAA used for training are not terminated from the AF inventory IAW AFI 16-402. TAA requests for use by non-maintenance AFSCs require coordination through AFMC/LCMC and the PM prior to approval of assignment via an AF Form 913. **(T-1)**.

11.15.2.3. Questions about the designation of an aircraft used for training should be directed to the MAJCOM AVDO.

11.15.2.4. Permanently grounded missiles retain their original MDS without a prefix.

11.15.2.5. Upon assignment of a permanently grounded GITA/TAA, the MXG/CC or equivalent will contact the applicable MAJCOM to coordinate "save list" requirements identified by the applicable PM. **(T-2)**.

11.15.2.5.1. "Save list" items removed will be turned into LRS for shipment. **(T-2)**.

11.15.2.5.2. If an item on the "save list" is not removed, the reason for not removing it will be annotated and coordinated with the applicable MAJCOM. **(T-2)**.

11.15.2.5.3. If items on the "save list" are required for training and an unserviceable item will suffice, units will coordinate with the applicable MAJCOM for receipt of the unserviceable item(s). **(T-2)**.

11.15.2.5.4. All unserviceable items furnished by ALC will be marked/identified as "unserviceable" in a conspicuous manner (such as, Red X or Red dot system). **(T-2)**.

11.15.3. MAJCOM Responsibilities. MAJCOMs will determine use of MIS for permanently grounded GITA records management.

11.15.3. **(AFMC)** Units will use the applicable MIS to document records management. **(T-2).**

11.15.3.1. MAJCOMs will coordinate "save list" requirements/changes with the applicable PMs.

11.15.4. MXG/CC Responsibilities. MXG/CC or equivalent will:

11.15.4.1. Develop an installation publication or supplement to define the scope of training functions for GITA/TAA use, functional responsibility for funding, operations, maintenance, and records management. **(T-1)**.

11.15.4.2. Ensure maintenance support of GITA/TAA used for training. **(T-1)**. Units that do not have organic maintenance capability will establish a Support Agreement or MOA assigning maintenance responsibility for GITA/TAA training use. **(T-1)**.

11.15.4.2.1. GITA maintenance includes on- and off-equipment maintenance of active systems and subsystems and necessary actions to maintain the aircraft in a safe and presentable condition.

11.15.4.2.2. TAA require minimal maintenance on systems/subsystems used to meet training requirements and should be maintained in a safe and presentable condition.

11.15.4.2.3. Determine which system and subsystem are required to support the training. Consider present, future, and cross-utilization of systems when making determinations. These systems will be maintained in the same configuration as operational equipment. **(T-1)**.

11.15.4.2.4. Ensure explosive components are removed that are not required to support training requirements.

11.15.4.2.5. Place retained systems and subsystems not currently being used for training into extended storage IAW applicable technical data.

11.15.4.2.6. Ensure standard maintenance practices regarding inspection appearance, cleanliness, ground safety, and prevention of corrosion are met. Corrosion control procedures are outlined in TO 1-1-691.

11.15.4.2.7. Develop and prepare inspection technical data check lists for use in inspecting the condition and safety of equipment before use and ensure inspections are performed.

11.15.4.2.7.1. Prior-to-use inspections will be conducted by the using organization employing a tailored weapon system pre-/post-dock checklist. **(T-1)**.

11.15.4.2.7.2. Conduct periodic maintenance inspections using a tailored work deck. **(T-1)**.

11.15.4.2.8. Prepare a separate memorandum for each GITA/TAA, addressed to the appropriate PM for the aircraft and inform them of the systems and subsystems that will be maintained in operational configuration. **(T-1)**.

11.15.4.2.8.1. When changes in requirements occur, initiate a new memorandum.

11.15.4.2.8.2. Ensures copies of all GITA/TAA memorandums to the MAJCOM AVDO. **(T-1)**.

11.15.4.2.9. Air and space vehicle inventory will be reported IAW AFI 21-103 as required for ground trainers. **(T-1)**. Aircraft used for ground trainers are exempt from status and utilization reporting.

11.15.4.2.10. Maintenance actions will be documented IAW TO 00-20-1. **(T-1)**.

11.15.4.2.10.1. Owning units not having maintenance capability will establish MOAs or MOUs with organizations which can provide maintenance support. **(T-1)**.

11.15.4.2.11. Ensure timely completion of TCTOs on systems designated for configuration management and proper configuration status accounting is maintained.

11.15.4.2.11.1. Accomplish TCTOs on systems not designated for configuration management as required to ensure safety of operation or as directed by the PM.

11.15.4.2.11.2. TCTOs are not maintained on TAA.

11.15.4.2.12. Ensure proper coordination and documentation of parts removed from training aircraft are accomplished as follows:

11.15.4.2.12.1. When an item is removed or replaced, supervisors will ensure this action is documented in the aircraft forms. **(T-1)**. Include the authority for removal (such as, message number, telecon, letters, and dates) and condition of installed/replacement items.

11.15.4.2.12.2. When the limited save list actions have been done, a copy of the completed list will be forwarded to the appropriate PM and the local documentation function which will be added to the TAA historical record. **(T-1)**.

11.15.4.2.12.3. W&B handbook requirements will be maintained IAW TO 1-1B-50 and applicable -5 series TOs. **(T-1)**.

11.15.4.2.12.4. Operating and maintenance technical data will be readily accessible whenever the GITA/TAA is in use or undergoing inspection. **(T-1)**.

11.15.4.2.12.5. MXG/CC will designate a GITA/TAA Manager as an additional duty. **(T-1)**.

11.15.4.2.12.5.1. The GITA/TAA Manager must be qualified to operate GITA/TAA systems and appropriate support equipment to conduct GITA/TAA

maintenance. **(T-1)**.

11.15.4.2.12.5.2. The GITA/TAA Manager will accomplish and/or coordinate maintenance actions for the GITA/TAA and ensure GITA/TAA documentation is accurate and complete. **(T-1)**.

11.15.4.2.13. For equipment designated as trainers, only the systems required for technical training (or those required to ensure safety or system integrity) need to be maintained. **Note:** This does not apply to "temporarily" grounded aircraft or operational equipment or systems on loan from MAJCOMs or ALCs.

11.15.5. Technical Data Applicability.

11.15.5.1. Operational systems on GITA/TAA are maintained IAW applicable technical data. The specific policy governing the use and modification of technical data is contained in TO 00-5-1.

11.15.5.1.1. Some systems may be operated and maintained with original contractor data because formal technical data was never developed and/or the contractor data was never assigned a TO number.

11.15.5.2. Inspection and lubrication requirements may be adjusted to correspond with training requirements and equipment usage and to prevent over or under inspection.

11.15.5.3. When significant savings may be achieved, the commander or contract project manager must request deviations or changes to technical data requirements, including substitution of materiel from the weapon system program manager.

11.15.5.3.1. If deviations are approved, the unit will retain approved deviations/changes in the GITA historical records. **(T-1)**. In all cases, safety or design function must not be compromised.

11.15.5.4. TCTOs. The QA function or other designated agency will be responsible for determining applicability of TCTOs for GITAs. **(T-1)**. TCTO upgrades are not required on TAA.

11.16. Aircraft Inlet/Intake/Exhaust Certification.

11.16.1. MAJCOMs will determine the requirement to implement an Aircraft Inlet/Intake/Exhaust Certification program and certification frequency requirements.

11.16.1.1. **(Added-AFMC)** This program is applicable to B-1, B-2, F-15, F-16, F-22, F-35, RPA, and propeller-driven aircraft/helicopters. (**Exception:** reciprocating engines.). **(T-2).**

11.16.1.2. **(Added-AFMC)** Units will have an installed and uninstalled aircraft/engine intake/inlet/exhaust training program. **(T-2).**

11.16.2. Units will track these programs on the SCR when implemented. **(T-1)**.

11.17. Engine Run Training and Certification Program.

11.17.1. A comprehensive engine run certification program will be developed and strictly enforced to prevent safety mishaps and potential loss of life. **(T-1)**.

11.17.1.1. The MXG/CC is responsible for ensuring the MT develops and manages an effective engine run certification program. **(T-1)**.

11.17.1.2. All maintenance personnel authorized to start and operate aircraft engines, APUs, and uninstalled engines and APUs will be trained and certified to operate engines at TO determined power settings. **(T-1)**.

11.17.1.3. Aircraft engine motoring will only be performed by qualified engine run personnel. **(T-1)**. Exception: Rotary wing maintenance personnel qualified through OJT may motor engines IAW prescribed TO.

11.17.1.4. The following minimum requirements will be used to certify engine run personnel:

11.17.1.4.1. The MT will serve as the OPR and focal point for the management and development of the engine run certification program, engine run certification test question bank, and written tests for their respective weapon system. **(T-1)**.

11.17.1.4.2. Pre-run training will be conducted in the trainee's work center through OJT. **(T-1)**. Pre-run training is designed to prepare the trainee for successful completion of initial engine-run training. As a minimum, pre-run training will include:

11.17.1.4.2.1. An evaluation by immediate supervisor or NCOIC/Flight Chief to determine the individual's level of maturity and experience prior to being selected for engine-run training. **(T-1)**.

11.17.1.4.2.2. The trainee will review and become familiar with engine-run operations to include emergency procedures IAW the applicable aircraft general system type TO and engine run checklist. **(T-1)**.

11.17.1.4.2.3. MTs may develop a handout to facilitate learning engine-run procedures, engine limitations, and emergency procedures.

11.17.1.4.3. **(Added-AFMC)** The MTs will review approved engine run certification procedures annually for accuracy. **(T-2).**

11.17.1.4.4. **(Added-AFMC)** Units will develop local procedures clearly depicting authorized run locations. **(T-2).**

11.17.2. Certifying Officials. Certifying official certification requirements are listed in **Table 11.1**.

11.17.2.1. Instructor Pilots (IP) can also be used as certifying officials during the practical engine-run demonstration.

11.17.2.2. Certifying officials must maintain proficiency in the same manner as other technicians; certifying officials must recertify each other. **(T-1)**.

11.17.3. Instructors. Individuals selected as instructors will hold the rank of SSgt or above and possess a 7-skill level in one of the following AFSCs: 2A3X3/7/8, 2A5X1/2/4, 2A6X1 or civilian equivalent, a qualified contractor, or AFETS/CETS personnel. **(T-1)**.

11.17.3.1. AFI 11-218, Aircraft Operations and Movement on the Ground, aircraft and engine TOs, commercial aircraft/engine operating procedures, and special test project

engineering procedures will be used to develop engine run certification training programs. **(T-1)**.

11.17.4. Installed Engine Run Personnel. Prior to entering engine run training, personnel will meet the following requirements:

11.17.4.1. Personnel will be selected IAW criteria established in **Table 11.1** **(T-1)**. MXG/CCs may designate contractors in writing to run aircraft engines.

11.17.4.2. Qualified to operate the aircraft APU as applicable. **(T-1)**.

11.17.4.3. Qualified as a brake operator. **(T-1)**.

11.17.4.4. Qualified in basic radio and interphone systems operation. **(T-1)**.

11.17.4.5. Qualified on marshalling signals. **(T-1)**.

11.17.5. The initial engine run certification program will consist of following three phases, each of which will be successfully completed before progressing to the next phase:

11.17.5.1. Phase 1. **(T-1)**. Phase 1 is formal classroom training. Classroom instruction will include:

11.17.5.1.1. General aircraft familiarization to include, as a minimum, basic MDS airframe characteristics, aircraft safe-for-maintenance procedures, cockpit configuration and systems, throttles and aircraft controls, egress, normal and emergency braking systems, and aircraft system/subsystems related to safe engine operation. **(T-1)**.

11.17.5.1.2. A thorough review of TO procedures with emphasis on and notes, cautions, and warnings. **(T-1)**.

11.17.5.1.3. Engine/APU operation, to include normal operational parameters and limitations. **(T-1)**.

11.17.5.1.4. Ensuring aircraft, engine, and APU emergency procedures are memorized. **(T-1)**.

11.17.5.1.5. UHF/VHF radio operation, Air Traffic Control tower procedures, and emergency radio transmissions. **(T-1)**.

11.17.5.1.6. A two-part closed book examination (students will successfully complete **Part I** before taking **Part II**). **(T-1)**. The examination will consist of the following:

11.17.5.1.6.1. Part I - Students will be given a written/computer-based examination on all boldface emergency procedures or all emergency procedures identified in applicable technical data requiring a passing score of 100 percent. **(T-1)**.

11.17.5.1.6.2. Part II - Students will be given a written examination covering normal engine run procedures and limitations requiring a minimum passing score of 90 percent, corrected to 100 percent. **(T-1)**.

11.17.5.1.7. Personnel failing the written/computer-based examination will receive additional instruction before being re-tested. **(T-1)**.

11.17.5.1.8. Students will not be given the same **Part II** test during re-testing efforts. **(T-1)**.

11.17.5.1.9. After a second failure of the two part closed book examination, the SQ/CC (or equivalent) will determine if personnel may retest and continue with the program. **(T-1)**.

11.17.5.2. Phase 2. **(T-1)**. Phase 2 is simulator training. All maintenance personnel requiring engine run certification will receive simulator training on each specific aircraft MDS and APU. **(T-1)**.

11.17.5.2.1. Training will be accomplished in an Aircrew Training Device, Cockpit Trainer, simulator, Maintenance Training Device or approved Technology Development Trainer. **(T-2)**. **Note:** If any of the above are not available, a similar MD(S) simulator may be used if the procedures are the same or "dry run" procedures will be accomplished in an aircraft to ensure procedural knowledge.

11.17.5.2.2. As a minimum, students will demonstrate knowledge and proficiency in the following areas:

11.17.5.2.2.1. Proper run clearance procedures. **(T-1)**.

11.17.5.2.2.2. UHF/VHF radio operation, Air Traffic Control tower procedures, and emergency radio transmissions. **(T-1)**.

11.17.5.2.2.3. Normal APU, engine start, run, and shutdown procedures. **(T-1)**.

11.17.5.2.2.4. Augmentor or thrust reverser operation (as applicable). **(T-1)**.

11.17.5.2.2.5. Applicable aircraft systems/subsystems normal operating parameters. **(T-1)**.

11.17.5.2.2.6. Ensure TO emergency bold face items are memorized. **(T-1)**.

11.17.5.2.2.6.1. Instructors will evaluate the student on response time and ability to handle emergency situations to include egress procedures. **(T-1)**.

11.17.5.3. Phase 3. **(T-1)**. Phase 3 is practical demonstration. Each individual will receive a practical engine run evaluation after successful completion of Phase 1 and Phase 2 training. **(T-1)**. For fighter-type aircraft, it is preferable to conduct the evaluation in a NSS, or on a trim pad. As a minimum, the student will demonstrate successful completion of the following areas without any discrepancies based on a go/no-go standard:

11.17.5.3.1. Run clearance procedures. **(T-1)**.

11.17.5.3.2. UHF/VHF radio operation, Air Traffic Control tower procedures, and emergency radio transmissions. **(T-1)**.

11.17.5.3.3. Normal APU, engine start, run, and shutdown procedures, including notes, cautions, and warnings. **(T-1)**.

11.17.5.3.4. Augmentor or thrust reverser operation as applicable, including notes, cautions, and warnings. **(T-1)**.

11.17.5.3.5. Applicable aircraft systems/subsystems normal operating parameters, including notes, cautions, and warnings. **(T-1)**.

11.17.5.3.6. Ensure TO emergency bold face items are memorized. **(T-1)**. Instructors will evaluate the student on response time and ability to handle emergency situations. **(T-1)**.

11.17.5.3.7. Egress procedures. **(T-1)**. MAJCOM/Lead Command, TO, and checklist procedures for the applicable MDS will be demonstrated without error. **(T-1)**.

11.17.6. Annual recertification for certifying officials and engine run certified personnel will be accomplished by successfully completing the written test (**Part I** and **Part II**) administered by the MT and demonstrating knowledge of normal and emergency procedures to a certifying official by operating one of the following: Aircrew Training Device, Cockpit Trainer, authorized Technology Development Trainer (if assigned or available), or aircraft as appropriate. **(T-1)**.

11.17.6.1. Personnel failing the written examination will receive additional instruction before being re-tested. **(T-1)**.

11.17.6.2. Students will not be given the same **Part II** test during re-testing efforts. **(T-1)**.

11.17.6.3. After a second failure of the two-part closed book examination, the individual will be decertified. **(T-1)**.

11.17.6.3.1. The SQ/CC (or equivalent) will determine if personnel may retest and continue with the program, and whether they must attend all three phases of initial training prior to being recertified. **(T-1)**.

11.17.6.4. Certified individuals who PCS to the same MDS, and engine type and model must be approved by the SQ/CC (or equivalent) and complete an initial evaluation by a certifying official prior to becoming run qualified at the gaining base. **(T-1)**. **Note:** MAJCOMs will determine if additional training is required for the specific engine series.

11.17.6.4. **(AFMC)** Provided certified individuals remain proficient IAW **paragraph 11.17.8** while transitioning to gaining unit, no additional training is necessary beyond the initial evaluation. **(T-2).**

11.17.6.4.1. The evaluation will include, as a minimum, familiarization of local procedures and requirements. **(T-1)**.

11.17.6.4.2. Carry over the date of original class completion from previous documentation (certificate, training record, MIS printout).

11.17.7. Documentation. Qualifications of installed engine run certifying officials and engine run certified personnel, will be documented in the MIS and entered on the SCR. **(T-1)**.

11.17.8. Proficiency. MAJCOMs will determine proficiency requirements for maintenance personnel authorized to operate installed engines.

11.17.8. **(AFMC)** To maintain proficiency, maintenance personnel authorized to operate engine(s) will perform at least one engine run on each aircraft engine type or weapons system they are certified to operate, in order to maintain currency and remain qualified, every 90 days. **(T-2).**

11.17.8.1. Units will track run proficiency requirements in the MIS. **(T-1)**.

11.17.8.2. Supervisors will ensure individuals who fail to maintain proficiency are decertified. **(T-1)**.

11.17.8.2.1. Decertified individuals will recertify IAW **Paragraph 11.17.6** **(T-1)**.

11.17.9. Engine run certification tests are controlled items and will be handled IAW AFI 36-2605, Air Force Military Personnel Testing System, and administered only by MT personnel. **(T-1)**.

11.17.10. Aircraft APU Installed Operation Training. The following requirements and standards will apply to qualifying maintenance personnel on operating the aircraft APU:

11.17.10.1. When conducting initial operator qualification training for APU, use the applicable video or other training program. **(T-2)**.

11.17.10.2. A two-part closed book examination consisting of the following: **Note:** MAJCOMs will determine examination applicability requirements for PMA only APU operations in their supplement/addendum to this AFI.

11.17.10.2. **(AFMC)** Two-part testing does not apply to F-22 APU operators using the PMA from the ground. **(T-2).**

11.17.10.2.1. Part I - Students will be given a written/computer-based examination on all boldface emergency procedures or all emergency procedures identified in applicable technical data requiring a passing score of 100 percent**. (T-1)**.

11.17.10.2.2. Students will successfully complete **Part I** before taking **Part II. (T-1)**.

11.17.10.2.3. Part II - Students will be given a written/computer-based examination covering normal APU run procedures and limitations requiring a minimum passing score of 90 percent, corrected to 100 percent. **(T-1)**.

11.17.10.3. Personnel failing the examination will receive additional instruction before being re-tested. **(T-2)**.

11.17.10.4. Students will not be given the same **Part II** test during re-testing efforts. **(T-2)**.

11.17.10.5. After a second failure of the two-part closed book examination, the individual will be decertified. **(T-2)**.

11.17.10.5.1. The SQ/CC (or equivalent) will determine if personnel may retest and continue with the program prior to being recertified. **(T-2)**.

11.17.10.5.2. Individuals must attend all three phases of initial training prior to being recertified. **(T-1)**.

11.17.10.6. Part III Personnel must then accomplish an on-equipment practical evaluation for certification completion. **(T-2)**.

11.17.10.7. Personnel will be recertified annually using the initial certification procedures. The practical evaluation portion will be accomplished by operating one of the following: Aircrew Training Device, Cockpit Trainer, authorized Technology Development Trainer (if assigned or available), or aircraft as appropriate (or as determined by the certifying

official). **(T-1)**. **Note:** Recertification is not required if the individual is engine run certified and has maintained annual engine-run certification requirements.

11.17.11. Documentation. Qualifications of APU run certifying officials and APU run certified personnel, will be documented in the MIS and entered on the SCR. **(T-1)**.

11.17.11.1. If applicable, MAJCOMs will define SCR applicability requirements for PMA only APU operations in their supplement/addendum to this instruction.

11.17.11.1.1. **(Added-AFMC)** Any personnel performing F-22 APU operation from the cockpit will be engine run qualified and listed on the SCR. **(T-2).**

11.17.11.1.2. **(Added-AFMC)** When another person is in the cockpit, personnel performing F-22 APU operations using the PMA from the ground will be engine run qualified and listed on the SCR. **(T-2).**

11.17.11.1.3. **(Added-AFMC)** Personnel performing F-22 APU operations using the PMA from the ground when nobody is in the cockpit do not need to be listed on the SCR. **(T-2).**

11.17.12. Proficiency. MAJCOMs will determine proficiency requirements for maintenance personnel authorized to operate APUs.

11.17.12. **(AFMC)** To maintain proficiency, maintenance personnel authorized to operate APU/GTC will perform at least one APU/GTC run every 180 days if applicable to the MDS. (**T-2**).

11.17.12.1. Units will track run proficiency requirements in the MIS. **(T-1)**.

11.17.12.2. Supervisors will ensure individuals who fail to maintain proficiency are decertified. **(T-1)**.

11.17.13. Certification tests are controlled items and will be handled IAW AFI 36-2605 and administered only by MT personnel. **(T-1)**.

11.17.14. Uninstalled Engine Operation on Test Stands and Cells (includes Jet Fuel Starter /APU uninstalled operations). All personnel identified for uninstalled engine run qualification will complete an uninstalled engine run training program prior to certification. **(T-1)**. The following minimum requirements will apply:

11.17.14.1. Certification Requirements. Individuals will be certified for each specific engine TMS authorized to run IAW criteria established in **Table 11.1** **(T-1)**.

11.17.14.1. **(AFMC)** Certified contractor personnel may be authorized to run uninstalled engines and/or small gas turbine engines when designated in writing by the respective MXG/CC/CL or equivalent. **(T-2).**

11.17.14.2. Certifying Officials. The MXG/CC will designate qualified TSgts or higher or civilian equivalent or fully qualified/certified contractors or AFETS/CETS personnel, to serve as certifying officials IAW criteria established in **Table 11.1** **(T-1)**.

11.17.14.3. Instructors. Individuals selected as instructors will be 7-skill level SSgts or above or civilian equivalent, a qualified contractor, or an AFETS/CETS representative, and be run certified on each TMS (if they are to be certifying officials). **(T-1)**.

11.17.14.4. Training. Uninstalled engine run training will consist of the following three phases:

11.17.14.4.1. Phase 1. **(T-1)**. Phase 1 is formal training. Instruction will include, as a minimum, the following areas:

11.17.14.4.1.1. General engine familiarization to include, as a minimum, basic engine description, component location, and functions. **(T-1)**.

11.17.14.4.1.2. Thorough familiarization of control cabs, NSSs, ETSs, and T-9 fire suppression control panels (if applicable). **(T-1)**.

11.17.14.4.1.3. Thorough review of TO procedures with emphasis on notes, cautions, and warnings. **(T-1)**.

11.17.14.4.1.4. Uninstalled engine operation to include normal operating parameters and limitations. **(T-1)**.

11.17.14.4.1.5. Ensuring uninstalled engine emergency procedures are memorized. **(T-1)**.

11.17.14.4.1.6. Local communication procedures. **(T-1)**.

11.17.14.4.1.7. A two-part closed book examination (students will successfully complete **Part I** before taking **Part II**) consisting of the following:

11.17.14.4.1.7.1. Part I - Students will be given a written/computer-based examination on all boldface emergency procedures or all emergency procedures identified in applicable technical data requiring a passing score of 100 percent. **(T-1)**.

11.17.14.4.1.7.2. Part II - Students will be given a written/computer-based examination covering normal engine run procedures and limitations requiring a minimum passing score of 90 percent, corrected to 100 percent. **(T-1)**.

11.17.14.4.1.8. Personnel failing the examination will receive additional instruction before being re-tested. **(T-1)**.

11.17.14.4.1.9. Students will not be given the same **Part II** test during re-testing efforts. **(T-1)**.

11.17.14.4.1.10. After a second failure of the two part closed book examination, the individual will be decertified. **(T-1)**.

11.17.14.4.1.10.1. The SQ/CC (or equivalent) will determine if personnel may retest and continue with the program prior to being recertified or be removed from program. **(T-1)**.

11.17.14.4.1.10.1.1. Individuals must attend all three phases of initial training prior to being recertified. **(T-1)**.

11.17.14.4.2. Phase 2. **(T-1)**. Phase 2 is the control cab evaluation. After successful completion of formal training, students will properly demonstrate the following minimum requirements to a certifying official without discrepancies using the go/no-go standard:

11.17.14.4.2.1. Proper uninstalled engine start, run, and shutdown procedures, including notes, cautions, and warnings (engine not operating). **(T-1)**.

11.17.14.4.2.2. Proper uninstalled engine boldface emergency procedures, including notes, cautions, and warnings (engine not operating). **(T-1)**.

11.17.14.4.2.3. Knowledge of normal uninstalled engine operating limits, including notes, cautions, and warnings. **(T-1)**.

11.17.14.4.2.4. Augmentor or thrust reverser operation (as applicable), including notes, cautions, warnings and emergency procedures. **(T-1)**.

11.17.14.4.3. Phase 3. **(T-1)**. Phase 3 is the practical evaluation. Each individual will receive a practical uninstalled engine run evaluation after successful completion of classroom training and control cab evaluation from a certifier. **(T-1)**. As a minimum, the student will demonstrate successful completion of the following areas without discrepancies based on a go/no-go standard:

11.17.14.4.3.1. Run clearance procedures. **(T-1)**.

11.17.14.4.3.2. Emergency communication procedures. **(T-1)**.

11.17.14.4.3.3. Normal uninstalled engine start, run, and shutdown procedures, including notes, cautions, and warnings. **(T-1)**.

11.17.14.4.3.4. Augmentor or thrust reverser operation (as applicable), including notes, cautions, and warnings. **(T-1)**.

11.17.14.4.3.5. Proper emergency procedure corrective actions during all bold face uninstalled engine emergency conditions. **(T-1)**.

11.17.14.5. Recertification. Recertification for certifying officials and uninstalled engine run qualified personnel will be accomplished annually. **(T-1)**.

11.17.14.5.1. The following three requirements must be met to obtain recertification:

11.17.14.5.1.1. Successfully completing the written test (**Part I** and **Part II**) administered by the MT. **(T-1)**.

11.17.14.5.1.2. Passing a control cab evaluation demonstrating knowledge of normal and emergency procedures to a certifying official. **(T-1)**.

11.17.14.5.1.3. Completing a practical engine run demonstration. **(T-1)**.

11.17.14.5.2. Personnel failing the written examination will receive additional instruction before being re-tested. **(T-1)**.

11.17.14.5.3. Students will not be given the same **Part II** test during re-testing efforts. **(T-1)**.

11.17.14.5.4. After a second failure of the two part closed book examination, the individual will be decertified. **(T-1)**.

11.17.14.5.4.1. The SQ/CC (or equivalent) will determine if personnel may retest and continue with the program prior to being recertified. **(T-1)**.

11.17.14.5.4.2. Individuals must attend all three phases of initial training prior to

being recertified. **(T-1)**.

11.17.14.6. Proficiency. MAJCOMs will determine proficiency requirements.

11.17.14.6. **(AFMC)** All uninstalled engine/small gas turbine engine run certified individuals and certifiers will run at least one engine every 180 days. When not feasible to run every 180 days, individuals will complete part I and part II tests to maintain proficiency. **(T-2).**

11.17.14.6.1. Supervisors will ensure individuals who fail to maintain proficiency are decertified. **(T-1)**.

11.17.14.6.1.1. Decertified individuals will recertify IAW **Paragraph 11.17.14.5** **(T-1)**.

11.17.15. Fire Control Panel Operation in NSS. This section applies to all NSS designed for enclosed aircraft and uninstalled engine operation (such as, T-9, T-10, T-11, T-12, and T-20) with fire suppression systems. Only qualified personnel will be certified to use the NSS Fire Suppression Systems. **(T-1)**. The following certification requirements will apply:

11.17.15.1. Meet criteria established in **Table 11.1** **(T-1)**.

11.17.15.2. Training will consist of formal training using TOs and hands on familiarization and will include the following minimum requirements:

11.17.15.2.1. NSS Fire Suppression System familiarization and operation. **(T-1)**.

11.17.15.2.2. Emergency procedures, including local notification procedures. **(T-1)**.

11.17.15.3. NSS supervisor, contractor, AFETS/CETS personnel or individual designated by the NSS supervisor will serve as certifying official(s). **(T-1)**.

11.17.15.4. Annual recertification of NSS Fire Suppression System certified personnel will be accomplished utilizing the same criteria as initial certification. **(T-1)**.

11.17.15.4.1. **(Added-AFMC)** Certification will be tracked on SCR. **(T-2).**

11.17.16. **(Added-AFMC)** Special Test Projects. Some AFMC units will participate in special testing of uninstalled engines and/or small gas turbine engines that do not fall within the scope of the normal certification processes outlined in this chapter. **(T-2).** Under these circumstances, the affected unit will apply the following guidelines to ensure test project engines are operated to the safest extent possible:

11.17.16.1. **(Added-AFMC)** Ensure engine operations on test projects that do not have approved Air Force technical procedures have written operating procedures including emergency procedures approved by the MXG/CC/CL or equivalent and appropriate safety agencies. **(T-2).**

11.17.16.2. **(Added-AFMC)** When engine operating procedures do not exist in Air Force TOs, test project plans will specify use of commercial engine operating manuals (if they exist) and require a contractor or USAF test engineer for the duration of engine testing. **(T-2).**

11.18. Engine Blade Blending Training and Certification Program.

11.18.1. General. All units will have a comprehensive training program to ensure technical standards are met, and proficiency is maintained. **(T-1)**. The number of individuals authorized to inspect and repair blades should be sufficient to meet mission requirements and production needs. Personnel will be certified IAW criteria established in **Table 11.1** **(T-1)**. MXG/CCs may designate contractors in writing to complete blade blending certification.

11.18.2. Responsibilities and Management. The MT or TD will be responsible for management and development of the blade blending training program. **(T-2)**.

11.18.2. **(AFMC)** [DEV] Within the 412th TW, Responsibility and management for the Engine Blade Blending Training and Certification process will be completed by the Propulsion Flight. This process includes the Propulsion Flight due to the multiple different engine models. All responsibilities contained in AFI 21-101 will be adhered to by Propulsion Flight leadership.

11.18.2.1. As a minimum, the course will include care and handling of equipment, applicable technical data, fault isolation/damage assessment/defect size determination, techniques required to correctly inspect and repair blades and performance of an engine blade blend. **(T-1)**.

11.18.2.2. Prior to placement on the SCR, the formal blade blending training (MT or TD course) and initial engine blade blending certification will be mandatory. **(T-1)**.

11.18.3. MXG/CCs will appoint in writing maintenance, TD, or AFETS/CETS personnel as instructors and ensure the following certification and proficiency requirements are tracked in the MIS by course code:

11.18.3.1. Formal training, engine blade blending course. **(T-1)**.

11.18.3.2. Annual engine blade blending recertification. **(T-1)**.

11.18.3.3. 180-day engine blade blending proficiency. **(T-1)**.

11.18.3.4. **(Added-AFMC)** Initial engine blade blending certification. **(T-2).**

11.18.4. Certification Criteria. Certifying officials will be selected IAW criteria established in **Table 11.1** **(T-1)**.

11.18.4.1. **(Added-AFMC)** Certification Criteria. Certifying officials will be selected IAW criteria established in AFMC **Table 11.1** of this instruction. Units will limit the number of certifiers to a minimum to ensure standardized training and certification. Certifying officials will maintain proficiency in the same manner as other technicians; certifying officials will recertify each other. **Note:** If applicable, assigned AFETS/CETS should be used to certify other certifying officials. **(T-2).**

11.18.4.2. **(Added-AFMC)** Certified individuals who PCS to the same MDS and engine TMSM, and are still current on their proficiency, may by-pass formal training course. These individuals will be re-certified by a certifier prior to being added to the SCR. Carry over date of original class completion from previous documentation (certificate, training record, MIS printout). **(T-2).**

11.18.4.3. **(Added-AFMC)** Upon completion of the formal training, individuals are task evaluated by the certifying official (an individual other than the instructor who administered the course), and placed on the SCR. **(T-2).**

11.18.5. **(Added-AFMC)** Proficiency Requirements. As a minimum, B-1, B-2, F-15, F-16, F-22, F-35 and U-2 personnel must perform one blend repair every 180 days to maintain proficiency. Work centers may use trainer engine blades to perform blade blend proficiency. Work center supervisors ensure personnel who do not meet this requirement are decertified. (**T-2).**

11.18.6. **(Added-AFMC)** Annual Recertification. Recertification is accomplished by having the technician demonstrate they can perform the task(s). A QA PE may be used to satisfy this requirement if the QA evaluator is a certifying official. **(T-2).**

11.18.7. **(Added-AFMC)** Blade blending procedures for installed/uninstalled engines/modules:

11.18.7.1. **(Added-AFMC)** Notify the Wing/Center FOD Monitor prior to blade blending anytime FOD is identified, other than for minor sand nicks or scratches (i.e. blending with emery cloth). **(T-2).**

11.18.7.2. **(Added-AFMC)** Fill out Blade Blending/FOD Damage worksheet or applicable form with the following information; engine serial number, stage number, number of blades blended, depth of damage before and after blend, area of damage and employee number/stamp number of maintenance personnel. **(T-2).**

11.18.7.3. **(Added-AFMC)** Notify EM section and forward Blade Blending/FOD Damage worksheet or applicable form to EM section for filing. The EM section will transcribe information provided in the Blade Blending/FOD Damage worksheet into the applicable engine/module records (i.e., AFTO IMT 95; if applicable) and CEMS, IAW TO 00-20-1. **(T-2).**

11.18.7.3.1. **(Added-AFMC)** The EM section will also document CEMS IAW 00-25-254-1/2. **(T-2).**

11.19. Engine Flexible Borescope Inspection Training and Certification Program. The purpose of this program is to ensure individual knowledge and proficiency levels; proper care and use of equipment; and standardization of program requirements.

11.19.1. All units maintaining engines using flexible borescopes will establish a comprehensive training program. **(T-1)**. Certification procedures described here are only for engine borescope certification.

11.19.1.1. Training will be annotated in training records. **(T-1)**.

11.19.2. MAJCOMs will:

11.19.2.1. Ensure an engine flexible borescope formal training course is developed, tracked and managed by MT/TD.

11.19.2.1.1. **(Added-AFMC)** MT, Propulsion Flight, or TD will develop and manage training. MXG/CC will select maintenance instructors or TD instructors to provide training, (AFETS/CETS may be used as alternate instructors). As a minimum, courses will include care and handling of the equipment, all borescope/ port locations to include all inspection requirements and procedures, all applicable technical data, fault isolation/damage assessment/defect size determination, and performance of an actual engine borescope. **(T-2).**

11.19.2.1.2. **(Added-AFMC)** Course material/instruction will include high interest borescope inspections (e.g., blade tip curl HS3 inspection on the F100-series engine). **(T-2).**

11.19.2.2. Ensure engine flexible borescope proficiency and annual recertification (by a certifying official) requirements are established by course code.

11.19.2.2. **(AFMC)** MT, Propulsion Flight, or TD will ensure engine flexible borescope proficiency and annual recertification requirements are established by course code.

11.19.2.3. Ensure time, training and documentation currency requirements are established for engine flexible borescope certified personnel who PCS to the same MDS/engine.

11.19.2.3. **(AFMC)** Personnel who utilize borescope equipment to inspect or perform maintenance on jet engine modules that are not installed on the final engine do not require recurring borescope training. Final borescope inspection of the completed engine must be performed by a certified technician who has completed this recurring requirement. **(T-2).**

11.19.2.3.1. **(Added-AFMC)** Personnel who utilize borescope equipment to inspect or perform maintenance on jet engine modules not installed on aircraft are required to complete initial borescope training for assigned TMS. **(T-2).**

11.19.2.4. Determine training requirements for personnel using borescopes for non-engine type inspections (such as, behind ejection seats, wing boxes) to include, as a minimum, proper use and care of borescopes.

11.19.2.5. **(Added-AFMC)** Certified individuals who PCS to the same MDS and engine TMSM may by-pass the formal training course. These individuals must be re-certified by a certifier prior to being added to the SCR. Carry over the date of original class completion from previous documentation (certificate, training record, MIS printout). **NOTE:** If applicable, assigned AFETS/CETS should be used to certify other certifying officials. **(T-2).**

11.20. Flying Crew Chief (FCC) Program. The purpose of the FCC Program is to enhance mission effectiveness by providing qualified maintenance support for aircraft at locations other than home station. The FCC flies in Mission Essential Personnel status. FCC's typically fly with the aircraft for the purpose of accomplishing ground maintenance at the TDY location. The duty period typically starts when the FCC shows at the aircraft prior to departure. FCCs are qualified in their duty AFSC and are required to obtain, maintain, and apply basic knowledge in several other aircraft maintenance AFSCs. They are responsible for launch, recovery, inspection, servicing, generation, and maintenance of aircraft in austere locations and locations where specific MDS maintenance capability may not be available.

11.20.1. MAJCOMs may authorize/develop a FCC Program under the direction of AF/A4LM for maintainers who are required to regularly fly and maintain aircraft.

11.20.1.1. FCCs will be selected per mission requirements as directed by MAJCOMs and qualify for Special Duty Assignment Pay (SDAP) IAW AFI 36-3017, *Assignment Incentive Pay and Special Duty Assignment Pay*. **(T-1)**.

11.20.2. The FCC program only applies to personnel assigned to positions on the Unit Manning Document with a "C" prefix for the Duty AFSC.

11.20.3. The following situations will not qualify the FCC for SDAP:

11.20.3.1. Occasional flights where the aircraft is used as transportation in lieu of commercial air.

11.20.3.2. Incentive or indoctrination flights.

11.20.3.3. Deployments where additional maintenance personnel are required at the designated location to supplement assigned maintainers.

11.20.4. Qualifying missions. A mission consists of one or more sorties with a mission number as entered on the AFTO Form 781, *Aircrew/Mission Flight Data Document*. The mission must meet the following criteria to qualify for this program:

11.20.4.1. The FCC is required to accomplish maintenance at locations other than home station to prepare the aircraft for its next departure. **(T-1)**.

11.20.5. FCC Program responsibilities.

11.20.5.1. AF/A1PA oversees the overall SDAP and provides guidance in AFI 36-3017.

11.20.5.2. AF/A4LM is the SDAP functional manager for FCCs.

11.20.5.2.1. AF/A4LM sets criteria for FCCs, validates MAJCOM FCC reports, and forecasts FCC SDAP budget needs.

11.20.5.2.2. AF/A4LM approves/disapproves FCC position increases/decreases in coordination with AF/A1PA.

11.20.5.3. MAJCOMs implement the FCC Program and will appoint in writing a FCC Program Manager to enforce standards and prepare the annual report.

11.20.5.3. **(AFMC)** HQ AFMC/A4MM manages the AFMC FCC program.

11.20.5.4. MAJCOM FCC Program Managers will determine which squadrons will participate in the FCC Program and will:

11.20.5.4.1. Validate and forward squadron FCC SDAP requests (**Attachment 5**) to AF/A4LM and AF/A1PA.

11.20.5.4.2. Annually validate FCC SDAP positions.

11.20.5.4.3. Assign FCC SDAP positions with an AFSC prefix of "C" and an appropriate SEI on command manpower documents.

11.20.5.4.4. Establish command unique training requirements and set additional qualification standards for their FCCs as needed.

11.20.5.4.5. Maintain quarterly and annual FCC reports (**Attachment 3** and **Attachment 4**).

11.20.5.4.6. Prepare and submit the command annual FCC report to AF/A4LM at **usaf.pentagon.af-a4.mbx.a4lm-workflow@mail.mil** and AF/A1PA by 15 August each year. Submit the biennial FCC report to AF/A1PA upon request.

11.20.5.4.7. Review and approve/disapprove ACR for changes of the “C” prefix to an AFSC on the UMD.

11.20.5.4.8. Review and recommend approval/disapproval of ACRs for additions, deletions of the "C" prefix to an AFSC on the UMD.

11.20.5.5. MAJCOM (A1M) Command Manpower and Organization Responsibilities. A1M will:

11.20.5.5.1. Coordinate and obtain approval/disapproval from MAJCOM for Installation Manpower and Organization Office ACRs pertaining to validation of "C" prefix to AFSCs on the UMD.

11.20.5.5.2. Assign the "C" prefix to AFSCs upon approval from MAJCOM FCC Program Manager. This provides MAJCOM functional managers and unit senior maintenance managers the visibility of squadron FCC SDAP positions. **Note:** FCC SDAP positions do not effect a unit's manpower authorizations.

11.20.5.6. SQ/CC's will:

11.20.5.6.1. Administer the squadron FCC Program IAW AFI 36-3017, AFI 36-2101, *Classifying Military Personnel (Officer and Enlisted)*, and this instruction. **(T-1)**.

11.20.5.6.2. Ensure FCCs fly only when required for the mission. **(T-1)**.

11.20.5.6.3. Appoint and remove personnel from the FCC Program IAW AFI 36-2101. **(T-1)**.

11.20.5.6.3.1. Assign FCCs for a minimum of one year, unless removed for cause. **(T-1)**.

11.20.5.6.4. Ensure only qualified FCCs and assistant FCCs who meet minimum requirements IAW AFI 36-3017 receive SDAP and fly a minimum of three qualifying missions per quarter. **(T-1)**. An indicator of having too many FCCs may be reflected in a unit whose FCCs routinely do not meet minimum quarterly requirements.

11.20.5.6.5. Assign no more than two FCCs per aircraft (an FCC and assistant FCC) to each qualifying mission unless otherwise approved by MAJCOM. **(T-2)**. Exception: SQ/CC may assign the minimum number of additional FCCs when required to maintain proper work-rest cycles or to meet TO requirements.

11.20.5.6.6. Appoint in writing a Unit FCC Program Manager. **(T-1)**.

11.20.5.7. Unit FCC Program Managers will:

11.20.5.7.1. Track status and prepare unit reports. **(T-1)**.

11.20.5.7.2. Ensure personnel possess the appropriate SEI for their MDS aircraft. **(T-1)**.

11.20.5.7.3. Provide a letter to their Installation Manpower and Organization Office and an information copy to the MAJCOM FCC Program Manager to change, add, or delete a "C" prefix to the AFSC on the UMD. **(T-1)**.

11.20.5.7.3.1. The letter will contain the unit designation, function account code, AFSC, position number, and a POC. **(T-1)**.

11.20.5.7.4. Ensure FCCs and assistant FCCs are aligned in a duty position with a "C" prefix by initiating an AF Form 2096, *Classification/On-the-Job Training Action*, or special order. **(T-1)**.

11.20.5.7.5. Counsel FCCs and assistant FCCs on SDAP termination (AFI 36-3017, **Table 3** lists reasons for termination). **(T-1)**.

11.20.5.7.5.1. SDAP stops on the dates listed in this table. As long as a "C" prefix is attached to an AFSC the member shall receive SDAP. **(T-1)**.

11.20.5.7.6. Review, update, and authenticate the monthly SDAP roster. **(T-1)**. The SDAP roster is the only administrative tool used to start, stop or continue the FCC pay entitlement.

11.20.5.7.6.1. If changes are made on the monthly SDAP roster, an AF Form 2096 or special order must be submitted to the Military Personnel Section (MPS). **(T-1)**.

11.20.5.7.6.2. Authentication of the monthly SDAP roster validates that each FCC is meeting the full intent of the program. **Note:** AFI 36-3017 provides commanders conditions concerning pay entitlements.

11.20.5.7.7. Submit SDAP position increase/decrease requests to MAJCOM FCC Program Manager by message, e-mail, or letter stating the number of positions to be increased/decreased with a brief justification. **(T-1)**.

11.20.5.7.7.1. MAJCOMs will forward requests to AF/A4LM for final approval.

11.20.5.7.8. Provide information for processing DD Form 1610, *Request and Authorization for TDY Travel of DoD Personnel*, for FCCs. **(T-3)**.

11.20.5.7.9. Ensure TDY orders authorize FCCs to travel in Mission Essential Personnel status. **(T-1)**. **Note:** Aeronautical orders do not apply to this program, as FCCs are not aircrew members.

11.20.5.7.10. Monitor training qualifications and currency to ensure only qualified FCCs are scheduled for missions. **(T-1)**.

11.20.5.7.10.1. As a minimum, maintain a folder for each FCC containing training qualifications, immunizations, military passport information, appointment letters, and FCC Mission Reports. **(T-1)**. If the unit mobility section already maintains these source documents, either electronic or paper copies may be maintained.

11.20.5.7.11. Coordinate scheduling of FCCs through Flight CC/Chiefs and operations schedulers. **(T-1)**.

11.20.5.7.12. Maintain a Unit FCC Program Manager's Continuity Book. **(T-1)**. As a minimum the continuity book will include:

11.20.5.7.12.1. Lists of required instructions with web addresses (including AFI 36-3017, AFMAN 36-2108 and this instruction). **(T-1)**.

11.20.5.7.12.2. Unit FCC Program Manager appointment letter, AF Form 2096 or special orders. **(T-1)**.

11.20.5.7.12.3. Manpower correspondence assigning "C" prefix AFSC. **(T-1)**.

11.20.5.7.12.4. Quarterly and annual FCC status reports, SDAP position requests and miscellaneous FCC and SDAP correspondence. **(T-1)**.

11.20.5.7.13. Report program status by Fiscal Year (FY) quarters to MAJCOM FCC Program Manager NLT the 15th day of the month following each FY quarter and report FY annual program status to the MAJCOM NLT 15 July each year. **(T-1)**.

11.20.5.7.13.1. Annual report will consist of the previous FY 4th quarter and current FY 1st, 2nd, and 3rd quarters (1 Jul - 30 Jun). **(T-1)**.

11.20.5.7.14. Submit funding requests for flight clothing, per diem, and other related expenses for the annual budget (for safety during flight, flight clothing is mandatory for FCCs and Assistant FCCs). **(T-1)**.

11.20.5.8. Installation Manpower and Quality Office will:

11.20.5.8.1. Forward ACR to MAJCOM to add, delete, or change "C" prefixes on AFSCs existing on the UMD. **(T-1)**.

11.20.5.9. Enroute supervisors will:

11.20.5.9.1. Not assign FCCs to work other enroute aircraft. **(T-2)**. However, FCCs left at an enroute location and awaiting transportation may be assigned to work other enroute aircraft.

11.20.5.9.2. Brief FCCs on local safety precautions, maintenance practices, and limitations. **(T-2)**.

11.20.5.9.3. Coordinate with the Pilot In Charge (PIC) and FCC to obtain transportation to/from quarters. **(T-2)**.

11.20.5.10. The FCC will:

11.20.5.10.1. Establish duty shifts and rest periods with the PIC and enroute supervisor based on maintenance and mission requirements. **(T-2)**. **Note:** Consider the duration of the flight, the ability to rest during the flight, and the quality of the rest during the flight. FCCs do not automatically enter crew rest with the aircrew upon arrival at an enroute/transient location unless the duty day was exceeded.

11.20.5.10.1.1. If the FCC's safety is jeopardized by fatigue, the FCC's duty day must end. **(T-2)**.

11.20.5.10.2. Upon arrival at enroute locations, determine their ability to safely and effectively perform duties. **(T-2)**. **Note:** The FCC's primary job is preparing the aircraft (inspect, service, aircraft forms maintenance) for the next mission.

11.20.5.10.2.1. Notify Tanker Airlift Control Center/Logistics Cell of planned crew rest periods and or establish an alternate point of contact during scheduled rest periods to minimize rest cycle interpretations. **(T-2)**.

11.20.5.10.3. Coordinate with the PIC to ensure crew integrity for quarters is maintained. **(T-2)**.

11.20.5.10.4. Coordinate with the PIC to ensure the FCC Performance Feedback Form in **Attachment 2** is completed by the PIC and provided the Unit FCC Program Manager upon return to home station. **(T-2)**.

11.20.6. FCC qualifications and responsibilities.

11.20.6.1. FCCs should be a 2AX AFSC 5- or 7-skill level.

11.20.6.2. As a minimum, the FCC must be qualified and certified on the following MDS applicable items:

11.20.6.2.1. Possess a SEI of the aircraft assigned to the FCC. **(T-2)**.

11.20.6.2.2. Refuel/defuel member and supervisor; concurrent servicing supervisor (as applicable). **(T-2)**.

11.20.6.2.3. Tow member, tow supervisor, and tow brake operator. **(T-2)**.

11.20.6.2.4. LOX/GOX servicing, nitrogen and tire servicing. **(T-2)**.

11.20.6.2.5. Tire and brake change; launch; recovery; marshalling; pre-flight, thru-flight and post-flight inspection. **(T-2)**.

11.20.6.2.6. APU operation/quick air start system. **(T-2)**.

11.20.6.2.7. Engine run. **(T-2)**.

11.20.6.2.8. Kneeling operation and cargo door/ramp/visor operation on applicable MDS. **(T-2)**.

11.20.6.2.9. All applicable powered/non-powered AGE. **(T-2)**.

11.20.6.2.10. Qualified to operate, troubleshoot, service, and perform maintenance on their aircraft's critical systems as required by the MAJCOM. **(T-2)**.

11.20.6.3. Assistant FCC qualifications and responsibilities.

11.20.6.3.1. Assistant FCCs must be a 5-level A1C or above with at least a SEI on their assigned aircraft, and must accompany a fully qualified FCC. **(T-2)**.

11.20.6.3.2. As a minimum, the Assistant FCC will be qualified and certified on the following MDS applicable items:

11.20.6.3.2.1. Refuel/defuel member. **(T-2)**.

11.20.6.3.2.2. Tow member and tow brake operator. **(T-2)**.

11.20.6.3.2.3. LOX/GOX servicing, nitrogen and tire servicing. **(T-2)**.

11.20.6.3.2.4. Tire and brake change; launch; recovery; marshalling; pre-flight, thru-flight and post-flight inspection. **(T-2)**.

11.20.6.3.2.5. APU operation/quick air start system. **(T-2)**.

11.20.6.3.2.6. Cargo door/ramp/visor operation on applicable MDS. **(T-2)**.

11.20.6.3.2.7. All applicable powered/non-powered AGE. **(T-2)**.

11.20.7. Work/rest plan (see **Chapter 1**).

11.20.8. MAJCOM FCC Program reporting.

11.20.8.1. MAJCOMs will forward a yearly report to AF/A4LM by 15 August.

11.20.8.2. Use previous FY 4th quarter; and current FY 1st, 2nd, and 3rd quarters. Late reports may postpone FCC waiver requests. Refer to **Attachment 3** and **Attachment 4** for reporting criteria.

11.20.9. Waivers.

11.20.9.1. Forward unit waiver requests to the MAJCOM FCC Program Manager, who will either disapprove/return to unit, or recommend approval/forward to AF/A4LM for final approval IAW AFI 33-360. **(T-1)**.

11.20.9.1.1. All approved waivers are reviewed annually as part of the annual report unless otherwise stipulated by the approval authority.

11.20.9.1.2. Waiver renewals. Submit a brief justification for waivers requiring renewal.

11.21. Maintenance of Flash Blindness Protective Devices.

11.21.1. MAJCOMs will define responsibilities across maintenance for sustainment of flash blindness protective devices for assigned aircraft in a supplement to this instruction. As a minimum, MAJCOM supplements will assign responsibilities that ensure:

11.21.1. **(AFMC)** AFMC has zero Emergency War Order (EWO)/OPLAN 8010 responsibilities requiring flash blindness protective devices.

11.21.1.1. Units maintain aircraft thermal protective devices, shields, and associated hardware IAW aircraft TOs.

11.21.1.2. Units will establish a training program to qualify individuals to install, inspect, and when required, seal aircraft thermal protective devices and shields. **(T-2)**.

11.22. WRM External Nestable Fuel Tank Build-Up. MAJCOMs will ensure units sustain the capability to support assigned wartime taskings. External Nestable Fuel Tank Build-Up is a wartime capability, supported/tasked through a UTC to provide a critical wartime skill that compensates for the expenditure of aircraft fuel tanks (refer to **Chapter 4**). With exception of the core 2A6X4 personnel, augmentees may come from any group or squadron within the wing. MAJCOMs, as applicable, will:

11.22.1. Ensure units adhere to the direction outlined in their particular Mission Capability statement and DOC statement IAW AFI 10-401, governing the quantity, size, and composition of fuel tank build-up teams.

11.22.2. Provide guidance for UDMs to ensure personnel tasked/selected for WRM Nestable Fuel Tank Build-Up team augmentees are not tasked for other wartime UTCs.

11.22.2.1. MAJCOMs must ensure UDMs responsible for deploying 2A6X4 personnel are designated as the focal point for WRM Nestable Fuel Tank Build-Up team assembly and are required to develop/maintain a written plan. The plan must be kept current, reviewed annually and contain the following:

11.22.2.1.1. Specific manning positions across the wing to be tasked as Nestable Fuel Tank Build-Up team augmentees. **Note:** The applicable independent Nestable Fuel Tank Build-Up UTC Manpower Force Packaging System will be used as a guide to construct the teams.

11.22.2.1.2. Guidelines for activation of the tank build-up teams are established.

11.23. Protective Aircraft Shelters (PAS). MAJCOMs that possess PAS will publish guidance for aircraft maintenance operations in a PAS environment. At a minimum, MAJCOM guidance and procedures will address:

11.23. (AFMC) Protective Aircraft Shelters (PAS). Units that possess PAS will coordinate aircraft maintenance operations guidance in a PAS environment with HQ AFMC/A4M (**AFMC.A4M.workflow@us.af.mil**).

11.23.1. PAS marking and floor plans.

11.23.2. Electrical Requirements.

11.23.3. Refueling/Defueling Operations.

11.23.4. Shelter Door Operations.

11.23.5. Aircraft Engine Operation.

11.23.6. Aircraft Positioning inside the PAS.

11.23.7. Aircraft Winching (Hot/Cold).

11.23.8. Placement and Storage of Munitions in the PAS.

11.23.9. Collocating Nuclear and Conventional Munitions (AF Munitions).

11.23.10. External Fuel Tank storage.

11.23.11. PAS maintenance and Inspection requirements not covered by existing publications (such as, grounding and ventilation, mods).

11.24. Combat Sortie Generation. Combat sortie generation is a process by which mission capable aircraft are generated in a minimum amount of time, during peacetime or wartime, through separate 2AXXX and 2WXXX tasks or by Concurrent Servicing Operations. Combat sortie generation may include fueling, munitions/ammunition loading/unloading, aircraft reconfiguration, -6 TO inspections, and other servicing requirements, IAW applicable MDS TOs, Technical Order Data (TOD), IETM, TO 11A-1-33, *Handling and Maintenance of Explosives-Loaded Aircraft*, TO 00-25-172 and other applicable directives. Procedures can be compressed through pre-positioning resources and concurrent performance of tasks.

11.24.1. Wings will define when to exercise combat sortie generation procedures. Procedures may be used during actual contingencies, scheduled exercises, and daily flying operations.

11.24.1. **(AFMC)** AFMC does not have a peacetime or wartime requirement for combat sortie generation. For mission necessity, see **paragraph A8.1.10.4** Rapid Crew Swap (RCS).

11.25. Hot Refueling Procedures. For the purpose of this instruction hot refueling is the transfer of fuel into an aircraft having one or more engines running and is conducted by certified AF maintenance and fuels personnel IAW this instruction. The purpose of hot refueling is to reduce aircraft ground time, personnel and equipment support requirements and increase system reliability

by eliminating system shut down and subsequent restart. Refer to the following sources for additional guidance: TO 00-25-172, TO 00-25-172 CL-4, *Checklist -- Aircraft Fuel Servicing with R-9, R-11 and Commercial Fuel Servicing Trucks and with Fuels Operational Readiness Capability Equipment (FORCE)*, TO 37A9-3-11-lCL-l, *Checklist, Operational and Organizational Maintenance Hot Refueling and Hot Integrated Combat Turnaround Procedures, Aircraft Fuel Servicing Unit Type GRU 17/E Pantograph PACAF Type IV Hydrant Servicing*, and AFMAN 91-203. Exception: N/A for MAJCOMs/Mx units not tasked to maintain hot pit refueling capabilities.

11.25.1. Maintenance personnel will not perform hot refueling operations until the location, equipment requirements, and personnel qualifications are certified IAW this instruction and TO 00-25-172. **(T-1)**.

11.25.1.1. Site Certification. MAJCOMs will develop hot pit refueling site certification requirements which as a minimum will include:

11.25.1.1. **(AFMC)** AFMC will follow the guidance in this instruction. Additional MAJCOM requirements are listed in **paragraph 11.25.1.1.9.1** and **11.25.1.1.10**. **(T-2).**

11.25.1.1.1. Field grade maintenance operations officer as the site certifying official.

11.25.1.1.2. Representative from OSS's Airfield Operations Flight, knowledgeable of aircraft taxiways, parking ramp, and hot refuel safe distance requirements.

11.25.1.1.3. Maintenance member with AFSC 2AXXX from MXG/QA.

11.25.1.1.4. Wing Occupational Safety member, minimum SSgt with AFSC 1S071 or civilian equivalent, task qualified in site certification and knowledgeable of hot refueling operations.

11.25.1.1.5. AFSC 2F071 Fuels Management Flight Member or civilian equivalent.

11.25.1.1.6. Civil engineering member with AFSC 3E271 or civilian equivalent familiar with aircraft ramp requirements for hot refueling.

11.25.1.1.7. Fire protection member with a minimum AFSC 3E771 or civilian equivalent familiar with fire protection standby requirements in TO 00-25-172 for hot refueling.

11.25.1.1.8. The following questions will be addressed as part of the site certification:

11.25.1.1.8.1. Has the aircraft been approved by System Safety Engineering Analysis (SSEA) for hot pit refueling?

11.25.1.1.8.2. Is adequate area provided to position the aircraft safely (evaluate ability to reposition due to wind direction)?

11.25.1.1.8.3. Is the ramp level to prevent drainage that could cause environmental impact? Request the fire department dump water to verify flow, if questionable.

11.25.1.1.8.4. Is the location adequate for the number of aircraft to be serviced?

11.25.1.1.8.5. Has a hot brake holding area been established?

11.25.1.1.8.6. Is there proper clearance between the hot pit area and hot brake holding area to prevent conflict?

11.25.1.1.8.7. Is there proper clearance between the hot pit and Explosive Clear Zone/Hot Cargo Pad/Airfield Clearance Zones to prevent violations of any area/zone?

11.25.1.1.8.8. Is the hot pit adequately clear of the aircraft/vehicle traffic area?

11.25.1.1.8.9. Is the hot pit and cursory check area of the ramp clear of FOD potential?

11.25.1.1.8.10. Does the location provide for rapid access of emergency equipment and egress of aircraft/equipment?

11.25.1.1.8.11. Are adequate grounding points available?

11.25.1.1.9. QA or responsible unit will maintain site certification documentation and a master listing of hot pit refueling sites administered by the MXG.

11.25.1.1.9.1. QA or responsible unit will coordinate with P&R to ensure hot pit site certification listing is updated any time sites are added, changed, or deleted. **(T-1)**. Reference **https://www.my.af.mil/BASE/baseapp**.

11.25.1.1.9.1. **(AFMC)** Send copy to AFMC/A4M Workflow (**AFMC.A4M.Workflow@us.af.mil**).

11.25.1.1.10. Each unit hot refueling site will be certified by a unit certification team, and approved by Installation Commander, when one of the following occurs:

11.25.1.1.10. **(AFMC)** Send copy to AFMC/A4M Workflow (**AFMC.A4M.Workflow@us.af.mil**).

11.25.1.1.10.1. Construction of new hot refueling sites. **(T-1)**.

11.25.1.1.10.2. Change in the unit MDS, or when an additional MDS is acquired. **(T-1)**.

11.25.1.1.10.3. Change in refueling equipment. **(T-1)**.

11.25.1.1.10.4. Changes in the certified site areas which affect/change the previous certification. **(T-1)**.

11.25.2. Hot pit site master listing. **(T-1)**. This listing must contain the following information for all hot pit sites established and/or sustained by an AF installation or equivalent:

11.25.2.1. All sites must be identified by coordinates on a map. **(T-1)**.

11.25.2.1.1. Each facility within the distance identified in TO 00-25-172, must be identified as to its use/contents and its distance in feet from the refueling site/operation. **(T-1)**.

11.25.2.1.2. Other refueling sites, aircraft parking areas, also need to be identified and all distances must be shown even if a violation exists. **(T-1)**.

11.25.2.1.3. The request cover letter will state if there are no violations. **(T-1)**.

11.25.2.1.4. Procedures such as aircraft taxi routes should also be shown. Use arrows or dotted lines to show taxi directions, both entry and exit.

11.25.2.1.5. Address any restrictions to normal operations and actions required IAW TO 00-25-172.

11.25.2.2. State the type of equipment used for hot refueling at each site, (such as, hose carts, truck). **(T-1)**.

11.25.2.2.1. Show the location of any fixed fuel pits and usual location of cart or truck if used. **(T-1)**.

11.25.2.2.2. Unit-approved sites will be identified on the aircraft parking plan. **(T-1)**.

11.25.2.2.3. OSS, CE and QA and will maintain copies of hot refueling sites on file. **(T-1)**.

11.25.2.3. State whether or not all hot refueling areas comply with the quantity-distance separation requirements of AFMAN 91-201 in relation to surrounding exposed sites/potential explosion sites.

11.25.3. Hot refueling requires detailed procedures be published in appropriate TOs and unit-developed Local Checklists. Unit Local Checklists will be developed IAW **Chapter 6** and include detailed procedures, normal and emergency, to meet requirements of the local environment. **(T-1)**.

11.25.3.1. Units will forward Local Checklists to their respective QA office for approval. **(T-2)**.

11.25.4. Units will publish procedures to supplement this section and outline local requirements and additional precautions as necessary for hot refueling, including hot refueling with ordnance, when authorized, IAW TO 00-25-172. **(T-1)**.

11.25.5. AMXS tasked to perform hot refueling operations will ensure hot refueling crews are available to meet mission requirements. **(T-1)**. MXS maintenance personnel may be utilized.

11.25.6. Hot Refueling Team Members and Duties.

11.25.6.1. Pad Supervisor. Responsible for overall supervision of hot refueling operations when two or more aircraft are simultaneously hot refueled on the same pad (multiple hot refueling).

11.25.6.1.1. Individual will possess a 5-skill level or higher qualification in an aircraft maintenance AFSC and be hot refueling supervisor "A" member qualified. **(T-2)**.

11.25.6.1.2. Supervisors must have full view and control of multiple hot refueling operations. **(T-1)**.

11.25.6.2. Refuel supervisor "A" member. Individual will be refuel task qualified, capable of supervising hot refuel crew, possess an aircraft maintenance AFSC 5-skill level qualification and 1 year of flightline aircraft maintenance experience. **(T-2)**.

11.25.6.3. Refuel crew "B" member. Individual will be task qualified, possess a flightline maintenance AFSC, and 1 year of flightline maintenance experience. **(T-2)**.

11.25.6.4. Fuels specialist with 2F0X1 AFSC, "C" member. Individual will be refuel task certified on the specific facility/equipment, and task qualified for aircraft hot refueling. **(T-2)**.

11.25.6.5. Additional refuel crew "D" member. Individual will be task qualified, possess a flightline maintenance AFSC, and have at least 1 year of flightline maintenance experience. **(T-2)**. Use "D" members as required by applicable aircraft technical data.

11.25.7. Hot refueling team members and QA certifying officials/evaluators may be multi-MDS qualified when more than one weapons system is permanently assigned to a squadron.

11.25.7.1. After initial certification on each MDS, personnel must update their hot refueling currency by performing hot refueling on any assigned weapon system. **(T-1)**.

11.25.7.2. Section NCOICs/Chiefs will ensure personnel maintain proficiency on each assigned MDS. **(T-1)**.

11.25.8. Conducting Hot Refueling Training, Certification and Documentation. [For additional information, refer to AFI 11-235, *Specialized Refueling Operations*]. Qualification training of hot refueling personnel will be conducted in three distinct phases. **(T-1)**. The three hot refueling qualification training phases are as follows:

11.25.8.1. Phase 1. "Familiarization" phase. Designated instructors familiarize trainees with applicable technical data, procedures and guidance for hot refueling. Place special emphasis on procedures for hot refueling with ordinance loaded, when authorized.

11.25.8.2. Phase 2. "Hands-on" phase. Apply information learned in Phase 1 to develop in-depth knowledge and proficiency in all facets of hot refueling. Training will include proper operation, preventive maintenance, use of hand signals and emergency procedures. **(T-1)**. Simulate hot refueling by performing all hot refueling tasks without aircraft engines running (cold pit). Designated instructors will demonstrate tasks then require trainees to perform tasks, practice emergency procedures, critique performance and provide additional training as required. **(T-1)**.

11.25.8.3. Phase 3. "Demonstration/Certification" phase. Trainees will demonstrate hot refueling under the supervision of designated certifying officials with aircraft engine(s) running. **(T-1)**. The Squadron Certifying Officials will certify individuals upon successful demonstration of hot refueling. **(T-1)**. If Phase 3 training has not been completed within 30 days of Phase 2 training, Phase 2 training must be repeated. **(T-1)**.

11.25.8.4. Qualification training will:

11.25.8.4.1. Stress safety requirements, emergency procedures and equipment inspection in all three phases of training. **(T-1)**.

11.25.8.4.2. Ensure procedures in TO 37A9-3-11-1CL-1, TO 00-25-172, and TO 00-25-172CL-4 are taught to all team supervisors and members. **(T-1)**.

11.25.8.4.3. Allow Phase 2 and Phase 3 training to be conducted utilizing joint sessions including 2F0X1 AFSC personnel and all maintenance AFSCs. **(T-1)**.

11.25.8.4.4. Utilize both fuels (2F0X1) and maintenance AFSC instructors for joint sessions.

11.25.8.4.5. Be conducted by MT (QA if MT not available). **(T-1)**.

11.25.8.5. QA hot pit certifying officials and QA hot pit certifier augmentees (squadron certifying officials) will train, evaluate, and certify unit personnel. **(T-1)**.

11.25.8.5.1. QA hot pit certifying officials will ensure augmentees conduct evaluations using procedures outlined in this instruction, applicable aircraft TOs and local procedures. **(T-1)**.

11.25.8.6. Hot pit certifying officials will be approved by the MXG/CC and tracked on the SCR. **(T-1)**.

11.25.9. Document training for personnel performing, evaluating, supervising or instructing hot refuel operations as follows:

11.25.9.1. Document all aircraft maintenance and 2F0X1 AFSC personnel Phases 1, 2, and 3 initial training in the TBA. **(T-1)**.

11.25.9.1.1. For AFSCs where "refuel aircraft with engines operating" is not contained in the TBA, use AF Form 797/MIS to document initial hot refuel training. **(T-1)**.

11.25.9.1.2. Track recurring hot refueling certification in the MIS (initial and annual) IAW 00-25-172 and this AFI. **(T-1)**.

11.25.9.2. 2F0X1 AFSC personnel will use the TBA/AF Form 1098, *Special Tasks Certification and Recurring Training*, to document Phases 1, 2, and 3 initial/recurring hot refuel training. **(T-1)**. **Note:** Fuels (2F0X1) certifying officials will be appointed by the LRS/CC IAW AFI 36-2651.

11.25.10. Track hot refueling members, by position, on the SCR. **(T-1)**.

11.25.11. Unique proficiency, certifying, and decertifying actions for hot refuel team members will be outlined in MAJCOM supplements/addendums to this AFI. **(T-1)**.

11.25.11. **(AFMC)** Training, certification, and recertification requirements for hot refuel team members are outlined in **Table 11.2** Personnel are decertified if they miss any semiannual proficiency requirements or annual special requirements. Personnel can also be decertified by any hot/aircraft to- aircraft refueling supervisor, squadron/immediate supervisor, or QA any time one of these individuals sees an unsafe act or demonstrated lack of proficiency on the part of any hot and/or aircraft-to-aircraft refueling team member. **(T-2)**

Table 11.2. (Added-AFMC) Hot/Aircraft-to-Aircraft Refueling Training/Certification Requirements. (T-2).

Position	Required Training	Proficiency Requirements	Special Requirements
QA/Squadron Hot Refueling Certifiers	I, II, III	1 Hot Refuel Semi-Annually	One time PE by hot refueling certified QA evaluator; thereafter, annual recertification by another hot refueling certifier or

			hot refueling certified QA evaluator
Pad Supervisor	I, II, III	1 Multiple Hot Refuel Semi-Annually	Annual recertification by hot refueling certifier
Refuel Member	I, II, III	1 Hot Refuel Semi-Annually	Annual recertification by hot refueling certifier
Fuels Specialist (2F0X1)	I, II, III	1 Hot Refuel Annually	Annual recertification by Fuels 7-level Supervisor
Decertified Certifier	Repeat II, III		Recertification must be started within 90 days or Phase I will also be completed. Recertification by another hot refueling certifier or hot refueling certified QA evaluator Decertified (Other than certifier) Repeat II, III Recertification
Decertified (Other than	Repeat II, III		Recertification must be

certifier)			started within 90 days or Phase I will also be completed. Recertification by hot refueling certifier.

11.26. Aircraft Rapid/Hot Defueling.

11.26.1. Rapid defueling presents hazards which are not normally encountered in normal defueling operations. Owning MAJCOMs will develop and sustain a rapid defueling capability to meet routine and contingency mission requirements IAW TO 00-25-172 and MDS-specific TOs.

11.26.1. **(AFMC)** AFMC does not have routine or contingency requirements for aircraft rapid/hot defueling.

11.26.1.1. Rapid defueling operations are considered hot defueling operations whenever the provider/source aircraft has an engine running.

11.27. 406 MHz Emergency Locator Transmitter Systems Program.

11.27.1. Units will ensure procedures are established to update the Emergency Locator Transmitter registration database whenever 406 MHz Emergency Locator Transmitter–equipped aircraft are transferred to other commands/wings, Emergency Locator Transmitter that are taken out of service, removed for maintenance or destroyed. **(T-0)**. **Note:** Emergency Locator Transmitter systems are not authorized for use in unmanned AF systems.

11.27.2. Aircraft maintenance functions must register and track status of fixed-mounted aircraft 406 MHz Emergency Locator Transmitter systems. **(T-0)**.

11.27.3. In accordance with DoDI 3002.02, *Personnel Recovery and 406 MHZ Search and Rescue (SAR) Emergency Beacons in the Department of Defense*, USAF 406 MHz Emergency Locator Transmitter systems must be registered in the DoD Joint Search and Rescue Satellite Aided Tracking Electronic Tracking System database. **(T-0)**.

11.27.3.1. The POC for JSETS registration is the Personnel Recovery Mission Software Help Desk at **PRMSMail@jricp.osis.gov**.

11.27.3.2. The governing agencies are the Joint Personnel Recovery Agency and the Electronic Services Command at Hanscom AFB, MA. Refer to AFMAN 10-207, *Command Posts*, for Command Post or C2 function responsibilities regarding 406 MHz Emergency Locator Transmitter and Personal Locator Beacon systems.

11.28. Crashed, Damaged or Disabled Aircraft Recovery (CDDAR) Program.

11.28.1. Installation/WG/CCs responsible for active airfields/runways, and flying missions will implement a CDDAR Program IAW TO 00-80C-1, *Crashed, Damaged, Disabled Aircraft Recovery Manual*. **(T-1)**. The program must be designed to provide a response and/or recovery capability of assigned host, tenant, and consider transient aircraft consistent with the following

considerations: (1) urgency to open the runway for operational use; (2) prevention of secondary damage to the aircraft; and (3) preservation of evidence for mishap or accident investigations IAW AFI 91-202 and AFI 91-204. **(T-1)**.

11.28.2. Responsibilities:

11.28.2.1. MAJCOMs will:

11.28.2.1.1. Ensure flying units maintain a CDDAR capability IAW 00-80C-1.

11.28.2.1.2. Designate a MAJCOM CDDAR OPR. As a minimum, the CDDAR OPR will:

11.28.2.1.2. **(AFMC)** HQ AFMC/A4MM is the MAJCOM CDDAR OPR.

11.28.2.1.2.1. Standardize CDDAR equipment inventory accountability and reporting requirements by MDS for all on hand CDDAR equipment prescribed by TO 00-80C-1, allowance standard and applicable weapons system TOs across assigned units with active airfields/runways.

11.28.2.1.2.1.1. Review unit's annual CDDAR equipment inventories to identify and document equipment shortfalls.

11.28.2.1.2.1.2. Coordinate AS change request with the applicable AFMC AS activity IAW AFI 23-101.

11.28.2.1.2.1.3. Ensure excess CDDAR equipment is redistributed to fill internal shortfalls prior to units turning equipment into supply/DLADS as excess.

11.28.2.2. AETC will:

11.28.2.2.1. Develop, sustain, and administer the CDDAR training program.

11.28.2.3. AFMC will:

11.28.2.3.1. Provide approved tech-data outlining equipment procedures to safely respond and/or recover aircraft from a CDDAR event.

11.28.2.3.2. Provide timely engineering support to facilitate resolution of unique CDDAR events which cannot be resolved by existing tech-data.

11.28.2.3.3. Develop, manage, and maintain AS needed to sustain a weapon systems for peacetime and wartime operations IAW AFI 23-101.

11.28.2.4. WG/CCs responsible for active airfields/runways will:

11.28.2.4.1. Collaborate to develop a publication IAW AFI 33-360, that assigns specific responsibilities and procedures to implement a CDDAR program IAW TO 00-80C-1. **(T-1)**.

11.28.2.4.1.1. The following additional references are to be used in developing the publication: AFI 10-2501, AFI 21-103, AFMAN 10-206, AFMAN 91-203, TO 00-105E-9, *Aerospace Emergency Rescue and Mishap Response Information* and this instruction.

11.28.2.4.2. Ensure CDDAR responsibilities and procedures are coordinated with Fire Emergency Services, Wing Safety, CES, LRS, SFS, MDS, OSS, and other on-/off-base agencies, as applicable. **(T-1)**.

11.28.2.4.3. Ensure wings with GSU/auxiliary fields outline support requirements in their publication. **(T-1)**.

11.28.2.5. MXG/CC or equivalent will:

11.28.2.5.1. Ensure CDDAR mobility UTC equipment requirements are available to deploy and accounted for on an AS (if applicable). **(T-1)**.

11.28.2.5.2. In coordination with the MSG/CC, determine unit vehicle/equipment requirements beyond those authorized in the AS(s) to provide 24/7 CDDAR response/runway clearing capability. **(T-1)**. Units must identify vehicles and SE designated to support CDDAR recovery in a local publication to ensure 24-hour availability. **(T-2)**.

11.28.2.5.3. Ensure as a minimum, units with a CDDAR requirement possess sufficient equipment to accomplish a recovery of the assigned MDS aircraft. **(T-1)**.

11.28.2.5.4. Establish an IFE response capability. **(T-1)**.

11.28.2.5.5. Participate in CDDAR training exercises. **(T-1)**.

11.28.2.5.6. Manage base level CDDAR equipment to minimize duplication of resources. **(T-1)**.

11.28.2.5.7. Ensure an annual CDDAR equipment inventory is completed and an inventory report containing CACRL inventory of CDDAR equipment that indicates excess or shortage items is completed, signed by MXG/CC or equivalent and sent to the MAJCOM CDDAR OPR, NLT 30 Sep. **(T-1)**.

11.28.2.6. CDDAR Team Chief and alternate will:

11.28.2.6.1. Be designated as the unit's subject matter expert on aircraft recovery operations and equipment and will be thoroughly familiar with and perform their Team Chief duties IAW TO 00-80C-1. **(T-1)**.

11.29. Aircraft Battle Damage Repair (ABDR). ABDR is an effective force multiplier contributing to wartime sortie production by assessing and repairing battle damaged aircraft rapidly to support flying operations. ABDR repairs will be accomplished during contingency or wartime only. However, weapons system program managers may approve ABDR repairs during peacetime on a case-by-case basis using trained ABDR Technicians.

11.29.1. Responsibilities:

11.29.1.1. The Directorate of Logistics (AF/A4L) will provide overall policy and guidance for the USAF ABDR Program.

11.29.1.2. AFMC will:

11.29.1.2. **(AFMC)** AFSC/LGPM is the USAF ABDR Program Office, they will: **(T-2)**

11.29.1.2.1. Assume management responsibility for USAF ABDR Programs.

11.29.1.2.2. Publish a MAJCOM instruction to implement the ABDR requirements contained in this instruction.

11.29.1.2.3. Develop and manage ABDR policy for pre-positioning of tools, materiel kits, related SE, and management of ABDR training aircraft.

11.29.1.2.4. Support development and publication of ABDR TOs for new weapon systems.

11.29.1.2.5. Maintain ABDR UTCs for AFMC organizations.

11.29.1.2.6. Plan for and develop capability to repair battle/crash damaged aircraft.

11.29.1.2.6.1. Ensure plans include procedures to add additional repair capabilities into operating locations and provide aircraft evacuation alternatives.

11.29.1.2.7. Plan, program, and submit ABDR funding requests.

11.29.1.2.8. Maintain an ABDR Technical Support Office to advocate and provide day-to-day management of tasks associated with development, implementation, maintenance, and support needed to enhance the USAF ABDR capability.

11.29.1.2.9. Provide support in determining technical requirements, repair techniques, repair materials, assessment aids and Research & Development (R&D) efforts.

11.29.1.2.10. Manage TO 1-1H-39, *Aircraft Battle Damage Repair General Technical Manual*, and the engineering handbook for ABDR engineers and support initiatives to develop, publish, and maintain weapon system-specific –39 TOs.

11.29.1.2.11. Ensure the status of aircraft permanently grounded for ABDR training is reported IAW AFI 21-103.

11.29.1.2.12. Establish Aircraft Battle Damage Evaluator training program, manage course documentation and provide training to MT Instructors as required. **(T-1)**.

11.29.1.3. MAJCOMs will:

11.29.1.3.1. Establish a command focal point to work ABDR issues with AFMC.

11.29.1.3.1. **(AFMC)** AFSC/LGPM is the command focal point.

11.29.1.3.2. In conjunction with AFMC, develop a command ABDR Concept of Operations and ensure Concept of Operations covers unit plans for repair of battle/crash damaged aircraft during combat operations.

11.29.1.3.3. Address ABDR in mission need statements for new weapon systems that support or engage in combat operations. **(T-1)**.

11.29.1.3.4. Incorporate ABDR in command war planning documents.

11.29.1.3.5. Task AFMC ABDR UTCs to support OPLANs. **(T-1)**.

11.29.1.3.6. Develop plans for the reception and employment of AFMC ABDR teams at the onset of hostilities. **(T-1)**.

11.29.1.3.7. Formalize integration and bed down requirements in applicable BSP IAW AFI 10-404.

11.29.1.3.8. USAFE and Pacific Air Forces (PACAF) will store and maintain serviceability, accountability and status reporting to include Financial Improvement and Audit Readiness reporting of AFMC owned and provided WRM ABDR trailers IAW established procedures. **(T-1)**.

11.29.1.3.9. Provide unit level weapon-system-specific tools (other than common hand tools) and equipment needed to repair battle/crash damaged aircraft.

11.29.1.3.10. Provide technical support to the ABDR Technical Support Office for live fire or similar testing.

11.29.1.4. Unit Responsibilities. Units will:

11.29.1.4.1. Utilize trained Aircraft Battle Damage Evaluators to evaluate aircraft battle damage and mishap damage sustained during combat or contingency operations. **(T-3)**.

11.29.1.4.2. Ensure shelf life items listed in TO 1-1H-39 and weapon system-specific –39 TOs are maintained at required levels to support ABDR requirements. **(T-3)**.

11.29.1.4.3. Ensure aircraft battle damage is documented on an AFTO Form 97, *Aerospace Vehicle Battle Damage Incident Debrief/Assessment/Repair Record* or AFTO Form 97B, *Aircraft Battle Damage Evaluator Checklist* as required IAW TO 1-1H-39. **(T-1)**. Completed forms will be forwarded to the Aircraft Battle Damage Repair Program Office. **(T-1)**. CLASSIFIED messages must be sent to SIPR: **usafsaf.wright-patt.afsc-lg.mbx.afsc-lgpm-abdr-tso@mail.smil.mil** and UNCLASSIFIED messages must be sent to NIPR: **afsc.lgpm.abdrtso@us.af.mil** for filing in the historical archives. **(T-1)**.

11.29.1.5. Aircraft Battle Damage Evaluator/Training:

11.29.1.5.1. Aircraft Battle Damage Evaluator training provides MXG/CC's with ABDR knowledgeable forces and prepares units to execute Air Tasking Orders in a denied airspace with potential heavy losses. Aircraft Battle Damage Evaluator roles and responsibilities are outlined in TO 1-1H-39.

11.29.1.5.2. Maintenance Supervision will determine the proper mixture of personnel to attend Aircraft Battle Damage Evaluator training from: 2A3, 2A5, 2A6, 2A773, QA and Production personnel. **(T-3)**.

11.29.1.5.3. Aircraft Battle Damage Evaluator formal training will be IAW the approved ABDR course control documents. **(T-1)**.

11.29.1.5.4. Aircraft Battle Damage Evaluators will complete refresher training every 24 months. **(T-1)**.

11.29.1.5.4. **(AFMC)** Field level MTFs will maintain instructors by using train the trainer. In the event a MTF has no trained instructors contact the ABDR Program Office. **(T-3)**.

11.29.1.5.5. Course documents and instructor training is provided by the ABDR Technical Support Office NIPR, and can be requested at: **afsc.lgpm.abdrtso@us.af.mil**.

11.30. Egress/Cockpit Familiarization Training.

11.30.1. All non-egress personnel who access aircraft cockpits with egress systems maintained and managed by 2A6X3 Egress Systems personnel must complete initial and refresher familiarization training. **(T-1)**.

11.30.1.1. As a minimum, initial and refresher egress/cockpit familiarization training will include location and installation procedures of egress system safety devices, cockpit entry/exit procedures, procedures for determining whether or not an egress component is expended, emergency procedures associated with an expended egress component, and local maintenance concerns identified by the egress work center supervisor. **(T-2)**.

11.30.1.2. New personnel to the unit must receive initial familiarization training prior to accessing cockpits unless last duty position involved same mission design aircraft as current duty position. **(T-1)**.

11.30.1.3. Personnel not requiring initial training will attend refresher training when they become due. **(T-1)**.

11.30.1.4. Initial egress familiarization training will normally be hands-on using an aircraft. **(T-1)**.

11.30.1.4.1. Due to the diverse egress systems across all weapon systems, units desiring to use an aircraft maintenance trainer in lieu of an aircraft must submit a request from the MXG/CC to the MAJCOM for approval/disapproval. Approving MAJCOM must coordinate with the MDS lead command to ensure no technical/other mitigating factors exist and to provide transparency. **(T-2)**.

11.30.1.5. Refresher familiarization training will be conducted annually using an aircraft, maintenance trainer or media, which is approved and designated by the egress work center supervisor. **(T-1)**.

11.30.1.5.1. Non-egress personnel may administer training media (slideshow/video) during refresher familiarization training.

11.30.1.5.2. Direct students to the egress section if technical assistance is required and/or questions are raised concerning course subject matter.

11.30.1.6. Only egress personnel, certified on assigned egress system(s), will conduct initial egress familiarization training. **(T-1)**. Exception: MT personnel may conduct this training provided they are currently certified to perform egress maintenance.

11.30.1.7. Training media must meet approval of the 2A6X3 AFSC MAJCOM Functional Manager (MFM) or current media produced by the 367 Training Support Squadron listed on the Defense Imagery at **http://www.defenseimagery.mil**. **(T-1)**.

11.30.1.8. Individuals overdue for annual egress familiarization training will not access aircraft cockpits until they complete familiarization training. **(T-1)**.

11.30.1.9. Units with unique, experimental, or test aircraft requirements.

11.30.1.9.1. If training courses are not available through AETC, units must use interagency training before considering non-government training sources. **(T-1)**.

11.30.1.9.1.1. If courses in both of these sources are not available, units will

establish a documented training program that meets the intent of this instruction. **(T-1)**.

11.30.1.9.1.2. Training will be conducted by the most qualified personnel and must be approved by the MFM prior to implementation. **(T-1)**.

11.30.2. MAJCOMs in coordination with the applicable lead command will identify emergency aircraft egress/evacuation training and frequency requirements in their supplement to this AFI for personnel assigned to weapon systems that do not have aircraft egress systems maintained and managed by 2A6X3 personnel.

11.31. Aircraft Defensive Systems Loading Program.

11.31.1. Aircraft Defensive Systems Loading Program provides instruction required to install/remove chaff/flare on unique mission aircraft in units where there are no 2W1 AFSC authorizations assigned.

11.31.2. Authorized units will establish a program to train and qualify personnel to perform these tasks IAW procedures outlined in AFMAN 21-201 and this **Chapter**. **(T-1)**.

11.31.3. Units will work with the installation Weapon System Manager (WSM) and Airfield Operations Flight to develop written instructions for handling chaff/flare-loaded aircraft IAW AFMAN 91-201 and AFI 91-202. **(T-1)**.

11.31.3.1. As a minimum, written instructions will include procedures for launch/recovery/parking of chaff/flare-loaded aircraft; chaff/flare storage and transportation; and partially ejected flares and minimum requirements outlined in AFMAN 91-201. **(T-1)**.

11.31.4. The MXG/CC will appoint 7-skill or 9-skill level individual with maintenance AFSC as the Weapons Task Qualification Manager (WTQM). **(T-1)**. **Note:** Units with 2W1 AFSCs assigned will comply with training/qualification requirements in **Chapter 10** **(T-1)**.

11.31.5. WTQM and Weapons Task Qualification Crew (WTQC) responsibilities. The WTQM/WTQC provide oversight of chaff/flare loading operations to ensure they are conducted safely by providing initial and recurring load training, serving as the focal point for all chaff/flare loading issues, and observing loading operations during training. The WTQM and WTQC will not participate in load operations during training. **(T-1)**.

11.31.5.1. WTQM. The WTQM typically holds a 2A871X AFSC; however, other flightline personnel with the 2AX7X AFSC may perform this function. The WTQM develops and oversees the chaff/flare loading standardization program, sets standards, and develops local policies and procedures. The WTQM will be tracked on the SCR. **(T-1)**. The WTQM will:

11.31.5.1.1. Receive initial and recurring load qualification training from a WTQC and maintain currency on chaff/flare loading tasks. **(T-1)**.

11.31.5.1.2. Once trained and qualified, the WTQM will develop and administer the unit's chaff/ flare load training program and train/qualify home station WTQC personnel. **(T-1)**. **Note:** In the event a unit is initially tasked and has no qualified instructors, it will be necessary for the WTQM to become certified at a unit with qualified trainers. The WTQM will:

11.31.5.1.2.1. Ensure sufficient numbers of personnel are qualified to load chaff/flare to support the unit's mission requirements. **(T-1)**.

11.31.5.1.2.1.1. A course code will be loaded in the MIS to identify trained personnel and qualification status. **(T-1)**.

11.31.5.1.2.2. Establish time standards for initial and recurring loading tasks. **(T-1)**.

11.31.5.1.2.2.1. Lead wings will develop time standards for each MDS for qualification purposes. **(T-1)**.

11.31.5.1.2.2.2. The senior evaluator has the discretion to add to the time standard if inclement weather or equipment failure is the cause for exceeding the time standard.

11.31.5.1.2.3. As a minimum, the WTQM will identify the number of qualified personnel, names and employee numbers, MDS qualification, Defensive Systems, equipment type, qualification date, and date(s) recurring training is due. **(T-1)**.

11.31.5.1.2.4. The WTQM will select, train, evaluate, and qualify a minimum of two personnel as the WTQC on safe and reliable munitions loading procedures. **(T-1)**.

11.31.5.1.2.4.1. The WTQM will evaluate and re-certify WTQC members annually. **(T-1)**. WTQC members will be tracked on the SCR. **(T-1)**.

11.31.5.1.3. Review and approve/disapprove RCs that pertain to chaff/flare loading technical data. **(T-2)**.

11.31.5.1.4. Develop a local Task Assignment List by utilizing lead wing-developed MDS-specific Task Assignment Lists for use during training for all chaff/flare loading operations. **(T-1)**. A Task Assignment List is derived from applicable MDS munitions load checklist (TO 33-1-20-series) and identifies the load crew members' responsibilities by step.

11.31.5.1.5. Ensure chaff/flare loading CTKs are standardized to the maximum extent possible. **(T-1)**.

11.31.5.1.5.1. Chaff/flare loading CTKs must include all tools and equipment necessary to support applicable MDSs and AME configurations. **(T-1)**.

11.31.5.1.6. Coordinate the scheduling of personnel for chaff/flare load training. **(T-1)**.

11.31.5.1.6.1. The WTQM may delegate this duty to the WTQC.

11.31.5.1.7. Coordinate with PS&D, or the Regional Training Center, if applicable, to obtain chaff/flare dispensing system-equipped aircraft for training purposes. **(T-1)**.

11.31.5.1.8. Ensure training magazines match the characteristics and "feel" of live magazines (such as, weight, dimensions). **(T-2)**.

11.31.5.2. WTQC. The WTQC assists the WTQM in managing the chaff/flare loading standardization program. The WTQC's primary purpose is to train and qualify personnel

to load chaff/flares, but may also perform chaff/flare load duties. The lead WTQC member is typically a 7-skill level technician with the 2AX7X AFSC. Initial training will be conducted using inert munitions. **(T-1)**. The number of trained WTQC members should be based on current/anticipated workloads and their ability to maintain proficiency on all applicable MDSs. WTQC members are qualified by the WTQM. The WTQC members will:

11.31.5.2.1. Provide personnel with initial and recurring load qualification training. **(T-1)**. One WTQC member will be required to conduct practical training. **(T-1)**.

11.31.5.2.2. Monitor personnel qualifications to ensure required academic and practical training is complete. **(T-1)**.

11.31.5.2.2.1. Disqualify individuals if recurring requirements are not met. **(T-1)**.

11.31.5.2.3. Spot-check personnel to evaluate proficiency. **(T-1)**.

11.31.5.2.3.1. The WTQC will disqualify personnel who violate safety, technical data, and reliability procedures, or fail to demonstrate proficiency. **(T-1)**.

11.31.5.2.4. Develop/coordinate training schedules and provide to PS&D for inclusion in the appropriate schedule (monthly, weekly). **(T-1)**. **Note:** Enroute WTQMs forward training requirements to the UTM, who coordinates for ground training aircraft with the Regional Training Center.

11.31.6. Training Requirements. Personnel are considered qualified upon successful completion of training provided by a qualified WTQC.

11.31.6.1. Initial qualification will be conducted using inert munitions. **(T-1)**.

11.31.6.2. Live munitions may be used during annual qualification to maintain currency. Load qualification training consists of academic and practical training.

11.31.6.3. Document the initial and recurring load qualification training requirements in the TBA. **(T-1)**.

11.31.6.4. Academic and practical training must be provided during initial and recurring load qualification training. **(T-1)**.

11.31.6.4.1. Academic training is required before practical training is accomplished. **(T-1)**.

11.31.6.4.2. Initial practical training must be completed within 14 days of successfully completing initial academic training. **(T-1)**.

11.31.6.4.2.1. Practical training should duplicate operational conditions as closely as possible.

11.31.6.4.3. Recurring practical task qualification is administered at least annually. **(T-1)**.

11.31.6.4.3.1. As a minimum, practical training will include chaff/flare module serviceability criteria, actual chaff/flare loading, and operation of support equipment/AGE used during loading operations. **(T-1)**. **Note:** Weapons task qualification academic training may fulfill the requirements for explosive safety

training if the requirements of AFI 91-202 are included.

11.31.6.5. Academic training is administered every 12 months. **(T-1)**. As a minimum, academic training will include:

11.31.6.5.1. Familiarization with chaff/flare loading publications, including TO 11A-1-33, MAJCOM and local procedures. **(T-1)**.

11.31.6.5.2. Aircraft and munitions familiarization. **(T-1)**.

11.31.6.5.3. Safety, security, and emergency procedures. **(T-1)**.

11.31.6.5.4. Support, test, handling equipment, and special tools familiarization. **(T-1)**.

11.31.6.5.5. Task Assignment Lists and aircraft specific 33-1-2 series TOs must be available at the load-training site. **(T-1)**. **Note:** Training course control documents will be coordinated annually through the Wing Safety and MT. **(T-1)**.

11.31.6.6. Personnel qualified on a specific task on a specific MDS are considered qualified to perform that task on all series of that MDS; however, the member must be familiar with differences within the MDS (such as, cockpit switch locations). **(T-1)**.

11.31.6.6.1. The WTQM or WTQC will provide practical, on-aircraft training on these differences and document these qualifications for each dispensing system in the qualification status or equivalent system. **(T-1)**.

11.31.7. Disqualifying Chaff/Flare Load Personnel. Disqualification will be documented in the TBA and the qualification status system. **(T-1)**.

11.31.7.1. Although not all-inclusive, the following criteria constitute grounds for disqualifying personnel from chaff/flare loading duties:

11.31.7.1.1. Failing to complete recurring training.

11.31.7.1.2. Committing a safety or reliability error.

11.31.7.1.3. Lack of proficiency.

11.31.8. Transient Aircraft.

11.31.8.1. Apply the following when working transient aircraft:

11.31.8.1.1. Under no circumstances will personnel attempt chaff/flare load operations without current technical data. **(T-1)**.

11.31.8.1.2. If current technical data is available, then qualified personnel may perform chaff/flare load operations. **(T-1)**.

11.31.8.1.3. If current technical data is available but no one is qualified on the transient aircraft type, then the MXG/CC (or Air Mobility Squadron (AMS)/CC at enroute locations) may authorize the WTQC or WTQM to de-arm and/or unload the aircraft.

11.31.8.1.3.1. The WTQM will submit a written request to the MXG/CC (or AMS/CC at enroute locations) identifying personnel selected to perform the task, aircraft type and (if applicable) number of aircraft to be de-armed and unloaded. **(T-1)**.

11.31.8.1.3.1.1. Approved requests will be maintained for 90 days. **(T-2)**. **Note:** This is a temporary, one-time authorization to facilitate required maintenance when qualified personnel are not available.

11.31.9. Identification of Chaff/Flare-Loaded Aircraft. Verify chaff/flare load status of aircraft by checking AFTO Form 781A/C before performing any maintenance.

11.31.9.1. Explosive placards are not required on AMC aircraft.

11.31.9.2. If an aircraft is loaded with chaff/flare, it will be safed IAW applicable technical data prior to performing any maintenance. **(T-1)**.

11.31.9.3. Before loading chaff/flares, review the AFTO Form 781C, A*vionics Configuration and Load Status Document*, for defensive systems inspection status. **(T-1)**.

11.31.9.3.1. If chaff/flare is loaded on aircraft, ensure/verify applicable MIS documentation requirements are completed. **Note:** Do not load chaff/flares if the aircraft is overdue a scheduled DS inspection.

11.31.10. Tracking and Reconciliation of Chaff/Flare-Loaded Aircraft.

11.31.10.1. Expenditure tracking and processing will be handled by Munitions Personnel (2W0X1) IAW AFMAN 21-201, **Chapter 7**. **(T-1)**.

11.31.10.2. Munitions personnel will not use the direct input method to process flightline chaff/flare expenditures; all chaff/flare expenditures will be returned to the Munitions Storage Area (MSA) for verification by munitions personnel before processing expenditures in Combat Ammunition System. **(T-1)**.

11.31.11. Additional Requirements (as applicable).

11.31.11.1. Document DS software version data and aircraft inspections (such as, 90-, 120-, or 180-day checks) on AFTO Form 781C. **(T-1)**.

11.31.11.2. For software version data, enter the following information in the remarks section for each reprogrammable system: type system; installed Operational Flight Program (OFP) version; and/or Mission Data File (MDF) version (such as, ALE-47, OFP XXXX, MDF XXXX).

11.31.11.2.1. If a system contains multiple OFPs, list all applicable versions (such as, ALE-47, Programmer OFP XXXX, Sequencer OFP XXXX, MDF XXXX).

11.31.12. Chaff/Flare Build-up. Chaff/flare magazine build-up will only be accomplished by personnel with 2W0 AFSC or qualified contractors. **(T-1)**.

11.31.12.1. Units will only perform chaff/flare build-up in facilities/locations approved by the installation WSM IAW AFMAN 91-201. **(T-1)**.

11.31.12.2. Units must have an approved explosive site plan or explosives facility license on file with Wing Safety prior to initiating chaff/flare build-up or storage operations. **(T-1)**.

11.32. Aircraft and Equipment Decontamination.

11.32.1. Maintenance organizations need to have the Ability to Survive and Operate in a Chemical, Biological, Radiological, Nuclear and high-yield Explosives (CBRNE) environment and have the capability to decontaminate operational aircraft, vehicle, and SE.

11.32.2. Units will employ AF and locally-developed TTPs IAW AFMAN 10-2503, *Operations in a Chemical, Biological, Radiological, Nuclear, and High-Yield Explosive (CBRNE) Environment*. **(T-1)**.

11.32.2.1. TTPs provide the fundamental counter-chemical warfare (CCW) tools to survive to operate and maximize combat sortie generation capabilities in a CBRNE environment.

11.32.3. The following references in addition to MDS-specific technical data should be utilized when developing unit decontamination programs: AFMAN 91-203, AFI 10- 2501, AFTTP 3-4, *Airman's Manual*, TO 00-110A-1, *Guidelines for Identification and Handling of Aircraft and Material Contaminated with Radioactive Debris*, TO 00-20-1, TO 11C15-1-3, *Chemical Warfare Decontamination, Detection and Disposal of Decontamination Agents*, TO 11D1-3-8-1, *Decontamination Apparatus, Power Driven, Portable Type A/E32U- 8, (Engineered Air).*

11.33. End-of-Runway (EOR) Inspection.

11.33.1. EOR is MDS specific, PM directed inspection of aircraft systems identified in the Dash 6 TO or equivalent and published in Dash 6 work cards IAW TO 00-20-1. (N/A to aircraft that do not have an EOR -6 TO requirement).

11.33.2. If local requirements dictate, publish additional guidance to TOs for EOR inspections IAW TO 00-20-1, and TO 00-5-1. **Note:** Safing, arming, and de-arming of live munitions will be accomplished by personnel qualified IAW **Chapter 4**, **Chapter 5**, and **Chapter 10**.

11.33.3. The EOR team chief (identified by a reflective vest) will carry an EOR checklist and ensures each item is inspected as required. **(T-1)**. On aircraft with a ground intercom system, units are only required to establish verbal communications with the pilot when communication beyond the standard EOR marshalling hand signals is required unless otherwise directed by MDS specific technical data.

11.34. Wing Avionics Manager (WAM).

11.34.1. WAM Duties and Responsibilities. The WAM will:

11.34.1.1. Be in the minimum grade of MSGT, 7 Level or equivalent and 2A Avionics AFSC. **(T-3)**.

11.34.1.2. Act As the Wing Avionics Functional Manager. **(T-1)**.

11.34.1.3. Serve as the maintenance group focal point for all avionics related interactions between PMs, MAJCOMs, Lead Commands, Wings, Operations and Maintenance or equivalent activities to discern and implement changes in avionics configuration requirements. **(T-2)**.

11.34.1.4. Ensure RAMPOD updates are completed daily IAW AFI 21-103. **(T-1)**.

11.34.1.5. Ensure classified pods/components and equipment are stored in authorized areas IAW AFI 16-1404. **(T-1)**.

11.34.1.6. Ensure classified aircraft/Support/Test equipment are stored in authorized areas IAW AFI 16-1404. **(T-1)**.

11.34.1.7. Meet quarterly with MXG Superintendent to review avionics manning status and ensure manning resources are strategically distributed to provide the greatest possibility for mission success. **(T-2)**.

11.34.1.8. Serve as the MXG Identify Friend or Foe Program Manager IAW **Paragraph 11.11** **(T-2)**.

11.34.1.9. Serve as the MXG Radar Warning Receiver/Radar Threat Warning program manager IAW **Paragraph 11.12** **(T-2)**.

11.34.1.10. Serve as the MXG EW program manager and EW Integrated Reprogramming focal point. **(T-2)**.

11.34.1.11. Serve as MXG focal point for external organizations 406 MHz Emergency Locator Transmitter Systems Program. **(T-2)**.

11.34.1.12. Coordinate with the wing EW POC to ensure compliance with AFI 10-703, *Electronic Warfare Integrated Reprogramming*. **(T-1)**.

11.34.1.13. Track wing assigned ECM, electronic attack and sensor pods, and associated support equipment. **(T-2)**.

11.34.1.14. Coordinate all pod shipments as directed by MAJCOM to/from base or operating location. **(T-2)**.

11.34.1.15. Track all incoming and outgoing pod parts and SE until received or arrived at destination. **(T-2)**.

11.34.1.16. Coordinate with Electronic Combat Pilot/Electronic Warfare Officer to ensure most current MDF to configure Radar Warning Receiver/Radar Threat Warning to meet mission requirements. **(T-2)**.

11.34.1.17. Serve as the MXG focal point for external organizations on all cybersecurity matters pertaining to aircraft interface equipment. **(T-2)**.

11.35. Fire Extinguisher Requirements.

11.35.1. Coordinate with Fire Emergency Services Flight and Airfield Operations Flight to ensure required number of portable fire extinguishers are available for on and off installation operational requirements. Refer to AFMAN 91-203, TO 00-25-172, *Ground Servicing of Aircraft and Static Grounding/Bonding*.

11.36. Air Force Repair Enhancement Program (AFREP).

11.36.1. The AFREP optimizes AF resources and repair capability of aerospace parts and equipment by increasing the wing-level (referred also as field-level) participation with the appropriate Program Office. This is accomplished by field-level identification and recommendation of candidates for reparability consideration by the appropriate PO.

11.36.1.1. The AFREP is an optional program. Maintenance personnel performing AFREP repairs, will perform the repair action only as an additional duty or as part of normal maintenance workload.

11.36.1.2. Unit leadership must verify mission benefit outweighs the cost and obtain MAJCOM AFREP Manager Approval prior to program implementation.

11.36.2. AFREP is repairing consumable/expendable items (XF3 and XB3). Repair Network is repairing XD2 (recoverable) and XF3 (field level/condemnable). The concept is to make recommendations to the PM of consumable/expendable items which the field-level has identified as desirable candidates to be considered for conversion to field-level repair, limited repair or even full depot-level repair, contract or organic as directed by the Depot Source of Repair process in AFI 63-101/20-101, in addition, ensure repair cost/benefit analysis takes into consideration the total costs to the AF as outlined in Air Force TO 00-20-3, *Maintenance Processing of Reparable Property and Repair Cycle Asset Control System*.

11.36.2.1. The approval authority to change the SMR/ERRC codes, or select, use, arrange for, contract with, qualify sources of repair, or authorize the initiation of any local or other repair action rests solely with the PM.

11.36.2.2. Repair Approval. The MXG/CC or equivalent will ensure all items being repaired by AFREP have been approved by the appropriate repair authority (such as, Program Manager or Program Office). **(T-1)**. IAW AFI 63-101/20-101, personnel must coordinate any operational change to the system, end item, modified configuration or maintenance procedure prior to implementation. For example, additional base-level repair or contract repair of any item beyond the provisions which already exist in field-level TOs. **(T-1)**.

11.36.2.3. Field-level personnel, including AFREP work centers, shall not contract out or arrange for repair services without prior written authorization by the PM and approval by the MAJCOM AFREP Manager. **(T-1)**. The PM responsible for the system or end item shall retain responsibility for making any decision stemming from such a recommendation. Field-level TOs do not give permission for local contract or off-base repair of any item, only on-base repair to the extent specified by the SMR code for a given item.

11.36.3. Operational Safety, Suitability & Effectiveness (OSS&E). OSS&E is an outcome of properly planned and applied systems engineering.

11.36.3.1. Organizations responsible for preserving OSS&E of AF systems or end items must ensure that operational use, configuration changes, maintenance repairs, aging, part substitutions, and similar activities and events do not degrade baselined characteristics of systems or end items over their operational life.

11.36.3.2. OSS&E is an integrated effort to ensure items are not allowed to degrade as a result of maintenance, repairs, parts substitutions, and similar activities.

11.36.3.2.1. The program manager is responsible for the assurance of OSS&E throughout the life cycle of each configuration of each component of each system. Only the PM may convert an item from non-repairable to reparable.

11.36.4. Requirements. Given authorized repair of a consumable/expendable item, the PM will determine the SMR/ERRC code validity. All resulting changes are linked with Supply Chain Manager Consideration for that item.

11.36.4.1. Supply Chain Management issues must be considered as a matter of law, given these issues affect Congressionally Authorized budget authority and funds allocated to accomplish specifically different supply chain functions (spares buys versus repairs).

11.36.4.1.1. Any personnel, organization or AFREP work center may request SMR/ERRC code changes IAW TO 00-25-195 and AFH 23-123, Volume 2, **Part 2**, *ntegrated Logistics System-Supply (ILS-S), Standard Base Supply System Operations*, **Chapter 8**.

11.36.4.2. Non-repairable (XB3) assets submitted to PM for repair approval will contain RC (SMR/ERRC change) IAW TO 00-25-195 and a MAJCOM published form for the AFREP Vendor Repair Approval that will include all supply data, full justification and test/repair procedures. This document will be reviewed by the MAJCOM AFREP Manager IAW **Paragraph 11.36.8** **(T-2)**.

11.36.4.3. Repairable (XF3) assets submitted to PM for vendor repair approval will be submitted on MAJCOM published form. The form must contain all current vendor certifications and governing technical procedures utilized for test/repair by vendor. This document will be reviewed by MAJCOM AFREP Manager and signed off.

11.36.5. Asset Turn-In. Items repaired IAW technical data will be turned in to the supply system following guidance in AFMAN 23-122 and TO 00-20-3. **(T-1)**.

11.36.6. AFREP Reporting Instructions: Wing AFREP Managers will provide quarterly updates to the MAJCOM AFREP Manager. **(T-1)**.

11.36.6.1. MAJCOM AFREP Managers will report yearly activity updates from October 1 to September 30 and file their yearly report with AF/A4LM by 15 October.

11.36.6.1.1. The quarterly/yearly updates will include at a minimum the nomenclature of items repaired, total cost, and total amount saved for each item.

11.36.7. AF/A4L Roles and Responsibilities.

11.36.7.1. Prepares, publishes and reviews AF-level policy and guidance for AFREP.

11.36.7.2. Perform annual program analysis to verify mission benefits outweigh costs.

11.36.8. MAJCOM AFREP Manager Responsibilities.

11.36.8.1. Administer/manage the MAJCOM AFREP in coordination with the applicable Program Office.

11.36.8.2. Perform annual analysis on program viability.

11.36.8.3. Mandate use of Program Office/selection authority criteria guidance and recommendations related to maintenance, supply, and repair sources.

11.36.8.4. Designate a focal point within the applicable Program Office for the MAJCOM and end users to contact regarding AFREP recommendations and OSS&E issues.

11.36.8.5. Establish a process to identify candidate items for submission to Program Office for consideration.

11.36.8.5.1. At a minimum, process will ensure base AFREP certifies the candidate item is beyond repair from all applicable on-base organic maintenance work

centers/back shops. Certification must be documented (email, log book). Parts coded direct NRTS are exempt from this requirement. **(T-2)**.

11.36.8.6. Establish and maintain an AFREP Program Office submission and status tracking web-site.

11.36.8.7. Compile annual program cost benefit analysis information and forward to AF/A4L.

11.36.8.8. Provide Program Office repair recommendations for evaluation and track their status (**Part I**dentification, initiation date, submittal date, closure date).

11.36.8.9. Maintain, update and distribute a list of Wing/Unit AFREP POCs to include representatives from other agencies (such as, DLA, ALCs, MAJCOMs).

11.36.8.10. Review/Validate Wing/Unit SMR/ERCC requests IAW TO 00-25-195 and TO 00-20-3 prior to submission to the applicable Program Office for evaluation/approval.

11.36.8.11. Validate items are approved for contract repair for strategic sourcing opportunities.

11.36.8.12. Initiate the opportunity assessment of strategic sourcing candidates when deemed appropriate or when requested by the Program Office.

11.36.8.13. Provide quarterly MAJCOM cross-tell of AFREP repairs to Base/Center AFREP managers. The minimum data will include nomenclature, total cost, and total amount saved for each item across the MAJCOM.

11.36.9. Wing/Unit Responsibilities:

11.36.9.1. Participate in AFREP when approved by the MAJCOM AFREP Manager. **(T-1)**.

11.36.9.1.1. MXG/CC or equivalent will assign a unit AFREP Manager. **(T-1)**.

11.36.9.1.2. MXG Superintendent will ensure AFREP Manning Positions are categorized as an additional duty and not listed as positions on the MXG UMD. **(T-1)**.

11.36.10. Wing/Unit AFREP Manager Responsibilities:

11.36.10.1. Submit SMR/ERRC change recommendations to the MAJCOM AFREP Manager for Program Office coordination. See TO 00-25-195, and this AFI. **(T-1)**. **Note:** Field-level TOs do not give authorization for local contract repair of any item, only on-base repair to the extent specified by the SMR code for a given item. AFREP or any other field level personnel will not perform repairs not authorized by technical data. **(T-1)**.

11.36.10.1.1. Workcenters participating in AFREP repairs will submit Critical Application Items (CAI) and Critical Safety Items (CSI) repair recommendations to the MAJCOM AFREP Manager for screening to determine appropriate PM for submission **(T-1)**. **Note:** CAIs, CSIs, or elements of a system which the PM has designated as a CAI system or a CSI system are prohibited from consideration under the AFREP program unless otherwise approved by an authorized engineering authority.

11.36.10.1.1.1. All Electronic Warfare (EW) Systems are CAI-designated systems. Verify CAI and CSI items on the Joint Services Critical Item Data Viewer, located

at: **https://remote3.amrdec.army.mil/csiviewer/**. See **Attachment 2**, CAI & CSI for additional information.

11.36.10.1.2. Contractor repairs of any item are not allowed without prior written authorization from the PM and approval by the MAJCOM AFREP Manager. **(T-1)**. **Note:** AFREP work centers are prohibited from entering into repair source contractual/obligation relationships with contractors. DoD regulations exist to assign such actions (finding and qualifying repair sources) to the authorized engineering authority.

11.36.10.1.2.1. If contract repairs are authorized, contracts will be established IAW local contracting procedures. **(T-1)**.

11.36.10.1.3. The Wing/Unit AFREP Manager will ensure the SOW includes, as a minimum, the following items for contracted repairs:

11.36.10.1.3.1. Requirement for the contractor to perform/document receiving inspections. **(T-1)**.

11.36.10.1.3.2. Requirement for the contractor to inspect/test the item following repair. **(T-1)**.

11.36.10.1.3.3. Requirement for the contractor to provide a record of the repair and test results to the AFREP office and made available for the Government Inspector (such as, Defense Contract Management Agency (DCMA)). **(T-1)**.

11.36.10.1.3.4. Contract will specify expected shipping, transportation and repair-estimate completion dates. **(T-1)**.

11.36.10.1.3.5. Repair items in accordance with Technical Data. **(T-1)**. **Note:** Restricted use of systems will result from use of components which have been repaired as described immediately above, without prior written authorization from the program manager.

11.36.10.1.3.6. Enter data into the AFREP Recommendation Submittal site: **https://usaf.dps.mil/sites/haf-a4/A4L/AF_A4LM/Policy/AFREP/SitePages/Home.aspx** The minimum data consists of a roll up AFREP repair total cost and will include:

11.36.10.1.3.6.1. Time expended coordinating PM approval for AFREP repair authorization. **(T-1)**.

11.36.10.1.3.6.2. Man hours to complete repair "labor hours". **(T-1)**.

11.36.10.1.3.6.3. Nomenclature/Stock Number of part being repaired. **(T-1)**.

11.36.10.1.3.6.4. Total cost of item if sourced from the supply chain. **(T-1)**.

11.36.10.1.3.6.5. Total cost of tangible resources expended to complete AFREP repair (such as, wiring/consumables). **(T-1)**.

11.36.10.1.3.7. Assist technicians by interfacing with engineering, Equipment Specialists (ES), QA, Air Force Engineering Technical Services, and other field-level agencies. **(T-1)**.

11.36.10.1.3.8. Accumulate and forward data requested by MAJCOMs concerning AFREP. **(T-1)**.

11.36.10.1.3.9. Provides repair authorizations to the MXG QA PIM IAW AFI 21-101. **(T-1)**.

11.36.10.1.3.10. Ensure individuals assigned AFREP extra duties are trained, qualified and maintains a minimum five-skill level in their AFSC IAW AFI 36-2651. **(T-1)**.

11.36.10.1.3.11. Submit and monitors DR for deficiencies discovered during a Wing/Unit AFREP initiative, IAW TO 00-35D-54 or equivalent PM approved DR process. **(T-1)**.

11.36.10.1.3.12. Review daily Awaiting Parts (AWP) and MICAP lists from maintenance activities to determine if the AFREP office can recommend to the appropriate PO, items from those lists. **(T-1)**.

11.36.10.1.3.13. Provided quarterly AFREP repair updates to MXG/CC. The repair updates at a minimum will include nomenclature, total cost, and total amount saved for each item. **(T-1)**.

11.36.10.1.3.14. Establish collection points within unit supply sections for consumable/expendable items coded with ERRC XB3 to determine reparability of assets prior to permanent disposal.

11.37. Calibration Limitation Approval Certification Program.

11.37.1. General. A limited TMDE calibration could seriously impact mission capability of weapon systems. All units will have a comprehensive training program to ensure authorized personnel can interpret TMDE calibration limitations to the specified requirement of the applicable weapon system. **(T-1)**. Personnel will be certified IAW criteria established in **Table 11.1** **(T-1)**. MXG/CCs may designate contractors in writing to authorize calibration limitations.

11.37.2. Responsibilities and Management. The MT or TD will be responsible for management and development of the calibration limitation approval training program. **(T-2)**.

11.37.2.1. As a minimum, the course will include when to consider a limited calibration, impact of using improperly calibrated equipment, and how to apply calibration specifications to weapon system requirements. **(T-1)**.

11.37.2.2. Prior to placement on the SCR, the calibration limitation approval training (MT or TD course) will be mandatory. **(T-1)**.

11.37.3. MXG/CCs will appoint maintenance, TD, or PMEL personnel as instructors and ensure the following certification and proficiency requirements are tracked in the MIS by course code:

11.37.3.1. Formal training, calibration limitation approval course. **(T-1)**.

11.37.3.2. Annual calibration limitation approval recertification. **(T-1)**.

11.37.4. Certification Criteria. Certifying officials will be selected IAW criteria established in **Table 11.1** **(T-1)**.

11.38. Oil Analysis Program (OAP).

11.38.1. Program. Oil Analysis is the process of analyzing oil and other fluids used to lubricate or operate mechanical equipment, evaluating the condition of the fluid or the equipment from which the fluid originated, and recommending maintenance actions to the equipment operating activity. An OAP ensures timely and accurate oil analysis support through the strategic location of oil analysis laboratories and the standardization of procedures, data elements, analytical instrumentation and diagnostic techniques. The Joint Oil Analysis Program (JOAP) is a combined effort of the Army, Navy and AF to set-up and maintain a standard program. Oil analysis requires a centrally-managed program and the integration of AF OAP and JOAP plans.

11.38.2. Objectives. The overall objective of the AF OAP is to detect oil-wetted air and space equipment failures before serious malfunction or secondary damage occurs. The specific objectives of the AF OAP and JOAP programs are as follows:

11.38.2.1. Improve the operational safety, readiness and economy of military equipment through the use of on-board and off-board oil analysis, a condition-monitoring concept that relies on the detection and measurement of wear-metals in the fluid.

11.38.2.2. Collect and analyze oil analysis data in order to increase the effectiveness of oil analysis techniques in the diagnosis of potential equipment failures and lubricant condition; to provide wear metal and lubricant physical property data to the various weapons system managers and others, as required.

11.38.2.3. Ensure oil analysis plans and operations are integrated (where practical) to provide:

11.38.2.3.1. Standard laboratory techniques, procedures, data, calibration standards, and analytical instruments.

11.38.2.3.2. Inter-service oil analysis support to all military departments.

11.38.2.3.3. The most cost–effective means of determining the condition of lubricants, fluids, and mechanical system through the use of various analytical techniques.

11.38.3. Guidance. The OAP helps aircraft technicians and supervisors to make informed, condition-based, preventive maintenance decisions, and can reduce equipment costs, increase equipment availability, and reduce in-flight risk. This is primarily achieved by monitoring the concentration of wear metals in fluids used to lubricate or power mechanical systems.

11.38.3.1. To monitor engine health, the OAP uses a variety of testing mechanisms. These include:

11.38.3.1.1. Atomic Emission spectrometric wear metal analysis.

11.38.3.1.2. Magnetic Chip Detectors/Magnetic Chip Detectors with on-board sensors.

11.38.3.1.3. Scanning Electron Microscope/Energy Dispersive X-ray system technology.

11.38.3.2. To the extent deemed cost effective, EOT shall be used as the standard time interval between oil analysis sampling when in-service engines are equipped with an Engine Monitoring System or other operating time recorders.

11.38.3.2.1. For engines without Engine Monitoring System or other operating time recorders, oil analysis trending intervals will be standardized based upon Engine Flying Hours.

11.38.3.3. Analyze oil samples from transient aircraft IAW applicable technical data and owning activity requirements.

11.38.3.3.1. For transient aircraft with an EMS, at bases without the capability to download EOT data, Engine Flight Hours shall be used to continue oil analysis trending.

11.38.3.4. Responsible activities must ensure the resultant data is accurate and given promptly to all customers so they can effectively monitor the condition of their equipment.

11.38.3.4.1. AF OAP laboratories will evaluate response times to optimize support of the customer. **(T-2)**. Evaluation frequency is established by MAJCOM supplemental guidance.

11.38.3.5. Laboratory operation.

11.38.3.5.1. Each OAP laboratory must be certified IAW TOs 33-1-37-1/-2. **(T-1)**.

11.38.3.5.2. Seek to maximize inter-service use of existing laboratories through laboratory consolidation, workload sharing, and use of standardized instrumentation, techniques and procedures. **(T-1)**.

11.38.3.5.3. AF OAP laboratories must provide oil analysis services at no charge for all US Government, North Atlantic Treaty Organization (NATO) and friendly Foreign Military Sales aircraft. These services include analyzing oil samples from transient aircraft IAW applicable technical data within the AF OAP laboratory capabilities. **(T-1)**.

11.38.4. Roles and Responsibilities

11.38.4.1. AF/A4L is the chief Air Staff agency with policy responsibility for the maintenance of air and space equipment.

11.38.4.1.1. Guidance. Prepares, publishes and reviews AF-level policy and guidance for the AF OAP.

11.38.4.1.1.1. Coordinates with MAJCOMs to review and resolve guidance-related issues.

11.38.4.1.2. Management. Designates a POC for AF OAP. The representative shall manage this publication while closely coordinating with functional experts.

11.38.4.1.2.1. Works with AF representative to the JOAP-Coordinating Group (CG) on policy issues.

11.38.4.2. Major Command. Each MAJCOM establishes a headquarters POC for complying with MAJCOM OAP responsibilities.

11.38.4.2.1. Establishes or relocates OAP laboratories to support MAJCOM mission. Coordinates establishment or relocation with the AF OAP Manager.

11.38.4.2.2. Ensures quality deficiency reports are submitted to the unit Product Improvement Manager IAW TO 00-35D-54. DRs must be submitted to engine program offices on all equipment requiring tear down or overhaul due to an OAP laboratory maintenance recommendation and on all oil-wetted component failures where no OAP laboratory maintenance recommendation was made.

11.38.4.2.3. Ensures laboratories provide the depot a computer-generated printout/record, for each engine undergoing scheduled maintenance or overhaul.

11.38.4.2.4. Ensures laboratories process and evaluate samples IAW TO 33-1-371/- 2.

11.38.4.2.5. Ensures proper training of AF OAP laboratory technicians. This includes identifying training requirements to the AETC.

11.38.4.2.6. Ensures assigned shop instrumentation and equipment is not modified or used for non-OAP applications without AF OAP Office approval.

11.38.4.2.7. Provides guidance necessary to execute the AF OAP and ensures all subordinate organizations understand and properly execute AF OAP and JOAP responsibilities. MAJCOMs/ANG may provide additional guidance in their supplements or addendums to this AFI as required.

11.38.4.2.8. Ensures AF OAP and JOAP requirements are included in planning, programming and budgeting process. This includes providing needed funds, personnel, facilities and other resources to maintain an effective program.

11.38.4.2.9. Supports equipment evaluations and field surveys for the AF OAP Office.

11.38.4.3. Air Force Materiel Command (AFMC). AFMC is the lead MAJCOM for the AF OAP and AF participation in the JOAP. AFMC is also responsible for oil analysis Research, Development, Test and Evaluation (RDT&E). The Directorate of Logistics, Civil Engineering, Force Protection, and Nuclear Integration (AFMC/A4/10) is the headquarters office of primary responsibility for AF OAP guidance coordination and implementation within AFMC.

11.38.4.3.1. Propulsion Directorate.

11.38.4.3.1.1. Sustainment Chief Engineer represents the AF on the JOAP-Executive Committee.

11.38.4.3.1.1.1. Establishes, funds, staffs and directs the AF OAP Office.

11.38.4.3.1.2. The Development Program Manager ensures specification guidance for oil analysis sampling provisions or other appropriate measures to detect oil-wetted failures, where applicable, are included during the design phase.

11.38.4.3.1.3. AF OAP Office, AFLCMC/LP. The AF OAP Office manages the AF OAP, and in coordination with the MAJCOMs and propulsion community, leads AF participation in the JOAP.

11.38.4.3.1.3.1. Certifies/decertifies AF OAP laboratories for participation in the JOAP.

11.38.4.3.1.3.2. Maintains a list of AF OAP laboratories, equipment and customers.

11.38.4.3.1.3.3. Assists MAJCOM/Center managers in program execution. This includes recommending the establishment, location, and relocation of AF OAP laboratories.

11.38.4.3.1.3.3.1. Communicates AF OAP objectives, policies and procedures to the Director of Propulsion, Engine OAP Managers, equipment specialists and program managers.

11.38.4.3.1.3.3.2. Evaluates the need for and performs special studies, as requested by the MAJCOMs or depots.

11.38.4.3.1.3.3.3. The AF OAP Office should periodically conduct laboratory assistance/assessments to determine adequacy and effectiveness of the AF OAP. Identifies problems and recommends solutions.

11.38.4.3.1.3.4. Establishes and manages a data system, meeting tri-service requirements, to evaluate AF OAP participation and effectiveness and to provide engine program offices with historical data on oil sample analysis results.

11.38.4.3.1.3.5. Coordinates and consolidates AF/MAJCOM requirements with Army/Navy to ensure, where practical, the procurement of common OAP equipment.

11.38.4.3.1.3.6. Represents the AF on the JOAP-CG.

11.38.4.3.1.3.7. Develops a comprehensive OAP laboratory certification and quality control program.

11.38.4.3.1.3.8. Maintains and provides AF inputs to TOs 33-1-37-1/-2/-3/-4, *JOAP Manual*.

11.38.4.3.1.3.9. Reviews and evaluates the JOAP school curriculum.

11.38.4.3.1.3.10. Assists the Engine OAP Manager and serves as an advisor for the engine Maintenance Planning Working Group (MPWG) for OAP issues.

11.38.4.3.2. Director of Propulsion (DOP). The DOP AFLCMC/LP in conjunction with Engine Single Managers at AFLCMC/LPS, AFLCMC/LPA and the AF OAP Office assess existing/potential oil analysis technologies. The DOP also ensures wear metal debris and oil analysis is an integral part of the Engine Health Management Program. The DOP appoints Engine OAP Managers for each AF managed engines.

11.38.4.3.2.1. Engine OAP Managers. The Engine OAP Manager is the engineer in charge of a particular engine and is solely responsible for the OAPrelated issues on that particular engine.

11.38.4.3.2.1.1. Serves as the focal point for the engine MPWG for OAP issues, provides the guidance necessary to accomplish engine-specific oil analysis.

11.38.4.3.2.1.2. Ensures expeditious handling of equipment returned for tear down or overhaul because of an OAP laboratory maintenance recommendation or where oil analysis results indicated a potential problem.

11.38.4.3.2.1.3. Provides guidance necessary to accomplish enginespecific oil analysis. Provides updates for TOs 33-1-37-1/-2/-3/-4 to the OAP Office.

11.38.4.3.2.1.4. Provides accurate and timely feedback to the MPWG and field units on OAP-monitored equipment. This includes maintenance findings on equipment in for tear down or overhaul as a result of an OAP laboratory maintenance recommendation. It also includes failure reports and related wear metal and oil analysis data on oil-wetted components where no OAP laboratory maintenance recommendation was made.

11.38.4.3.2.1.5. Works with the MPWG to establish and maintain wear metal limits, diagnostic criteria and other oil analysis parameters. This is based on a review of data from equipment tear-down and overhaul findings.

11.38.4.3.2.1.6. Maintains metrics on hits, misses and escapes. Once oil analysis data is included in the Engine Health Management AF Enterprise Center with software capability to perform metric monitoring, the AF OAP will concurrently monitor metrics with the Engine OAP managers.

11.38.4.3.2.1.7. Works with the MPWG, MAJCOM customers and the AF OAP Office to establish engine-specific technical and performance requirements for all wear metal debris and oil analysis equipment.

11.38.4.3.2.1.8. Utilizes the Component Improvement Program as needed to evaluate the cost effectiveness of existing and potential wear metal debris and oil analysis applications, establish test programs and implement the most cost effective method(s).

11.38.4.3.2.1.9. Sends updates of specific oil sampling intervals and wear metal limits (evaluate for new engines during the design phase; reconsider for existing engines when oil-wetted parts undergo any material or strength changes) to the MPWG.

11.38.4.3.3. SE and Vehicles Division (AFLCMC/WNZ) procures oil analysis equipment at the request of the AF OAP Office.

11.38.4.3.3.1. Maintains a contract for procurement of JOAP AE spectrometers used by the Army, Navy, and AF laboratories.

11.38.4.3.3.2. Provides technical order provisioning and support.

11.38.4.3.3.3. Establishes inter-service logistics support. This includes spare parts support, instrument repair and overhaul, procurement of common JOAP laboratory equipment and supplies, item management and equipment specialist activities, and funding status of existing contracts.

11.38.4.3.4. Air Force Research Laboratory. The Air Force Research Laboratory accomplishes RDT&E to improve wear metal and oil analysis instruments, materials and techniques. **(T-1)**.

11.38.4.3.4.1. Supports the AF OAP charter to conduct test and evaluation for the oil analysis programs, including the JOAP and the AF OAP, as applicable. **(T-1)**.

11.38.4.3.4.2. Coordinates RDT&E activities with the MAJCOMs, DOP, and AF

OAP Office as applicable. **(T-1)**.

11.38.4.4. AETC. Provides initial oil analysis training for AFSC 2A7X2 through the Nondestructive Inspection course. The AF OAP Management Office and MAJCOMs may request additional training, as required.

11.38.4.4.1. Coordinates course material changes with the AF OAP Office and the MAJCOM POCs.

11.38.5. Reporting and Measurement. All MAJCOMs and laboratories must collect and report metrics to the AF OAP Manager IAW TOs 33-1-37-1/-2/-3/-4.

11.38.5.1. All laboratories must collect and report hits, misses and escapes as a minimum. **(T-1).**

11.39. Air Force Engineering and Technical Services (AFETS).

11.39.1. General. The AF must maintain its weapons systems and equipment to meet worldwide mission requirements and operational needs at a reasonable cost. To accomplish this, units need the capability to quickly resolve complex or unusual technical problems and provide enhanced system-specific technical training to AF technicians, contractors and operators. Engineering and Technical Services (ETS) provides this expeditionary resource and is prepared to deploy AFETS and CETS as needed.

11.39.1.1. AFETS personnel are the primary source of Engineering and Technical Services support in the AF. AFETS field engineers are Emergency Essential DoD civilian employees, highly experienced and thoroughly trained technical specialists.

11.39.1.2. CETS can be an important element in developing an independent AF capability on new systems; however, units must develop their own organic capability and/or request AFETS support. **(T-2)**. Organizations should normally terminate CETS within 12 months after obtaining self-sufficiency.

11.39.2. AFETS are DoD civilians who provide advantages of long-term continuity and decreased retraining costs provided by a civilian work force. AFETS field technicians shall be used and retrained as necessary to meet technical needs and changing mission requirements. **(T-1)**.

11.39.2.1. AFETS can design special test equipment, develop special maintenance procedures, develop and conduct technical training for unit maintainers and operators, and recommend changes to maintenance processes.

11.39.2.2. AFETS also serve as the unit technical liaison and work with MAJCOM functional managers, depot technicians, engineers, item managers, and equipment manufacturers to resolve complex equipment problems.

11.39.2.3. AFETS will certify tasks IAW AFI 36-2650 and AFI 36-2651 in USAF personnel training records when training is provided to the go/no-go level. **(T-1)**.

11.39.3. AFETS personnel should be functionally aligned under the local ETS OPR (typically the MXG/CC or equivalent commander) and reside within the assigned organizations maintenance complex.

11.39.3.1. AFETS will not be authorized to overcome manning shortfalls or to perform duties considered organic to the unit's manning. **(T-1)**.

11.39.3.2. When AFETS and contracted engineering support (example, CETS, Field Service Engineer or FSR) are assigned to a unit every effort shall be made to co-locate these resources to maximize effectiveness of technical support within the organization. **(T-2)**.

11.39.4. The AF may utilize CETS to provide on-site proficiency training, technical advice, and technical assistance for initial system bed-down or major modifications when AFETS are unavailable. Units desiring services of strategically assigned CETS will direct their requests to their MAJCOM OPR. **(T-2)**.

11.39.4.1. When CETS and AFETS are assigned to the same unit, CETS will support and train AFETS personnel as required. **(T-1)**.

11.39.4.2. CETS will certify tasks IAW AFI 36-2651, and AFI 36-2650, in USAF personnel training records when training is provided to the go/no-go level. **(T-1)**.

11.39.5. Exclusions. ETS covered in this AFI excludes:

11.39.5.1. Engineering review and resolution of service-revealed deficiencies reported through normal maintenance information systems.

11.39.5.2. Material DR covered in TO 00-35D-54.

11.39.5.3. The engineering determination of material integrity.

11.39.5.4. The engineering or technical services used in 61-series instructions.

11.39.6. Limits: CETS are restricted to the duties and responsibilities outlined in this AFI and specific tasks listed in the Task Work Specification. MAJCOM OPRs (with approval by the applicable MAJCOM Directorate) may grant exceptions to these limits only on a case-by-case basis based on mission need. Do not use CETS to avoid manpower ceilings or other personnel rules and regulations.

11.39.6.1. CETS will not:

11.39.6.1.1. Perform non-ETS duties or normal unit duties. **(T-3)**.

11.39.6.1.2. Make policy or represent the using activity at meetings or conferences. **(T-3)**.

11.39.6.1.3. Supervise or control AF personnel or personnel of other contractors. **(T-3)**.

11.39.6.1.4. Hold engineering decision-making positions. **(T-3)**.

11.39.6.1.5. Perform direct maintenance except in emergency situations. **(T-3)**.

11.39.7. MAJCOM Responsibilities. MAJCOMs will:

11.39.7.1. Supplement this document as necessary to ensure standardization among subordinate units.

11.39.7.2. Designate a Lead ETS Program Office in a single MAJCOM to administer the activities of the member MAJCOMs merged by MOA/MOU.

11.39.7.3. Designate an ETS OPR in the appropriate Headquarters Directorate or Field Operating Unit (FOA) to serve as the MAJCOM ETS OPR for member MAJCOMs merged by MOA/MOU.

11.39.7.4. Ensure all applicable requirements of this AFI are met by units authorized to decentralize management of their ETS programs to the using activities.

11.39.7.5. Program and defend MAJCOM ETS funds and manpower requirements over the Future Years Defense Program (FYDP) consistent with AF mission requirements.

11.39.7.6. Budget and fund AFETS PCS, TDY, and Developmental Training costs to support their MAJCOM requirements and submit Program Objective Memorandum (POM) for all ETS requirements.

11.39.7.7. Identify and ensure mobility statements are in AFETS Standard Core Personnel Document and designate positions as Emergency-Essential. Refer to AFI 36-202, *Civilian Mobility*.

11.39.7.8. Ensure general personnel management records are maintained at the unit of assignment on all ETS personnel to assure proper management and administration of ETS resources.

11.39.7.9. Ensure training for AFETS receive proper priority in AF training plans.

11.39.7.10. Redistribute ETS resources between major activities when mission changes dictate such realignment. All redistribution efforts will be coordinated with losing and gaining organizations.

11.39.7.11. Provide government property support to CETS IAW Federal Acquisition Regulation (FAR), Subpart 45.3, Authorizing the Use and Rental of Government Property.

11.39.7.12. Coordinate CETS contract questions with the AFLCMC/Enterprise Acquisition Division (PZIEB) who performs all central acquisition contracting functions for CETS.

11.39.8. Lead ETS Program Office/Decentralized Management Activities Responsibilities (as applicable). Lead ETS Program Office/Decentralized Management Activities will:

11.39.8.1. Develop Task Work Specification and initiate procurement packages for each approved CETS requirement using appropriate Advisory & Assistance Service policies and procedures IAW FAR Subpart 37.2, *Advisory and Assistance Services*.

11.39.8.2. Oversee Contract Officer Representative (COR) activities.

11.39.8.3. Establish procedures to notify subordinate activities of CETS termination.

11.39.8.4. Develop and utilize assessment criteria to effectively manage, administer, and control ETS activities.

11.39.8.5. Conduct annual assessments of ETS Team performance at each field unit.

11.39.8.6. Validate manpower requirements at least every 24 months. Validation should be accomplished with inputs and recommendations from unit leadership and MAJCOM ETS OPR.

11.39.8.7. Realign AFETS manpower as needed when the mission, system, or equipment changes dictate.

11.39.8.8. Coordinate AFETS placement and Standard Core Personnel Documents with manpower and civilian personnel offices.

11.39.8.9. Maintain the knowledge, training abilities and skills of the AFETS workforce.

11.39.8.10. Update/train AFETS on new weapon systems, equipment conversions and major system modifications.

11.39.8.11. Coordinate with weapon system and equipment managers to program AETC Type I Training and other types of training for AFETS on a priority basis for current and new systems.

11.39.8.12. Provide AFETS instructor training.

11.39.8.13. Verify need for CETS personnel security clearances and take action to maintain access at the minimum level required IAW AFMAN 16-1405, *Air Force Personnel Security Program*.

11.39.8.14. Include Personnel Reliability Program guidance in the Task Work Specification of contractors whose duties involve nuclear weapons.

11.39.8.15. Consolidate subordinate units' requirements and establish a validation process through the MAJCOM, FOA, or Direct Reporting Unit (DRU) ETS OPR (as applicable).

11.39.8.16. Establish, maintain and manage MAJCOM ETS TDY and training budget to include planning and execution of funds.

11.39.9. Using Activity will:

11.39.9.1. Employ ETS resources effectively and efficiently to enhance mission capability IAW AF and MAJCOM guidance. **(T-1)**.

11.39.9.2. Provide specific direction and guidance on maintenance activities requiring focused AFETS attention and/or technical support. **(T-2)**.

11.39.9.3. Ensure AFETS personnel attend and participate in Group, Squadron, and unit maintenance meetings, as required. **(T-2)**.

11.39.9.4. Ensure AFETS personnel are providing desired coverage on all shifts, as required, with a focus on shifts where the significant maintenance and repair activities are ongoing. **(T-3)**.

11.39.9.5. Provide local access and oversight of Time and Attendance actions for assigned AFETS personnel.

11.39.9.6. AFETS assigned as tenants will be afforded command/base support by the host commensurate with other assigned DoD civilians to include eligibility for local awards, security clearance processing, annual physicals, passport/visa processing. **(T-1)**.

11.39.9.7. Fund AFETS to attend conferences, Technical Interchange Meetings (TIM), and deployments as required. **(T-3)**. In addition, fund training requirements to ensure AFETS remain current on assigned and emerging systems. **(T-3)**.

11.39.9.8. Provide office supplies, special Information Technology (IT) equipment as necessary to support the unit's mission. **(T-3)**.

11.39.9.9. Adhere to AF and ETS TDY/Deployment Policies and regulations. **(T-1)**. Units are authorized and encouraged to deploy AFETS to support mission requirements worldwide. AFETS employees must be assigned UTC positions in mobility tasked units on the Deployment Manning Document (DMD) as required. **(T-1)**. CETS representatives are typically not deployed, but may be deployed on specific approval of the MAJCOM OPR if AFETS personnel are not available, subject to contract provisions and funding availability.

11.39.9.10. UDM/deployment functions/processes are the responsibility of assigned unit for AFETS personnel.

11.39.9.11. Adhere to Adverse Action, Appeal and Grievance Procedures. **(T-1)**. Refer to AFI 36-704, Discipline and Adverse Action of Civilian Employees, issue based 36-Series AFIs, and Negotiated Labor Management (Union) Agreement as applicable, before proceeding.

11.39.9.12. Provide support through the local security manager to process AFETS personnel security periodic reviews and updates.

11.39.9.13. Provide AF Certifying Officer Support. **(T-1)**. The using activity OPR will serve as or designate AF Certifying Officers for CETS personnel and provide the name, office symbol, signature, and telephone number of the Air Force Certifying Officer to the Administrative Contracting Officer, with a copy to the MAJCOM OPR, no later than 30 days after the CETS assignment or within five workdays of any AF Certifying Officer change. **(T-2)**.

11.39.9.13.1. The CETS contract line items assigned to each certifying officer will be clearly identified in this designation.

11.39.9.13.2. The AF Certifying Officer is responsible for certifying the monthly Certificate of Service. It is recommended that the using activity delegate the AF Certifying Officer responsibilities to the Operations Officer of the squadron primarily using the individual CETS employee's services.

11.39.9.13.2.1. The designated certifying officer will be a commissioned officer. **(T-2)**. When it is impractical to designate a commissioned officer or one is not available, requests for approval to appoint a senior NCO or AF civilian (GS-11 or above) as AF Certifying Officer will be submitted by the using activity OPR in writing to the MAJCOM OPR. Each request will be evaluated on an individual basis.

11.39.10. AFETS Responsibilities. AFETS personnel will:

11.39.10.1. Provide field service engineering, technical advice; and assistance to resolve system anomalies and equipment failures. **(T-1)**.

11.39.10.2. Develop and teach specific technical training for maintaining and operating unit equipment and assigned weapons systems. **(T-1)**.

11.39.10.3. Investigate equipment failures and mishaps and train personnel to help prevent recurrence. **(T-1)**.

11.39.10.4. Develop contacts with contractor, depot, and AFLCMC engineers, technicians, and item managers to resolve maintenance problems, design deficiencies, and supply problems. **(T-1)**.

11.39.10.5. Develop special test equipment and maintenance procedures to resolve complex system problems. **(T-1)**.

11.39.10.6. Perform emergency maintenance (direct assistance) on equipment when temporary skill or manning shortages prevent accomplishment by other assigned personnel. **(T-1)**.

11.39.10.7. Advise the ETS OPR on the best utilization and management of CETS. **(T-1)**.

11.39.10.8. Document technical activates and provide stakeholders a written account of maintenance activities by the end of each month. **(T-2)**.

11.39.10.9. Maintain mobility readiness and accomplish unit required ancillary training. Training must be kept current. **(T-1)**.

11.39.11. CETS Contractor Responsibilities. CETS contractor will:

11.39.11.1. Provide ETS through CETS employees to perform the duties described in the Task Work Specification. **(T-1)**.

11.39.11.2. Select, supervise, and exercise sole and autonomous control and direction over CETS employees. **(T-1)**.

11.39.11.3. Comply with the administrative and security regulations of the using activities. **(T-1)**.

11.39.11.4. Provide copies of the Task Work Specification to CETS employees. **(T-1)**.

11.39.11.5. Provide CETS security clearance certification to the unit security office. **(T-1)**.

11.40. Senior Leader Mission Generation (SLMG) Course.

11.40.1. The Senior Leader Mission Generation (SLMG) Course was developed in 2013 and focused on wing leadership teaming between maintenance, operations, and logistics support to achieve safe and effective mission generation. SLMG objectives are to: 1) comprehend the organizational dynamics and responsibilities of operational, maintenance, logistics support, and medical functions for aircraft mission generation; 2) comprehend the necessary integration and teamwork between operational, maintenance, logistics support, and medical functions for aircraft mission generation.

11.40.2. Only Wing CCs/CVs, Operations Group Commander (OG/CCs), MXG/CCs, Mission Support Group (MSG/CCs), MDG/CCs and their equivalent to be stationed at wings with a flying or nuclear mission are required for attendance. **(T-2)**. **Note:** MAJCOM/CV is the waiver authority for attendance. Officers in Space, Cyber, Intel, Air Base Wings or other "non-traditional" wings are not mandated to attend; however, officers desiring to attend from non-mandated wings can contact their Senior Leader Management office and be added to the

course. Registration for SLMG will be accomplished during registration for Pre-Command Training. **Note:** The SLMG course is a unit funded TDY.

11.41. (Added-AFMC) Identification Friend or Foe (IFF) Program.

11.41.1. **(Added-AFMC)** Units will ensure fully operational IFF Mode V systems by performing checks on all aircraft departing the Continental United States (CONUS) to overseas locations. **(T-2).**

Chapter 12

MAINTAINING COMMERCIAL DERIVATIVE AIRCRAFT (CDA).

12.1. Background Information, Objective and Roles and Responsibilities. The USAF procures CDA for various missions. These aircraft are originally type certificated to Federal Aviation Administration (FAA) regulations/orders and have FAA-approved aircraft maintenance manuals. If the aircraft are civil registered (N number displayed) in lieu of military registration and military tail number, it may carry an FAA standard airworthiness certificate if operated and maintained in full compliance with civil regulations.

12.1.1. Civil registered aircraft owned and operated by the USAF in accordance with Title 10 U.S. Code are public use aircraft. When these aircraft are engaged in civil aircraft operations, such operations must be conducted in accordance with FAA and civil. When these aircraft are engaged in public aircraft operations, they are exempt from civil regulations and FAA oversight. Civil registered aircraft owned and operated by the USAF may be declared public use at any time, and are then exempt from civil regulations and FAA oversight. If the aircraft are civil registered but do not have a civil airworthiness certificate, or are operated by the USAF under a military registration and tail number, the aircraft are for public use and operate entirely under the authority of the USAF military technical airworthiness authority.

12.1.2. All USAF-managed aircraft, and associated modifications, must meet the requirements of AFI 62-601, *USAF Airworthiness*, and AFI 63-101/20-101. **(T-1)**. PMs are ultimately responsible for maintaining configuration control and ensuring flight safety of systems within their portfolio. When a military mission is compatible with a certified civil usage, the USAF will utilize FAA-type certified CDA to the maximum extent practicable. **(T-1)**. To ensure safety and support, all modifications performed on CDA type certificated components or systems shall be FAA certified (example, supplemental type certificate). Modifications to CDA military type certificated components or systems require approval of AF chief engineer, or delegated authority.

12.1.3. For maintenance and operations of CDA the AF will use AF-managed TOs or FAA-approved aircraft and component maintenance manuals and FAA regulations called out in Title 14 Code of Federal Regulation **Parts 43**, **91**, **121,** and **145** as a guide. **(T-0)**. FAA Advisory Circulars, Notices to Airmen, and other FAA information sources may also be used to satisfy all requirements of Title 14 Code of Federal Regulations **Parts 43**, **91**, **121,** and **145.**

12.2. AF/A4L will:

12.2.1. Coordinate relevant policies and procedures with SAF/AQ and the FAA.

12.3. The Program Manager (PM) will:

12.3.1. Be responsible for all elements of life cycle management IAW AFI 63-101/20-101. **(T-1)**.

12.3.2. When FAA manuals are used, issue technical data for configuration items and inspection requirements that are not approved by the FAA or supplied by the Original Equipment Manufacturer. **(T-1)**.

12.3.3. Review evaluations from the Lead Commands concerning Airworthiness Directives (AD), Service Bulletins (SB), Customer Bulletins (CB), All Operator Letters, and Aircraft Service Changes (ASC) and will determine extensions for each, if required. **(T-1)**.

12.3.4. For CDA which maintain an FAA Type Certified, ensure that the MAJCOM performs overhauls, rebuilding, major repairs, major alterations, minor repairs, and minor alterations in FAA-authorized repair facilities with appropriate ratings and authorizations or an AF-approved AFSC Military Repair Station depot facility, as directed by the PM. **(T-1)**.

12.3.5. Establish a maintenance plan and Service Action Review process with the Lead Command for aircraft originally Type Certified by the FAA. **(T-1)**.

12.3.6. Follow AFI 63-101/20-101 for modification requests and approvals. **(T-1)**.

12.3.7. Obtain airworthiness approvals IAW AFI 62-601. **(T-1)**.

12.3.8. Coordinate with the FAA Military Certification Office for approval of modifications that affect commercial derivative aircraft configuration IAW USDOT/FAA Order 8110.101, *Type Certification Procedures for Military Commercial Derivative Aircraft*. **(T-0)**.

12.3.9. Ensure FAA ADs and SBs are utilized in place of TCTOs and commercial maintenance manuals are utilized in lieu of AF TOs to the greatest extent possible. **(T-1)**.

12.3.10. For units possessing CDA that strictly utilize commercial manuals, may issue original FAA SBs, ADs or other FAA-approved modifications in-place of TCTOs. **(T-1)**.

12.3.11. For units possessing CDA that strictly utilize USAF managed T.O.s, in order to implement ADs, SBs or other FAA-approved modifications, issue TCTOs IAW TO 00-5-1 and TO 00-5-15. **(T-1)**. Reference one of the following in each TCTO:

12.3.11.1. The AD and/or SB involved.

12.3.11.2. The Supplemental Type Certificate number.

12.3.11.3. Other FAA approval.

12.3.12. Ensure maintenance planning data is supplied to units or contractors in order to appropriately track TCIs and inspections.

12.4. Lead Commands will:

12.4.1. Ensure any new or modified configurations or maintenance conditions are coordinated with, and approved by, the designated Lead Command IAW AFPD 10-9 and the PM or equivalent responsible for the reliability, maintainability and availability of the systems and end-items prior to implementation. **(T-1)**.

12.4.2. Assist ALC in determining additional inspection and component time-change requirements, intervals, documentation and publication update requirements. **(T-1)**.

12.4.3. Review evaluations from their field units on ADs, SBs, CBs, All Operator Letters, or ASCs and make recommendations to the aircraft's PM. **(T-1)**.

12.4.4. Ensure depot and contractor maintenance providers are furnished with lead command maintenance program and they meet AF approved FAA equivalent requirements or are a FAA approved repair station, as applicable. **(T-1)**.

12.5. Units will:

12.5.1. Participate in the Service Action review process established by the PM. **(T-1)**.

12.5.2. Assist Lead Commands and the PM to determine additional inspection intervals and requirements. **(T-1)**.

12.5.3. Comply with FAA ADs as directed by the Chief Engineer or delegated authority. **(T-1)**.

12.6. Maintenance Personnel Requirements. For AF-managed aircraft that maintain an FAA TC, maintenance personnel shall meet the PM established requirements and procedures to maintain airworthiness. **(T-1)**. AF maintenance technicians performing organic depot maintenance follow Air Force Sustainment Center Instruction (AFSCI) 62-100, *Military Repair Station Program*.

12.6.1. For CDA that do not maintain a civil airworthiness certificate, maintenance is not required to be completed by an FAA-certificated mechanic. However, a maintenance plan detailing the maintenance personnel requirements shall be established between the PM and the Lead Command. **(T-1)**.

12.6.1.1. The plan shall address as a minimum the training requirements, the level of effort allowed (such as, specific maintenance tasks as identified in the Original Equipment Manufacturer maintenance manuals), and tasks that shall be performed by FAA-certified mechanics, repair stations, AFSC Military Repair Stations, or the Original Equipment Manufacturer. **(T-1)**.

12.6.1.2. The maintenance plan will be approved by the PM with coordination by the FAA Military Certification Office or Military Repair Station/Flight Standards Management Office as appropriate. **(T-1)**.

12.7. Deviations/Changes to Inspection Requirements, Time Change Intervals, and Component/Aircraft Overhaul. Commercial derivative aircraft inspection requirements, time change, component and aircraft overhaul intervals are established and controlled by the Original Equipment Manufacturer and approved by the FAA. When deviation from the Original Equipment Manufacturer established maintenance standards/configuration is needed to meet AF mission requirements, units will send proposed changes to the PM through MAJCOM and for evaluation. **(T-1)**.

12.8. Air Force Modifications to CDA and Components. AF modifications to CDA and components are developed following procedures outlined in AFI 63-101/20-101. All AF modification requests require coordination with the Chief Engineer or delegated authority who will provide assistance in determining applicable requirements, forms and coordination necessary to correctly disposition aircraft and component modification requests. **(T-1)**.

12.9. Certification Basis for CDA. Elements of the certification basis for any CDA which are not met via FAA certification are satisfied by compliance with approved military airworthiness requirements derived from MIL-HDBK-516C, *DoD Handbook, Airworthiness Certification Criteria*. CDA whose primary mission is the transport of passengers are FAA Type Certified; FAA certification of these CDA passenger carrying aircraft are maintained for the life of the air system.

Chapter 13

CENTRALIZED REPAIR FACILITIES (CRF).

13.1. Introduction. CRFs consolidate off-equipment intermediate-level, and in some instances, depot-level tasks for commodities such as aircraft engines, electronic warfare pods, avionics line replaceable units, wheel and tire assemblies, and other aircraft components. CRFs focus on efficiently providing maintenance, repair, and/or overhaul capabilities, support RN efficiencies and will be fully integrated into the AF Supply Chain. CRFs are considered part of the repair network and exist to ensure responsiveness to MGN requirements to sustain operations both at home station and/or when deployed. Management and control procedures are outlined in AFI 20-117.

13.2. Organization. CRFs will be established within existing maintenance organizations (EMS, CMS, MXS), minimizing requirements for overhead and support. **(T-1)**. Production oversight and monitoring of repair operations is the responsibility of the owning maintenance organization in which the CRF is established. Commanders with CRFs will manage the personnel, facilities, and processes for the CRF following the policies and procedures in this AFI and AFI 20-117. **(T-1)**.

13.3. CRF Production Requirements. Maintenance Squadron (EMS, CMS, MXS) Operations Officer/MX SUPT will:

13.3.1. Ensure the Node Manager (NM) executes enterprise production duties as outlined in AFI 20-117. **(T-1)**.

13.3.2. Ensure the NM identifies and up-channels repair constraints that affect CRF repair/RN CAP2 to the MFM and RNM as prescribed in AFI 20-117. **(T-1)**.

13.3.3. Ensure the NM utilizes information management systems and participates in RNM collaboration calls to provide timely status reports, resolve repair constraints, and receive revised repair requirements/RN changes. **(T-1)**.

13.3.4. Identify systemic distribution, transportation, and supply difficulties and coordinate with base LRS leadership and/or up-channel concerns to the RNM and MFM for resolution. **(T-1)**.

13.3.5. Follow established procedures to ensure the rapid movement of retrograde and sustainment assets to support enterprise requirements.

13.4. MGN Support. Units supported by CRFs will maintain the level of intermediate-level repair capability necessary to sustain MGN operations. MAJCOMs must identify intermediate-level tasks and resources required to perform MGN maintenance tasks for assigned weapon systems (for example, repair of XF3 assets, hose/tube testing, functional checks, NRTS screening).

13.4.1. Rotable Pools. Customer Wait Time and transportation constraints may drive the establishment of a Centralized Rotable Pool for Class VII end items such as engines and pods to meet established weapons system availability goals. Use of a Centralized Rotable Pool can enhance mission capability by placing serviceable assets closer to the user when the repair capability is off installation. Centralized Rotable Pool size, compared to support unit spare levels, will be determined during deliberate planning between the appropriate RNM and MAJCOMs.

13.4.1.1. **(Added-AFMC)** Centralized Rotable Pool (CRP) requirements for items managed in the propulsion network will be determined using the Propulsion Requirements System process outlined in AFI 63-101/20-101. **(T-2).**

13.4.2. Cannibalization at supported units. When commodity LRU local retail stocks fall below mission requirements, retention of CRF-repaired end items as "CANN assets" may be necessary. However, this shall be by exception, and must be approved by the appropriate RNM in coordination with the supporting MAJCOM CRF Manager. **(T-2)**. CRFs will document their cannibalization process and notify supporting unit of approval to retain CANN assets. **(T-1)**.

13.4.3. Provide CRF node performance, CAP2, and commodity status reports and metrics as defined in AFI 20-117. **(T-1)**.

13.4.4. Ensure the NM utilizes information management systems to provide timely status reports and receive workload requirements/ changes for commodity group repairs supported by the CRF IAW with AFI 20-117. **(T-1)**.

13.5. CRF Enterprise Information Management. Managers require accurate, timely, and enterprise repair data to make CRF command and control and production decisions. To facilitate this requirement, NMs will utilize systems, processes, and business rules prescribed by AFI 20-117 to provide repair data and ensure enterprise visibility. **(T-1)**.

13.6. Documentation. The CRF and supported units will maintain all required status, inventory, and historical record documentation on CRF-repaired assets, IAW TO 00-20-1 and AFI 21-103. **(T-1)**.

13.7. Metrics. CRFs will report performance against metrics IAW AFI 20-117. **(T-1)**.

Chapter 14

MAINTENANCE PLANS, SCHEDULING AND DOCUMENTATION (PS&D).

14.1. Responsibilities:

14.1.1. AF/A4L will:

14.1.1.1. Prioritize development and distribute MxCAP2 models and supporting guidance as available. **Note:** The MxCAP2 Model or equivalent is intended to establish a standardized and empirically supported process for projecting MDS-specific, wing-level maintenance capability and capacity. It provides maintenance units the ability to accurately develop and support flying hour projections and accommodate FHP reflows. Reference MxCAP2 model support files located at: **https://cs2.eis.af.mil/sites/10585/mxcap2/Mx%20CAP%202%20Data/Forms/AllItems.aspx**. For additional information on the MxCAP2 model contact: **usaf.pentagon.af-a4.mbx.a4lm-workflow@mail.mil** or AF/A4LM at DSN 223-7803, Comm: (703) 693-7803. For technical support contact: Mon-Fri, 0900-1700 EST, DSN: 224-8314, Comm: (703) 614-8314.

14.1.1.1. **(AFMC)** See deviation **paragraph 2.2.4.3**

14.1.2. MAJCOMs will:

14.1.2.1. Supplement this instruction to establish minimum requirements for the following:

14.1.2.1.1. TCTO folders and monthly/weekly utilization and maintenance schedules.

14.1.2.1.1. **(AFMC)** Refer to **paragraph 14.1.6.5.1 (T-2).**

14.1.2.1.2. Publish MAJCOM procedures for verification of configuration items.

14.1.2.1.2. **(AFMC)** Refer to **paragraph 14.1.6.5 (T-2).**

14.1.2.1.3. Determine whether to ship removed engines to depot or induct into CRF repair.

14.1.2.1.3. **(AFMC)** Refer to **paragraph 14.4 (T-2).**

14.1.2.1.4. Determine routing and approval for AF Form 2407.

14.1.2.1.4. **(AFMC)** Refer to **paragraph 14.5.6.3.8 (T-2).**

14.1.3. PS&D will:

14.1.3. **(AFMC)** Maintenance schedulers are centralized (physically) in the MO PS&D section.

14.1.3.1. Maintain historical documents and maintenance data essential for the development of wing plans, schedules and analysis of historical maintenance events. **(T-1)**.

14.1.3.2. Maintain historical maintenance data within the MIS. **(T-1)**.

14.1.3.3. Develop wing maintenance plans using MIS aircraft/system historical data input by all maintenance personnel. **(T-1)**.

14.1.4. The PS&D Section NCOIC/Chief (or equivalent) will:

14.1.4.1. Act as the wing 2R1XX functional manager. **(T-2)**.

14.1.4.2. Establish and coordinate plans for rotating 2R1XX personnel through various duty positions to increase field knowledge and experience every 24 months, not to exceed 36 months. **(T-2)**.

14.1.4.2.1. This rotation plan applies to TSgts and below as well as 3- or 5-skill level personnel of any rank. **(T-3)**.

14.1.4.3. Evaluate quarterly the performance of workcenters performing scheduling functions to include TCTO, SI, and Job Standard Master Listing (JML) management (such as, AGE, Armament, Egress, Fuels, MXO, PS&D). **(T-2)**.

14.1.4.3.1. During the visit, ensure historical documents are properly maintained and review and discuss the 2R1X1 training and rotation plan with each section NCOIC that have 2R1s assigned. **(T-2)**.

14.1.4.3.2. Provide formal written reports of deficiencies found during the visits to the MXO OIC/SUPT and applicable section NCOIC. **(T-2)**.

14.1.4.3.2.1. Deficiencies will not be closed until validated by the MXO OIC/SUPT. **(T-2)**.

14.1.4.4. Develop and sustain the PS&D Master Training Plan IAW AFI 36-2650 and AFI 36-2651. **(T-1)**.

14.1.4.4.1. Document familiarization training in the individual's TBA. **(T-1)**.

14.1.4.4.2. Ensure civil service training is conducted IAW applicable local bargaining agreements and contractor maintenance organizations comply with training plans established in the PWS, SOW, or Performance Requirements Statement (PRS). **(T-1)**.

14.1.4.5. Provide SME on all maintenance scheduling issues and equipment historical document AFTO Form 95 management to QA during inspection/evaluations. **(T-1)**.

14.1.4.6. Designate the MSM administrator from within PS&D (for units utilizing IMDS only). **(T-1)**.

14.1.5. The Wing AVDO will:

14.1.5.1. Complete AVDO duties IAW AFI 21-103 and maintain the inventory and utilization portion of the MIS Inventory, status and utilization subsystem. **(T-1)**.

14.1.5.1. **(AFMC)** Coordinate all assignment/possession planning through the AFMC AVDO, (AFMC/A4M) and the AFMC Aerospace Vehicle Fleet Manager (AFMC/A3F). Coordinate all assignment/possession changes also through the AFMC Aerospace Vehicle Fleet Manager (AFMC/A3F). **(T-2).**

14.1.5.2. Maintain a PDM schedule by tail/serial number for all assigned aircraft and equipment in support of AFMC and Lead Command plans and requirements. **(T-1)**.

14.1.6. AMXS/AMU Dedicated Scheduler will:

14.1.6.1. Provide dedicated support to AMXS/AMU. **(T-2)**.

14.1.6.2. Attend and actively participate in daily, weekly, and monthly scheduling, and quarterly and yearly planning programs and meetings. **(T-2)**.

14.1.6.2.1. Inform AMXS/AMU supervision of maintenance capabilities or limiting factors that could affect maintenance production. **(T-2)**.

14.1.6.3. Coordinate with AMXS/AMU supervision and Operational Squadron (OS) operations schedulers when scheduling AMU aircraft to meet flying requirements. **(T-2)**.

14.1.6.3. **(AFMC)** In addition to the coordination with internal agencies including AMXS and OS operations schedulers, coordinate with applicable outside agencies directly involved in the aircraft flying requirements (i.e. engineers/test customers, other government agencies, sympathy organizations), as needed with the execution of flying scheduling processes and procedures.

14.1.6.4. Provide a listing of JCNs for following week's scheduled maintenance. **(T-1)**.

14.1.6.4.1. This list will be used to track Maintenance Scheduling Effectiveness (MSE). **(T-1)**.

14.1.6.4.2. PS&D will determine causes of missed maintenance for reporting MSE. **(T-1)**.

14.1.6.5. Manage TCTOs, TCIs, and SIs (including installed engine inspections) for aircraft assigned to their appointed AMXS/AMU. **(T-1)**.

14.1.6.5. **(AFMC)** Individual work centers accomplishing TCIs are responsible for changing configuration information in MIS. The performing work center supervisor and PS&D must conduct supervisory reviews of configuration change, TCTO, SI and TCI events using MIS on-line capabilities. Unless otherwise specified in local procedures, schedulers must process IMDS screen 128 for all removal, installation, TCI, SI and TCTO compliance updates for any items installed on the aircraft. **(T-2).** EM must process IMDS screen 128 for engines and engine components. In addition:

14.1.6.5.1. **(Added-AFMC)** Attend TCTO planning meetings when aircraft or equipment are affected and initiate/maintain folders for applicable TCTOs. TCTO folders will be standardized IAW TO 00-5-15, Air Force Time Compliance Technical Order (TCTO). Process as a minimum, and may be augmented with additional information provided in MOF PS&D guidance. AMU PS&D will attend the monthly TCTO review meeting hosted by MOF PS&D. **(T-2).**

14.1.6.5.2. **(Added-AFMC)** Manually update MIS products as changes occur IAW procedures established by MOF PS&D. **(T-2).**

14.1.6.5.3. **(Added-AFMC)** Correct TCI and SI program discrepancies identified by the MOF PS&D time change monitor as soon as possible. Provide MOF PS&D with MIS products or other documentation of the corrections. **(T-2).**

14.1.6.6. Generate AFTO Form 103, *Aircraft/Missile Condition Data*, to record certified maintenance needs for PDM aircraft IAW TO 00-25-4, *Depot Maintenance of Aerospace Vehicles and Training Equipment*, coordinate it with PS&D, QA, and AMXS maintenance supervision. **(T-1)**.

14.2. Data Documentation.

14.2.1. Maintenance Historical Documentation.

14.2.1.1. Maintenance historical documentation will be accomplished in accordance with TO 00-20-1 which outlines the requirements to capture and record the significant maintenance actions on aerospace vehicles and equipment. **(T-1)**.

14.2.1.2. Historical documentation will be entered and tracked in the authorized MDS MIS. **(T-1)**. When the MIS is not available, historical documentation will be documented and tracked on the AFTO Form 95, or equivalent. **(T-1)**.

14.2.1.3. MAJCOMs should develop supplements to this instruction to identify aerospace vehicle and support equipment historical file content and retention requirements needed beyond the minimum requirements outlined in this instruction and TO 00-20-1.

14.2.2. Aircraft jacket files. Units will develop and maintain a standardized master aircraft jacket file for use throughout the wing following the requirements listed in this instruction, TO 00-20-1 and AFMAN 33-363. **(T-1)**.

14.2.2.1. MAJCOMs will standardize MDS-specific requirements not captured in this instruction in supplements and addendums to this instruction.

14.2.2.1. **(AFMC)** Local procedures are authorized for compliance of any established AF policy unless specified in supplemental guidance for this paragraph.

14.2.2.2. Aircraft jacket files will be maintained in PS&D and standardized IAW the master aircraft historical file developed by the PS&D NCOIC. **(T-1)**.

14.2.2.2.1. Off-equipment maintenance documents may be decentralized to sections maintaining installed-on equipment assets (examples include fuel cell records at fuel systems section, landing gear strut records at hydraulics section).

14.2.2.2.1.1. Decentralized records are filed by and are the responsibility of the owning work center.

14.2.2.2.2. PS&D will list all historical records, including those decentralized in their file plan or office of record. **(T-1)**.

14.2.2.2.2.1. The DD Form 2861, *Cross-Reference*, will be used to cross-reference documents decentralized from PS&D to other sections and will be filed to cross reference AFTO Form 95 records that are maintained in the MIS. **(T-1)**.

14.2.2.2.3. Wing-assigned aircraft jacket files may be maintained electronically, however, they must mirror the standardized master aircraft jacket file in organization and appearance. **(T-1)**. **Note:** Slight variations in composition are allowed between different MDS weapons systems located within the same wing.

14.2.2.3. MXG/CC may identify additional local items for inclusion in aircraft jacket files. Aircraft jacket files as a minimum will include:

14.2.2.3.1. Packages for one complete inspection cycle. **(T-1)**. Units may download paperless inspections to automated storage media from MIS for filing in aircraft jacket files.

14.2.2.3.2. Last FCF documentation (such as, FCF certification letter/FCF checklist). **(T-1)**.

14.2.2.3.3. Last depot package. **(T-1)**.

14.2.2.3.4. Transfer packages. **(T-1)**.

14.2.2.3.5. Applicable weapon system -6 TO AFTO Form 95s. **(T-1)**.

14.2.2.3.6. W&B records. **(T-1)**.

14.2.2.3.7. Engine Records. **(T-1)**.

14.2.2.3.8. Document review records/checklists. **(T-1)**.

14.2.2.3.9. NDI records. **(T-1)**.

14.2.2.3.10. AF Form 2411, Inspection Document (or equivalent). **(T-1)**.

14.2.2.3.11. Annual aircraft jacket file review checklist. **(T-1)**.

14.2.2.3.12. Authorized TO variances. **(T-1)**.

14.2.2.3.13. Requests for assistance meeting the requirements for retention as historical records IAW TO 00-25-107, or equivalent/like MDS specific requirements for retention of documents as historical records. **(T-1)**. **Note:** Contact the Lead Command as identified in AFPD 10-9 for guidance for meeting retention as historical records requirements outside the scope of TO 00-25-107. 14.2.2.3.14. Pulled AFTO Form 781-series aircraft forms. **(T-1)**.

14.2.2.3.14.1. Pulled paper forms retained as part of the jacket file will be destroyed after 3 months if they do not contain historical information IAW AFRIMS. **(T-1)**.

14.2.2.3.14.2. Fusing fully automated forms will maintain the last 7 copies of the pulled aircraft forms and destroy the earliest record when the 8th report is received IAW AFRIMS. **(T-1)**.

14.2.2.3.14.3. Units not required to use a MIS will use aircraft forms and maintain the current and the last 3 months' worth of pulled aircraft forms. **(T-1)**.

14.2.2.3.14.4. Pulled 781 forms will be filed in order by sets identified by the "From and To" date at the top of each 781-series form (see TO 00-20-1). **(T-1)**.

14.2.2.3.14.5. Sets of forms may or may not include an AFTO Form 781J, *Aerospace Vehicle - Engine Flight Document* and AFTO Form 781K, *Aerospace Vehicle Inspection, Engine Data, Calendar Inspection and Delayed Discrepancy Document*. AFTO Forms 781J and K will be included in the set of forms they were pulled with and retained for the same period of time. **(T-1)**.

14.2.2.3.14.6. When PS&D discovers the AFTO Form 781-series missing during a jacket file inspection, a missing-forms letter will be sent to the appropriate Operations Officer/MX SUPT of the maintenance unit responsible for pulling the forms with a 5 duty-day suspense. **(T-2)**.

14.2.2.3.14.6.1. If a response is not returned within 5 duty days, notify the applicable maintenance unit supervision. **(T-2)**.

14.2.2.3.14.6.2. If the forms cannot be located, file the missing forms letter, endorsed by the Operations Officer/MX SUPT in place of the missing forms.

(T-2). See TO 00-20-1 for missing form procedures and AFMAN 33-363 for records management and disposition instructions

14.2.2.3.15. **(Added-AFMC)** Temporary modification packages.

14.2.2.4. Annual jacket file review. Review aircraft jacket files annually using a locally-developed PS&D checklist. **(T-1)**.

14.2.2.4.1. The last completed checklist will be kept on file in each aircraft jacket file. **(T-1)**.

14.2.3. Aircraft Document Reviews (ADR). ADRs validate and correct any errors on airframe and engine operating times and cycles, TCTO documentation, TCI component operating times, time remaining to the next inspection, backordered supply document numbers and open deferred discrepancies. The aircraft AFTO Form 781-series for possessed aircraft are reviewed by aircraft crew chiefs, flightline maintenance functions, PS&D, Engine Management (EM) and LRS personnel to ensure the accuracy and validity of entries.

14.2.3.1. MAJCOMs will standardize the MIS/on-line products used to perform ADR on like-MDS weapons systems.

14.2.3.1. **(AFMC)** Test units can standardize MIS/on-line products as required for respective test aircraft management.

14.2.3.1.1. Units using MDS-specific laptop forms (for example Integrated Maintenance Information System (IMIS), Autonomic Logistics Information System (ALIS)) must develop procedures to ensure intent of ADRs is implemented. **(T-1)**.

14.2.3.2. An ADR will be accomplished at least every 60 days for units using the fully automated AFTO Form 781-series (AFTO Form 781A, AFTO Form 781J, *Aerospace Vehicle - Engine Flight Document*, AFTO Form 781K, *Aerospace Vehicle Inspection, Engine Data, Calendar Inspection, and Delayed Discrepancy Document*. **(T-1)**.

14.2.3.2.1. Units without access to a MIS and authorized to use manual AFTO Form 781-series, must accomplish an ADR at least every 30 days. **(T-1)**.

14.2.3.2.1. **(AFMC)** Modular engine flying hours and manual cycles are verified with the EM section during document reviews. **(T-2).**

14.2.3.2.1.1. **(Added-AFMC)** If the aircraft has been away from home station and it has been more than 30 days since the last document review, check the documents within 7 days after return. **(T-2).**

14.2.3.2.2. ADRs will also be accomplished when an aircraft is transferred, before and after scheduled inspections (PH or ISO), before and after storage and after fatigue tests. **(T-1)**.

14.2.3.2.3. For CANN aircraft, conduct ADRs at least every 30 days. **(T-2)**.

14.2.3.2.3. **(AFMC)** PS&D will conduct document reviews and validations at least every 14 days on CANN aircraft. The documents are also reviewed before and upon completion of other major programs such as Programmed Depot Maintenance (PDM), analytical condition inspections, and special tests. The AFTO Forms 781F, Aerospace

Vehicle Flight Report and Maintenance Document, will also be reviewed for accuracy. **(T-2).**

14.2.3.3. Units will develop and publish an ADR checklist for use by home station and deployed units. **(T-1)**.

14.2.3.3.1. This checklist will identify who initiates the ADR, reviewing agencies (to include the OAP lab), AFTO Form 781-series entry requirements, agency responsible for completing the AFTO Form 781-series/MIS entry, and outline any configuration verification requirements. **(T-1)**.

14.2.3.4. ADR Procedures.

14.2.3.4. **(AFMC)** The AMXS will develop local procedures to review aircraft forms and MIS automated products as part of document reviews and/or validations. This process will include a review by the aircraft section/flight commander or NCOIC, then the AMU PS&D. This process will allow each level of supervision to review and maintain continuity of the process. **(T-2).**

14.2.3.4.1. PS&D will create a JST for ADRs on a red dash symbol and ensure it is loaded against all assigned aircraft. **(T-3)**.

14.2.3.4.2. ADRs will be scheduled and added to the appropriate maintenance plan. **(T-2)**. An ADR is a scheduled maintenance action and will be included in MSE computations. **(T-1)**.

14.2.3.4.3. PS&D and EM will validate applicable inspection, TCI, TCTO data for correct due dates/time or expiration dates, airframe and engine operating times (or flight times if applicable) and appropriate symbol entry IAW TO 00-20-1. **(T-2)**.

14.2.3.4.4. Units will coordinate with /LRS to run a tail number inquiry to validate backorders and correct any discrepancies discovered. **(T-2)**.

14.2.3.4.5. Maintenance personnel will correct all discrepancies discovered during the ADR, prior to signing off the ADR JCN. **(T-1)**.

14.2.3.4.5.1. If an ADR discrepancy cannot be corrected immediately, document the ADR discrepancy in the AFTO Form 781A with a JCN and applicable symbol and retain it in the AFTO Form 781-series forms until corrected and signed off. **(T-1)**. Once all the uncorrected discrepancies are documented in the AFTO Form 781-series the ADR can be signed off as complete.

14.2.4. Pre-Dock Meetings. PS&D personnel will:

14.2.4.1. Review planned aircraft inspection schedules and initiate an AF Form 2410, *Inspection/TCTO Planning Checklist*, or locally-developed product for each aircraft prior to the pre-inspection meeting. **(T-2)**.

14.2.4.1.1. MAJCOMs may determine if the pre/post dock requirement for inspections with less than a 200-hourly or 200-calendar day cycle is required. If it is determined that a pre/post dock meeting is not required, initiation of an AF Form 2410 is not necessary.

14.2.4.2. Host meetings and notify the appropriate Operations Officer/MX SUPT and flight supervisors of any recurring problems with attendance. **(T-2)**. Prior to the pre-dock meeting, PS&D will:

14.2.4.2.1. Determine pre-dock meeting attendees. **(T-2)**.

14.2.4.2.1.1. The following personnel will attend the meeting as a minimum: PS&D, Pro Super, Inspection Dock NCOIC, aircraft crew chief, DMS, and EM representative. **(T-2)**.

14.2.4.2.1.2. Include other agencies as required for performance of the work package.

14.2.4.2.2. Review and list all known aircraft and equipment TCTOs, TCIs, SIs and other major requirements to be accomplished during the inspection on the AF Form 2410, or locally-developed product. **(T-2)**.

14.2.4.2.3. Identify requirements for kits or parts. **(T-2)**.

14.2.4.2.4. List all Delayed Discrepancies to be accomplished during the inspection on the AF Form 2410 keeping the original JCN. **(T-2)**.

14.2.4.2.5. Incorporate all requirements against the aircraft into a work package. **(T-2)**.

14.2.4.2.6. List specialist tasks required in addition to normal inspection needs. **(T-2)**.

14.2.4.2.7. Develop a list of items identified as out-of-configuration for verification/correction during the inspection. **(T-2)**.

14.2.4.2.7.1. For non-configuration tracked aircraft, compile a list of missing serially-controlled items and coordinate/forward them to Inspection Dock NCOIC for verification. **(T-2)**.

14.2.4.3. At the pre-dock meeting, PS&D will brief representatives of the inspection schedule and scope, including TCTOs, TCIs, SIs, DDs and special requirements to be accomplished. **(T-2)**.

14.2.4.3.1. Agency representatives will inform PS&D of limiting factors that might affect the schedule. **(T-2)**.

14.2.4.3.2. PS&D will discuss aircraft configuration during all aircraft pre-dock meetings. **(T-2)**.

14.2.4.3.3. Wings will use the AF Form 2410, or locally-developed product to record additional information discussed during the pre-dock meeting. **(T-2)**.

14.2.4.3.3.1. Maintain the original AF Form 2410, or locally-developed product on file in the aircraft jacket file for use as a guide when conducting the post-dock meeting. **(T-2)**.

14.2.4.3.3.2. Provide a copy to the Inspection Dock NCOIC or equivalent for use during the post-dock meeting. **(T-2)**.

14.2.4.3.4. PS&D will provide a copy of the applicable “out of configuration” MIS products (such as, IMDS screen 810 and 990; G081, screen 8110; serial number

checklists) to Inspection Dock NCOIC in pre-dock package for verification/correction. **(T-2)**.

14.2.4.3.4.1. The responsible work center will correct verified erroneous data and "out of configurations" in the MIS prior to post-dock. **(T-2)**.

14.2.4.3.5. As a minimum, the following will also be discussed at the pre-dock meeting:

14.2.4.3.5.1. The type and number (if applicable) of the inspection to be performed. **(T-2)**.

14.2.4.3.5.2. Validation of current aircraft and engine operating times. **(T-2)**.

14.2.4.3.5.3. Parts in the TNB that require aircraft installation. **(T-2)**.

14.2.4.3.5.4. Any known post inspection fuel cell work required. **(T-2)**.

14.2.4.3.5.5. Date the aircraft is to be ready for the flightline to accept back. **(T-2)**.

14.2.4.3.5.6. All known engines requiring replacement. **(T-2)**.

14.2.4.3.5.7. Review of the aircraft forms open discrepancies including Delayed Discrepancies and develop a joint plan to work as many discrepancies as feasible/applicable. **(T-2)**.

14.2.4.3.5.8. Any inspections that will require maintenance personnel to stop work (such as, NDI shop requirements) and when the maintenance dock needs to be clear of personnel to perform the inspections. **(T-2)**.

14.2.4.3.5.9. All meeting attendees will sign the AF Form 2410. **(T-2)**.

14.2.5. Post-Dock Meetings. Units will hold a post-dock meeting as soon as possible after the inspection but no later than before the FCF or first flight. **(T-2)**. PS&D will:

14.2.5.1. Lead a post-dock meeting for all inspections that required a pre-dock meeting. **(T-2)**. As a minimum, discuss and validate the following information at the post-dock meeting:

14.2.5.1.1. PS&D, Pro Super, Inspection Dock NCOIC, Aircraft Section representative/crew chief and other locally-determined attendees will discuss open discrepancies, review any significant inspection events and identify any problems that may adversely affect future scheduling. **(T-2)**.

14.2.5.1.2. The Inspection Dock NCOIC will provide the completed inspection work package to PS&D for filing until it is replaced by the next similar inspection work package. **(T-2)**. For example, an HPO1 will be replaced by the next HPO1 and the HPO2 will be replaced with the next HPO2.

14.2.5.1.3. The Inspection Dock NCOIC will return the completed serial number verification sheet to the PS&D representative. **(T-2)**.

14.2.5.1.4. The Inspection Dock NCOIC or designated representative and the aircraft crew chief or equivalent will perform an aircraft documents review. **(T-2)**.

14.2.5.1.5. PS&D personnel will validate TCTOs, TCIs, and SIs scheduled during the inspection were completed and signed off in the MIS prior to the post dock meeting. **(T-2)**.

14.2.5.1.5.1. Any action that was scheduled but not complied with will be annotated on the AF Form 2410 (used at the pre dock meeting) with the reason why it was not performed. **(T-2)**.

14.2.5.1.5.2. Validate that any TCTO/TCI/SI not complied with will not ground the aircraft before releasing the aircraft back to flightline maintenance personnel. **(T-2)**.

14.2.5.1.6. Verify all parts placed on order during the inspection but not received have valid document numbers.

14.2.5.1.7. The Inspection Dock NCOIC and flightline maintenance supervisor (Pro Super or above) agree that all inspection requirements are completed and the flightline supervisor agrees to accept or "buy back" the aircraft. **(T-1)**.

14.2.5.1.7.1. If maintenance actions previously identified for completion were not accomplished, establish agreements as to how these inspection requirements will be completed and documented on the AF Form 2410 or locally-developed product. **(T-1)**.

14.2.5.1.8. PS&D will file the completed AF 2410, or locally-developed product, and completed/verified copies of the output products in the aircraft jacket file (PS&D retains completed package until the next scheduled PH/ISO inspection for that aircraft). **(T-1)**. Electronic versions may be saved to digital media.

14.2.6. MIS (G081/IMDS) extended downtime (more than 48 hours).

14.2.6.1. If the MIS is not available for more than 48 hours, maintenance organizations will use the most current data contained in MSM for IMDS units and "Global Reach" system products for G081 units. The MSM database will be refreshed with new MIS products daily. **(T-2)**.

14.2.6.1.1. MSM usage may continue in a digital format as long as updates can be made and retained.

14.2.6.2. If data cannot be retained by MSM or Global Reach, the use of AFTO Form 349, *Maintenance Data Collection Record*, or will be initiated for use in data collection/completion. **(T-2)**.

14.2.6.2.1. The most current paper or electronic version of MIS products will be used once AFTO Form 349 or electronic equivalent usage is initiated. **(T-2)**.

14.2.6.2.2. The AFTO Form 349 or electronic equivalent, will be used to update applicable MIS products once brought back online. **(T-2)**.

14.2.6.2.3. The AFTO Form 349 or electronic equivalent, will be maintained until the data listed on it has been verified as captured/loaded in the MIS. **(T-2)**.

14.2.6.2.4. After all changes have been verified in the MIS, destroy the AFTO Form 349 or electronic equivalent.

14.2.6.3. If an aircraft is temporarily moved to an operating location away from the unit of assignment and connectivity to the MIS is unavailable, units will send only those documents necessary to ensure safety of flight and current aircraft status. **(T-2)**.

14.2.7. Aerospace Vehicle and Equipment Mishap Response Procedures:

14.2.7.1. PS&D will coordinate with MMA or equivalent to ensure MIS lock out procedures to prevent further manipulation of data concerning the aerospace vehicle and/or equipment used during maintenance prior to the mishap event are completed IAW **Chapter 5** **(T-1)**.

14.2.7.2. At a minimum, produce, consolidate and impound the following products: aircraft jacket file, aircraft AFTO Form 95s, TCTO history, debriefing records, pulled AFTO Form 781-series forms, SI/TCI data, maintenance history, automated records check. **(T-1)**. Include any additional significant historical data, and other decentralized records. **(T-2)**.

14.2.7.3. EM will download and impound engine records from the applicable MIS and CEMS. **(T-1)**.

14.2.8. **(Added-AFMC)** Status Reporting. Accomplish status reporting IAW AFI 21-103. Aircraft transfer Possession Purpose Code (PPC) "BT" may only be used within the following guidelines. These guidelines also apply for permanent aircraft transfers via PDM/modification or contract repair facility. **NOTE:** If the gaining organization utilizes the aircraft prior to the transfer inspection, use of "BT" status will not be authorized. **(T-2).**

14.2.8.1. **(Added-AFMC)** Intra-command (within AFMC) transferring aircraft may be possessed in this code no longer than 2 workdays for the losing organization (to prepare the aircraft) and no longer than 2 workdays for the gaining organization (to accept the aircraft). This code allows the organization time to prepare and complete pre-transfer inspections and actions in a non-possessed status. HQ AFMC/A4M must approve any extension. **(T-2).**

14.2.8.2. **(Added-AFMC)** Inter-command (into or out of AFMC) transferring aircraft may be possessed in this code no longer than 2 workdays for both accepting and preparing the aircraft. This code allows the organization time to prepare and complete pre-transfer inspections and actions in a non-possessed status. Any extension must be approved by HQ AFMC/A4M. **(T-2).**

14.2.8.3. **(Added-AFMC)** Aircraft going to programmed depot maintenance (PDM)/modification may be possessed in this code for no longer than 2 workdays to prepare the aircraft. Aircraft returning from PDM/modification, contract field team or depot field team maintenance units may use this PPC no longer than 2 workdays after return of the aircraft. PPC "BT" is not authorized for the sole purpose of accomplishing scheduled maintenance such as TCTO, time change items and special inspections before or after PDM/modification input. HQ AFMC/A4M must approve any extension. **(T-2).**

14.3. Configuration, TCTO, SI and TCI Management.

14.3.1. Responsibilities. MAJCOMs will establish PS&D requirements and responsibilities to support work centers who's AFSCs require scheduling functions for the equipment they

maintain (such as, Egress, Armament, and Aerospace Ground Equipment, Fuels) in a supplement to this instruction.

14.3.1. **(AFMC)** Local procedures are authorized for compliance of any established AF policy unless specified in supplemental guidance for this paragraph.

14.3.1.1. PS&D will provide work centers who's AFSCs require scheduling functions (such as, Egress, Armament, and Aerospace Ground Equipment, Fuels) SME training support and oversight of scheduling products necessary to ensure configuration data integrity is maintained. **(T-1)**. PS&D will:

14.3.1.1.1. Outline procedures for ordering hazardous materials for TCIs and TCTOs (such as, batteries). **(T-2)**.

14.3.1.1.2. Units using a MIS will not delegate suspense validation processing for TCIs installed on aircraft to the performing work center unless the written procedures include the following: a list of work centers and specific technicians authorized to process suspenses; a list of the specific suspenses authorized to be cleared; and the method for notifying PS&D of the work completed (an audit trail) (IMDS units only). **(T-2)**.

14.3.1.1.2.1. Ensure EM processes all IMDS suspense validations for engines and engine components. **(T-2)**.

14.3.1.1.3. Validate that data errors are corrected with appropriate personnel and updated in the MIS weekly. **(T-1)**.

14.3.1.1.4. Submit MSM trouble tickets at **https://midtier.gunter.af.mil/**, call the Field Assistance Branch at DSN 596-5771, or e-mail **team4@gunter.af.mil** to correct program deficiencies. **(T-1)**.

14.3.2. Configuration Management. Configuration management provides unit managers the capability to determine the actual versus approved configuration of an aircraft or equipment. The intent of configuration management is to ensure selected serially-controlled and/or TCIs are properly loaded to the MIS database. Of major concern are accurate, approved part numbers, Quantity per Assembly and Next Higher Assembly items by WUC/LCN. PS&D has overall responsibility for the Equipment Configuration Management or Aircraft Configuration Management subsystem of the MIS and will provide assistance to maintenance personnel. **(T-1)**. The performing work center supervisor and PS&D conduct supervisory reviews of configuration change, TCTO, SI and TCI events using MIS on-line capabilities. **(T-1)**. Individual work centers accomplishing TCIs are responsible for changing configuration information in MIS. Unless otherwise specified in local procedures, schedulers will process all removal, installation, TCI, SI and TCTO compliance updates for aircraft and equipment in the applicable MIS and EM will process engines and engine components in applicable engine information system. **(T-1)**.

14.3.2.1. Lead Commands will ensure procedures exist and are executed to provide system configuration tables which are updated, validated, and provided to field maintenance personnel as configurations change. **(T-1)**.

14.3.2.1.1. Items not accessed or visible during field-level maintenance shall be identified to Lead Command and AFSC managers for disposition. **(T-1)**.

14.3.2.2. Maintenance personnel discovering an item with a missing data plate, or one which does not have a serial number, will contact PS&D who will coordinate with the Lead Command system functional manager and/or AFSC item manager for disposition. **(T-1)**.

14.3.2.3. For those aircraft that do not currently have an established configuration table, the Lead Command will develop procedures to identify, track and validate installed configuration managed items against the data in the MIS.

14.3.2.4. PS&D will coordinate the daily resolution of IMDS configuration management notices with the appropriate maintenance section utilizing the applicable MIS screen. **(T-1)**.

14.3.2.4.1. Uncorrected discrepancies will be briefed weekly at the daily production/scheduling meeting and forwarded to the appropriate maintenance supervision for corrective action. **(T-2)**.

14.3.2.5. When out of configuration items or missing serially-tracked items are discovered, establish a single DD for the "out-of-configuration" condition. **(T-2)**.

14.3.2.5.1. Additionally, add a MIS WCE for each WUC/LCN and part/serial number item requiring verification to the single DD. **(T-2)**.

14.3.2.6. **(Added-AFMC)** If ACM responsibilities are delegated to other work centers, MOF PS&D will develop a formal agreement between AFMC and the delegated work center to assign responsibilities and guidelines for updating/correcting the IMDS database (e.g., check suspense validation records in IMDS and coordinate to ensure the appropriate work center processes their suspense's daily). **(T-2).**

14.3.2.6.1. **(Added-AFMC)** When assigning these responsibilities, consideration must be given to the agency performing removal and replacement actions for the configured item, (i.e., the egress shop has the responsibility for CAD/PAD items, while flightline avionics has the responsibility for tracked LRUs, etc.). **(T-2).**

14.3.2.6.2. **(Added-AFMC)** Additionally, this guidance establishes procedures to ensure configuration data is maintained during routine maintenance actions. **(T-2).**

14.3.2.6.3. **(Added-AFMC)** All TO 00-25-107, Maintenance Assistance, requests must be certified at the appropriate center level and coordinated through HQ AFMC/A4MM. **(T-2).**

14.3.3. TCTO Management. TCTOs are AF, MAJCOM/Lead Command or Numbered Air Force (NAF) directed modifications and inspections that provide units with instructions for doing a one-time change, modification, or inspection of equipment, (includes applicable FAA Airworthiness Directives, original equipment manufacturer service bulletins and service instructions, after concurrence by Lead Command). Lead Command, NAF and local inspections are considered OTIs. Use the MIS to process Lead Command and NAF OTIs or modifications in the same manner as TCTOs with compliance periods, remove from service dates and rescission dates IAW TO 00-5-15. TCTOs, with the exception of immediate and urgent action, are considered scheduled maintenance and integrated into maintenance planning cycles. **(T-1)**. Consider concurrent accomplishment of TCTO work with other unscheduled or scheduled maintenance (such as, PH, ISO, HSC, HPO). Manage TCTOs using the MIS, TO 00-5-15 and specific MAJCOM instructions. **Note:** Communication of a grounding, or

potential grounding event (TCTO, OTI, PM event) to weapon systems operating in a deployed environment and/or under the authority of an operational command must follow the grounding procedures outlined in AFI 11-401 and 63-101/20-101. Units must not directly communicate home station requirements to its deployed forces but provide communication through their respective MAJCOM. **(T-1)**.

14.3.3. **(AFMC)** Command-directed temporary (T-1 and T-2) modifications are temporary, and there is no corresponding change to approved weapon system technical data. The approved modification instruction is the authority for both modification and maintenance as long as the modification is installed. Follow additional AFMC guidance in AFI 63-101/20-101 AFMC Sup, Integrated Life Cycle Management. **(T-2).**

14.3.3.1. PS&D is responsible for managing all assigned weapon system TCTO programs and will monitor/provide oversight of all AF owned aircraft, weapon system, AGE and commodity TCTOs to ensure all compliance requirements are met. **(T-1)**.

14.3.3.1. **(AFMC)** MOF PS&D or equivalent has the overall responsibility on depot level TCTO management. MOF PS&D will coordinate with System Program Managers, Lead Commands, and AFMC/A4MM. **(T-2).**

14.3.3.1.1. Munitions-related TCTOs will be managed by the munitions scheduler (if assigned) and engine-related TCTOs will be managed by EM schedulers. **(T-1)**.

14.3.3.1.1.1. **(Added-AFMC)** AGE-related TCTOs will be managed by the AGE scheduler (if assigned). **(T-2).**

14.3.3.1.2. PMEL TCTOs will be managed by the owning agency with PS&D oversight. **(T-1)**.

14.3.3.1.3. The parent technical training center manages and schedules all TCTOs for training equipment assigned to a TD or Mobile Training Team.

14.3.3.2. PS&D will review MIS products weekly to ensure proper documentation and management by owning and managing TCTO agencies. **(T-1)**.

14.3.3.2.1. When an error is detected, PS&D will inform affected work centers and provide assistance to correct the discrepancy IAW TO 00-20-2. **(T-1)**.

14.3.3.2.2. Units will complete an annual TCTO status review between MIS and REMIS or equivalent systems. **(T-1)**.

14.3.3.2.2.1. Units will reconcile rescinded TCTOs using a REMIS Master TCTO report or equivalent annually (NLT 30 Sep) and before deleting/retiring TCTO records from the appropriate MIS. **(T-1)**.

14.3.3.2.2.2. If REMIS or equivalent access is not available, request a REMIS Master TCTO report or equivalent from the MAJCOM MDS Weapon Systems Team/Program Office identified in the subject TCTO. If TCTO status conflicts are identified, units will contact the applicable Lead Command to establish the process for resolving conflicts and facilitating status correction in REMIS or equivalent system. **(T-2)**.

14.3.3.2.2.3. Once all status errors are corrected, and reconciliation is complete and verified, IMDS units can delete the TCTO from the MIS. G081 automatically

retires TCTOs 60 days after rescission, and all equipment shows as complete.

14.3.3.2.2.3.1. Document completion on AF Form 2411. **(T-1)**.

14.3.3.2.3. PS&D will brief the MXG/CC (or equivalent) weekly on unaccomplished TCTOs that are within 60 days of grounding. **(T-1)**.

14.3.3.2.3.1. Significant problems or potential delays in TCTO accomplishment will be brought to the immediate attention of the MXO OIC/SUPT and MXG/CC (or equivalent). **(T-2)**.

14.3.3.2.4. PS&D will chair a TCTO review meeting attended by all TCTO owning and managing agencies after the monthly supply TCTO reconciliation meeting. **(T-1)**. These meetings may be combined.

14.3.3.2.4.1. PS&D will discuss the supply reconciliation, supply status, scheduling factors, current TCTO status and anticipated problems for all active TCTOs. **(T-2)**.

14.3.3.2.4.2. PS&D will produce meeting minutes on the AF Form 2410 and distribute to all affected agencies. **(T-3)**.

14.3.3.2.5. Depot-level TCTOs, excluding commodities, will be loaded and tracked in the MIS for auditing compliance and applicability. **(T-1)**.

14.3.3.2.5.1. Depot-level engine TCTOs will be loaded in CEMS only. **(T-1)**.

14.3.3.2.5.2. Units shall ensure dual reporting of completed depot-level TCTOs is prevented. **(T-1)**.

14.3.3.2.5.3. All field-level companion TCTOs for commodities must be loaded in the MIS. **(T-1)**.

14.3.3.2.6. PS&D will monitor, track, and administer all applicable CPINS as commodity TCTOs for configuration management purposes IAW TO 00-5-15 and TO 00-5-16. **(T-1)**.

14.3.3.2.6.1. PS&D will coordinate reprogramming of all passive/active aircraft internal and external electronic warfare systems and equipment with the wing Electronic Warfare Officer or equivalent before implementing any CPIN changes. **(T-1)**.

14.3.3.2.6.2. PS&D will coordinate with EM before issuing NSS/ETS CPINS. **(T-1)**.

14.3.3.2.7. When TCTOs are directed for items without serial numbers, assign permanent serial numbers IAW TO 00-20-2 and AFI 23-101. **(T-1)**.

14.3.3.2.7.1. For serial numbers that cannot be created IAW TO 00-20-2 or AFI 23-101, use the associated equipment serial number the item is assigned to (for example, an aircraft chock serial number would be 0000AXXXC1).

14.3.3.2.8. Control and Transfer of TCTO Kits. Units will transfer aircraft or equipment, with any TCTOs still pending completion, with their applicable TCTO kits. **(T-1)**.

14.3.3.2.8.1. Retain engine TCTO kits for engines installed on aircraft at depot locations if the aircraft is returning to that unit for TCTO compliance. **(T-2)**.

14.3.3.2.8.2. Transfer TCTO kits IAW AFI 23-101, TO 00-5-15 and TO 00-5-1. **(T-1)**.

14.3.3.2.8.3. **(Added-AFMC)** Until proper disposition is determined, MOF PS&D will record and maintain TCTO kits received for aircraft in waivered status for applicable TCTOs. Consult with TCTO single managers and test program managers for proper disposition of kitted TCTOs IAW TO 00-5-15. If unable to attain disposition of received kitted TCTOs, contact AFMC/A4MM for guidance. **(T-2).**

14.3.3.2.9. **(Added-AFMC)** MOF PS&D will manage the status reporting for command-directed assessments, modifications, and modification rescissions that require de-compliance work, as well as organizational, intermediate, and depot TCTOs. Command-directed modifications will be identified by a title, command data code, and rescission date. **(T-2).**

14.3.3.3. Specific TCTO Responsibilities.

14.3.3.3.1. QA personnel will:

14.3.3.3.1.1. Review all new and revised technical data and TCTO's for completeness, accuracy and applicability. **(T-1)**. Inform applicable work centers of changes and up channel any problems discovered during this review. **(T-1)**.

14.3.3.3.1.2. Determine if the TCTO impacts W&B. **(T-1)**.

14.3.3.3.1.3. Distribute copies of TCTOs to the managing agency, performing work centers, and LRS. **(T-2)**.

14.3.3.3.1.4. Provide a supply cover letter requesting the number of items in supply (including WRM) affected by the TCTO. **(T-2)**.

14.3.3.3.1.5. Report all deficiencies in technical instructions and kit-proofing to the appropriate TCTO Manager IAW TOs 00-5-1 and 00-5-15. **(T-1)**.

14.3.3.3.1.6. Attend TCTO planning meetings. **(T-2)**.

14.3.3.3.1.7. Provide technical support to performing work centers. **(T-3)**.

14.3.3.3.2. PS&D personnel will:

14.3.3.3.2.1. Determine the total number of end items applicable to the TCTO. **(T-1)**.

14.3.3.3.2.1.1. Items that are assigned with the same Mission Design Series, WUC, Part Number, but are not applicable to the TCTO will be loaded in "22" status. **(T-1)**. This ensures accurate accountability that all equipment has been verified as being affected or not applicable to TCTO.

14.3.3.3.2.2. Chair a TCTO planning meeting with attendees from QA, owning and performing work centers and Flight Service Center/LRS IAW AFI 23-101, **Chapter 4**. **(T-1)**.

14.3.3.3.2.2.1. Record meeting minutes on AF Form 2410, or locally-developed product and provide an overall plan to implement the TCTO. **(T-2)**.

14.3.3.3.2.2.2. Minutes will include TCTO applicability by ID number (or applicable part number or serial number for commodity TCTOs), purpose of the inspection/modification and clearly identify and document the performing work centers, training requirements, scheduling parameters, remove from service date, a review of the TCTO procedures, form entries and supply requirements prior to scheduling the TCTO for completion. **(T-2)**.

14.3.3.3.2.2.3. All attendees sign the AF Form 2410, or locally developed product, at the conclusion of the planning meeting indicating agreement with the conditions. **(T-1)**.

14.3.3.3.2.3. Establish and maintain a TCTO folder for each active TCTO. **(T-1)**.

14.3.3.3.2.3.1. TCTO folders will be standardized and include the basic TCTO and any supplements, completed AF Form 2410, or locally developed product, AF Form 2001, *Notification of TCTO Kit Requirements* (if required), messages and the supply cover letter from QA (if required). **(T-2)**.

14.3.3.3.2.3.2. Once the TCTO has reached its rescission date, print a MIS product showing the current status of equipment and place it in the TCTO folder. **(T-1)**.

14.3.3.3.2.3.2.1. Move the folder to an inactive TCTO file. **(T-1)**.

14.3.3.3.2.3.2.2. The TCTO managing agency will maintain the folder until the TCTO is rescinded in the applicable MIS IAW TO 00-5-15. MIS TCTO records will be deleted (scheduled to retire for G081 users) at that time. **(T-1)**.

14.3.3.3.2.3.3. TCTOs will not be deleted from the MIS prior to the rescission date. **(T-1)**.

14.3.3.3.2.3.4. Validate in REMIS that no additional requirements have been submitted or extensions applied. **(T-1)**.

14.3.3.3.2.4. If an initial TCTO load is not received from REMIS or equivalent, notify the single manager and/or equipment specialist IAW TO 00-5-15. **(T-1)**.

14.3.3.3.2.5. Use the ILS-S to order required kits/parts/tools IAW MIS manuals. **(T-1)**. Kits, parts, tools, and software will be ordered within 24 hours of the TCTO meeting and document numbers input on the AF Form 2001. **(T-2)**. Locally manufactured and obtained parts will be documented on the AF 2001. **(T-2)**.

14.3.3.3.2.5.1. When ILS-S is not available, initiate three copies of the AF Form 2001 and forward two copies of the Form with a copy of the TCTO to the supply TCTO monitor. **(T-2)**.

14.3.3.3.2.5.2. For locally obtained parts, prepare an AF Form 2001 listing each item by NSN, noun and quantity required. **(T-2)**.

14.3.3.3.2.6. Assign ID numbers to kits as they are received. **(T-1)**.

14.3.3.3.2.6.1. Use **Part II** of the AF Form 2001 to manage kit/part assignment and track individual end items, date issued, document numbers and the number of kits remaining. **(T-1)**.

14.3.3.3.2.6.2. The LRS/Flight Service Center TCTO monitor will ensure kits and/or parts are assembled prior to release. **(T-1)**.

14.3.3.3.2.7. Control and release TCTO kits from LRS. **(T-1)**.

14.3.3.3.2.8. Notify appropriate MAJCOM, by message, when local managers anticipate a problem with TCTO compliance within prescribed time limits. **(T-1)**.

14.3.3.3.2.8.1. The message should include the TCTO number and narrative, total units affected, total units complete, kits on hand, kits on order, estimated delivery date, requisition number and a narrative of the problem.

14.3.3.3.2.8.2. The message will be endorsed by MXG/CC (or equivalent) prior to submission to MAJCOM. **(T-2)**.

14.3.3.3.2.9. Report status of TCTOs that cannot be reported under "HOW MAL" codes 793, 797, 798, 801, 802, or 911 IAW the MIS, and 00-20 series TOs. **(T-1)**.

14.3.3.3.2.10. Schedule, track and monitor TCTO accomplishment. **(T-1)**.

14.3.3.3.2.10.1. Prepare a work order in the MIS for each affected end-item, including spares. Agencies owning installed on-equipment TCTOs will coordinate with PS&D prior to scheduling on-aircraft TCTOs. **(T-3)**.

14.3.3.3.2.11. Review suspense validation or equivalent inputs prior to processing TCTO suspenses and updating the MIS. **(T-1)**.

14.3.3.3.2.12. Annotate back-up MIS products as changes occur. **(T-1)**.

14.3.3.3.2.13. Ensure TCTOs are scheduled for completion prior to expiration or grounding date whichever comes first. **(T-1)**.

14.3.3.3.2.14. Schedule all workable TCTOs for accomplishment prior to permanent equipment transfer or storage input. **(T-2)**.

14.3.3.3.2.15. For TCTOs with compliance periods calculated in operating time (hours, cycles, starts, landings, or rounds) create a local JST and load the JST to the equipment; schedule for completion prior to expiration of the compliance period operating time. **(T-2)**. **Note:** Once compliance period operating time has been reached remove equipment from service until the TCTO has been completed. **(T-2)**.

14.3.3.3.2.15.1. Document the JST number in the TCTO notes.

14.3.3.3.2.16. **(Added-AFMC)** The owning scheduling agencies will ensure all automated reports are verified and corrected IAW TO 00-20-2. **(T-2).**

14.3.3.3.2.17. **(Added-AFMC)** Each month, MOF PS&D, EM section, and TCTO managing agencies receive a copy of the TCTO reconciliation listing and must annotate this listing with TCTO requirements. **(T-2).**

14.3.3.3.2.18. **(Added-AFMC)** MOF PS&D monitors completion of commodity

TCTOs and coordinates with performing work centers to ensure compliance within specified time limits. AMU PS&D establishes schedules for completion of installed commodity TCTOs with companion aircraft TCTOs. AMU PS&D schedules aircraft TCTOs or on-equipment munitions type TCTOs. The EM section schedules non-installed engine-related TCTOs and coordinates with AMU PS&D on installed engine related TCTOs. The munitions flight scheduler manages TCTOs for all air-launched surface attack guided missiles and associated support equipment, munitions, nuclear ordnance controlled material (NOCM) items, guidance kits, air intercept/aerial guided missiles and air intercept/aerial rockets. **(T-2).**

14.3.3.3.2.19. **(Added-AFMC)** TCTO Waiver Procedures. Commanders of AFMC organizations may request to temporarily waive compliance with routine, immediate and urgent action TCTOs (Organizational, Intermediate and Depot Level) only when TCTOs are applicable to components of a system or subsystem that are deactivated or removed from the aircraft because of RDT&E missions or compliance of the TCTO would adversely affect the test mission. Procedures are outlined in AFI 21-101, Aircraft and Equipment Maintenance Management. **(T-2).**

14.3.3.3.2.19.1. **(Added-AFMC)** Owning organization will initiate the waiver request for Organizational, Intermediate, and Depot Level TCTOs. **(T-2).**

14.3.3.3.2.19.2. **(Added-AFMC)** The request will include the affected TCTO number, T-2 modification number and specifically why the modification interferes with accomplishing the TCTO. **(T-2).**

14.3.3.3.2.19.3. **(Added-AFMC)** The owning organization will contact the TCTO single manager to ensure that noncompliance will not result in a safety of flight condition, and to see if there are any safeguards that should be taken until the TCTO can be complied with. Include the single manager's name and phone number on the waiver request. **(T-2).**

14.3.3.3.2.19.4. **(Added-AFMC)** Owning organization will coordinate the waiver request with the MXG/CC/CL or equivalent. **(T-2).**

14.3.3.3.2.19.5. **(Added-AFMC)** Once the request has been signed, forward a copy of the signed request to the TCTO monitor, command aircraft manager, and the TCTO single manager. Wing TCTO monitor will retain a record copy. **(T-2).**

14.3.3.3.2.20. **(Added-AFMC)** Noncompliance will be recorded on the AFTO Form 95, Significant Historical Data, and appropriate Maintenance Information System, as applicable IAW TO 00-20-1 and TO 00-5-15. The entry will indicate the reason and estimated date of compliance. **(T-2).**

14.3.3.3.2.20.1. **(Added-AFMC)** Conduct an annual review and validate all waived TCTOs using the original MXG/CC/CL or equivalent approved date or last review date. **(T-2).**

14.3.3.3.2.20.2. **(Added-AFMC)** Send a list of waived TCTOs to HQ AFMC/A4MM no later than the first workday of January and July or when a

significant change to a TCTO or waiver has occurred. **(T-2).**

14.3.4. SI and TCI Management:

14.3.4.1. Job Standard Master Listing (JML) Management.

14.3.4.1.1. PS&D will maintain (load, change, and delete) the JML for all inspections and time changes listed in the applicable aircraft/system -6 TO and commodity TOs. **(T-1)**.

14.3.4.1.1. **(AFMC)** Schedulers will monitor -6 and associated TOs to ensure time change/inspection frequencies align and support the maintenance concept of the weapon system. Scheduled maintenance requirements that do not align with the established maintenance concept and affect aircraft availability will be identified and forwarded to the Product Improvement Working Group (PIWG) for consideration and/or resolution. **(T-2).**

14.3.4.2. Develop a matrix/chart depicting the total number of SIs and TCIs to be loaded in the MIS for each assigned aircraft/system. **(T-1)**.

14.3.4.2.1. Maintain JMLs for off-equipment items in the OWC. PS&D will provide written guidance and training for JML management of off-equipment JSTs when PS&D authorizes OWCs to maintain it. **(T-3)**.

14.3.4.2.2. For units using G081, Lead Commands must maintain master inspection and time change requirements.

14.3.4.2.3. Once Master Job Standard Numbers are fielded for a weapon system, local PS&D will review TO 00-20-2 for Master Job Standard Numbers procedures. **(T-1)**.

14.3.4.2.4. PS&D will load, change and delete JSTs in the MIS as soon as possible after receipt of any -6 TOs, or other TO, TCI or inspection change and will promptly notify all affected PS&D sections for action. **(T-1)**. PS&D will:

14.3.4.2.4.1. Load separate JSTs for all aircraft/systems -6 TOs special/scheduled inspections with frequencies greater than 30 days or 50 hours in the MIS. **(T-1)**.

14.3.4.2.4.1.1. Load PE, PH, engine changes and other event type inspections (such as, hard landing) as a JST in the MIS as they occur. **(T-1)**.

14.3.4.2.4.1.2. Provide training for maintaining JSTs as necessary. **(T-2)**.

14.3.4.2.4.2. Perform a semi-annual review of the JML and all JSTs for accuracy and currency to include off-equipment and decentralized activities. **(T-1)**.

14.3.4.2.4.2.1. Review matrix/chart depicting the total number of SIs and TCI requirements to be loaded in the MIS for each assigned aircraft/system. **(T-1)**.

14.3.4.2.4.2.2. Reconcile TCI and SI JSTs with the aircraft/systems -6 TOs and applicable commodity TOs and document the semi-annual review on AF Form 2411. **(T-1)**.

14.3.4.2.4.2.3. Units may create JSTs in the MIS to automate required documentation of repetitive or complex tasks (such as engine change, tire change, phase inspection, flight control maintenance).

14.3.4.2.4.3. Monitor the inspection and time change subsystems in the MIS. **(T-1)**.

14.3.4.2.4.3.1. Perform a monthly review of all inspections, SIs and TCI JSTs for each assigned aircraft. **(T-1)**.

14.3.4.2.4.3.2. Look for missing and/or excess inspections and TCIs loaded to the aircraft and ensure the accuracy of all due dates/times for TCIs and verify the Date of Manufacture (DOM) and Date of Installation (DOI). **(T-1)**.

14.3.4.2.4.3.2.1. TCIs will be loaded in the MIS with a part number and serial number. **(T-1)**.

14.3.4.2.4.3.3. Document the review and ensure corrections are made to the MIS. **(T-2)**.

14.3.4.2.4.3.4. Maintain the report on file with corrective actions until the next review. **(T-2)**. The use of automated verification tools is encouraged provided MIS data is the source for verification.

14.3.4.3. PS&D will manage the assigned weapon systems TCI program. **(T-1)**. PS&D Personnel will:

14.3.4.3.1. At least annually, meet with Egress and Aircrew Flight Equipment activities to verify each aircraft's egress data. **(T-1)**. **Note:** MAJCOM/Units may direct more frequent verification of Egress and Aircrew Flight Equipment as required to maintain system integrity.

14.3.4.3.1.1. Document all verification of aircraft's egress data on the AF Form 2411 maintained in the aircraft jacket file. **(T-1)**.

14.3.4.3.2. Identify, monitor, forecast and schedule only those selected items specifically identified in TO 00-20-9, *Forecasting Replacement Requirements for Selected Calendar and Hourly Time Change Items*; applicable commodity TOs; the aircraft -6 TO, AFMAN 21-201 or identified as Federal Supply Group 13 and Materiel Management Code AQ Items. **(T-1)**.

14.3.4.3.2.1. TCIs will be loaded in the MIS with a part number and serial number. **(T-1)**.

14.3.4.3.3. Establish a JST for both the DOM and DOI for Cartridge-Actuated Devices (CAD), Propellant Actuated Devices (PAD), life sustaining, and other TCI items listed in the aircraft -6 TO and applicable commodity TOs. **(T-1)**.

14.3.4.3.3.1. Load only the DOI or DOM JST that comes due first, in the MIS against a specific part or serial number. **(T-1)**.

14.3.4.3.3.2. As a minimum, when the DOI and DOM frequencies are identical, maintain the JST for the DOM. **(T-1)**. (N/A for G081 units).

14.3.4.3.3.3. Ensure component background information is provided by Egress to include a list of all components having multiple part numbers with a different service life. **(T-1)**.

14.3.4.3.3.3.1. Forecasting of CAD/PAD items for long-term CAD/PAD spare

requirements will be accomplished by Ogden Air Logistics Complex through use of the Requirements Determination Module to extract installation and due dates from REMIS. **(T-1)**.

14.3.4.3.3.3.2. When CAD/PAD items or forecast requirements are not visible within the maintenance data system (for example, Contract Logistics Support managed components), units will forecast for TCIs IAW TO 00-20-9 and AFMAN 21-201. **(T-1)**.

14.3.4.3.3.3.3. Validate and consolidate TCI forecasts for items listed in TO 00-20-9, commodity TOs, and aircraft specific -6 TOs. **(T-1)**.

14.3.4.3.3.3.4. Submit consolidated forecasts to the appropriate Lead Command representative with an info copy to munitions operations. **(T-2)**.

14.3.4.3.3.3.5. Forward any quarterly updated forecasts to munitions operations. **(T-2)**.

14.3.4.3.4. Initiate, validate, and submit TCI extension requests to the Air Force Sustainment Center item manager with an info copy to munitions operations. **(T-1)**.

14.3.4.3.4.1. Ensure a copy of approved extension are placed in the affected aircraft's forms and removed when no longer required. **(T-1)**.

14.3.4.3.4.2. Maintain and monitor a suspense copy of the extension request and follow up prior to the grounding date of the TCI. **(T-1)**.

14.3.4.3.4.3. Refer to TO 00-20-1 and 00-20-9 for additional guidance on TCI extensions and maintain a copy of the Air Force Sustainment Center/System Program Director approved message until the item is replaced. **(T-1)**.

14.3.4.3.4.4. EM will generate engine TCI extension requests and coordinate through the Command Engine Manager to the appropriate Engine Program Office in AFLCMC. **(T-1)**.

14.3.4.3.5. Perform monthly reconciliation of all TCIs with LRS. **(T-2)**.

14.3.4.3.5.1. The reconciliation will consist of 100 percent validation of existing due-outs. **(T-2)**.

14.3.4.3.5.2. Inform FSC of any "mark for" changes or items no longer required. **(T-2)**.

14.3.4.3.6. Monitor and requisition TCI requirements based on projected equipment utilization. **(T-1)**.

14.3.4.3.6.1. Order parts using MIS or coordinate with LRS/DMS to order parts using AF Form 2005, unless otherwise specified in -11, -14 and -6 TOs. **(T-1)**.

14.3.4.3.6.2. TCIs are considered due for replacement at the HPO, PH, PE, HSC or ISO inspection nearest to the replacement due date IAW TO 00-20-1. **(T-1)**. **Note:** Life sustaining or CAD/PAD TCIs cannot exceed replacement interval in applicable -6 and commodity TOs without an approved extension/waiver from the Program Office/appropriate item manager.

14.3.4.3.6.3. Notify the Munitions Flight of the need to order munitions items IAW TO 00-20-9 and AFMAN 21-201. **(T-1)**.

14.3.4.3.6.3.1. Serviceable CAD/PAD TCIs components will not be turned into munitions operations until the remaining service life reaches 9-months or less. **(T-1)**. Serviceable CAD/PAD TCIs components with less than 9-months service life remaining will not be reissued. **(T-1)**.

14.3.4.3.6.3.2. Maintenance plans must reflect replacement dates to coincide within the 9-month parameter. **(T-2)**.

14.3.4.3.6.3.3. **(Added-AFMC)** Agencies requesting changes or updates to the need date of any cartridge actuated device/propellant actuated device (CAD/PAD) item must coordinate with AMU PS&D, MOF PS&D, and MASO in sufficient time to preclude emergency issue requests. Agencies requesting a change shall provide justification if need dates are changed by more than 30 days. No justification is necessary if changes are within 30 days, regardless of the quarter, or if the change is driven by OO-ALC. Issue requests for unforecasted or improperly forecasted items (except for replacement of inadvertently fired items or items found to be unserviceable) will be supported by a letter of justification signed by the MXG/CC/CL or designated representative. **(T-2).**

14.3.4.3.6.4. Order non-CAD/PAD or engine TCIs IAW AFI 23-101. **(T-1)**.

14.3.4.3.7. Schedule the time change in the MIS and incorporate it in the monthly/weekly/ quarterly maintenance schedule. **(T-2)**.

14.3.4.3.8. Review the data (DOM, DOI, LOT number, JST, and Due Date) entered by the performing work center. Ensure the suspense validation is updated in the MIS when the time change is completed (Suspense validation N/A for G081). **(T-1)**.

14.3.4.3.9. Coordinate management of respective TCIs with applicable maintenance and operation work centers. **(T-1)**.

14.3.4.3.10. Schedule drogue chute TCIs, except chute harnesses, for replacement during the drogue chute repack before the expiration of the component service or shelf life. **(T-2)**.

14.3.4.3.10.1. These components will not be over flown without an approved extension from the appropriate item manager. **(T-2)**.

14.3.4.3.10.1.1. A copy of approved extensions must be maintained in the affected aircraft's forms and removed when no longer required. **(T-1)**.

14.3.4.3.11. Prepare TCI forecasts IAW TO 00-20-9. **(T-1)**.

14.3.4.3.11. **(AFMC)** Prepare AFTO Form 223, Time Change Requirements Forecast for TO 00-20-9 and applicable -6 TO requirements. Forward AFTO Form 223 to the MOF PS&D section. MOF PS&D will review all AMU AFTO Form 223 and will forward a combined list of requirements to the appropriate supply agency. AMU PS&D is responsible for forecasting only those selected items specifically identified in TO 00-20-9, and the aircraft -6 TO. **(T-2).**

14.3.4.3.11.1. Provide squadron Operations Officers/MX SUPTs a forecast for non-munitions items for their supply section. **(T-2)**.

14.3.4.3.12. To facilitate quarterly requisitioning, P&S will submit the quarterly validated time-change AFTO Form 223, Spreadsheet, or IMDS/G081 generated forecast to the Munitions Accountable System Officer. **(T-1)**. This must be submitted between 45 and 60 calendar days Continental United States (CONUS) or between 90 and 120 calendar days Outside Continental United States (OCONUS) before the next calendar year quarter IAW **Table 7.3**, OCONUS and CONUS Time Change Requisitioning Schedule IAW AFMAN 21-201. **(T-2)**. If aircraft is scheduled to be in depot when time change will be required home station P&S will coordinate with depot P&S to facilitate requisition of required assets by the depot munitions function IAW AFMAN 21-201 **Table 7.3** time frames. **(T-1)**.

14.3.4.3.12.1. Validate current requirements against the annual forecast and make corrections based on aircraft utilization. **(T-2)**.

14.3.5. Major Maintenance Work Processing. PS&D will:

14.3.5.1. Coordinate on all TO 00-25-107 requests for AFI 21-103 reporting. **(T-2)**.

14.3.5.1.1. The work center discovering the discrepancy is responsible for drafting the TO 00-25-107 request and forwarding the request to QA for coordination and release.

14.3.5.1.2. PS&D will make the appropriate PIC changes in the MIS when the 00-25-107 request has been submitted and/or received. **(T-1)**.

14.3.5.1.3. Depot-level assistance provided by contractor support will be accomplished IAW contract specifications. **(T-1)**.

14.3.5.2. Develop procedures in conjunction with QA for routing all major maintenance requests to ensure all affected parties are informed. **(T-2)**.

14.3.5.3. Conduct an initial meeting upon arrival of a DFT to validate maintenance support requirements are in place. **(T-2)**.

14.3.5.3. **(AFMC)** Conduct an initial meeting upon arrival of a Depot Pre-Induction Inspection team (DPII). **(T-2).**

14.3.5.3.1. The meeting will be documented on an AF Form 2410, or locally-developed product. **(T-2)**.

14.3.5.3.2. PS&D will initiate/accomplish all PIC changes in the MIS. **(T-1)**.

14.3.5.3.3. Once work is completed, PS&D will ensure appropriate PIC are changed and a completed copy of the work package is placed in the aircraft jacket file. **(T-1)**.

14.3.5.3.3.1. PS&D will document significant historical data on the appropriate AFTO Form 95 IAW 00-20 series TOs. **(T-1)**.

14.3.6. Transfer Inspections.

14.3.6.1. Units will perform gaining/losing transfer inspections IAW TO 00-20-1, MAJCOM guidance and this instruction. **(T-1)**.

14.3.6.1.1. In conjunction with QA, develop a local JST for both gaining and losing aircraft and equipment transfer. **(T-2)**.

14.3.6.1.1.1. This JST must meet all TO 00-20-1, 2J-1-18, *Preparation for Shipment and Storage of Gas Turbine Engines*, applicable aircraft -6 and -21 TOs, as well as AFI 21-103 and MAJCOM specific transfer requirements. **(T-2)**.

14.3.6.1.1.2. Include all historical records (example, NDI records, Egress records, W&B records, OAP records, strut records) and other applicable items. **(T-2)**.

14.3.6.1.1.3. **(Added-AFMC)** MOF PS&D personnel will:

14.3.6.1.1.3.1. **(Added-AFMC)** Ensure a minimum of 6 months of engine operating time are remaining on time change items (TCI) such as modules/compressors/turbines/gearboxes and other major components at time of transfer or according to established MOA. **(T-2).**

14.3.6.1.1.3.2. **(Added-AFMC)** Ensure all engines have a comprehensive borescope inspection accomplished unless a borescope was accomplished within the last 10 aircraft flying hours. **(T-2).**

14.3.6.1.1.3.3. **(Added-AFMC)** Verify TCIs have a minimum of 60 days or 50 hours remaining at time of transfer. **(T-2).**

14.3.6.1.1.3.4. **(Added-AFMC)** Verify all SI have at least 25 percent of the usable time remaining at time of transfer. **(T-2).**

14.3.6.1.1.3.5. **(Added-AFMC)** Include two copies of the IMDS pilot reported discrepancy (PRD) report (NFS1SO screen 179) for the previous 90-day period in the aircraft records file. **(T-2).**

14.3.6.1.2. Losing PS&D ensures all actions are completed in the MIS prior to permanently transferring an aircraft to another unit. **(T-2)**.

14.3.6.1.3. Losing PS&D conducts a transfer pre-dock meeting one duty day prior to start of the aircraft transfer. **(T-2)**.

14.3.6.1.4. All items to be accomplished during the transfer inspection will be documented on an AF Form 2410, or locally-developed product, and scheduled in the MIS. **(T-2)**.

14.3.6.2. Losing PS&D will complete a total verification of all TCIs installed on the transferring aircraft. **(T-2)**.

14.3.6.2.1. Verify the correct computation of all due dates/hour/cycles based on DOM, DOI, installed times, or equivalent factors. **(T-2)**.

14.3.6.2.2. For IMDS units only:

14.3.6.2.2.1. Ensure the IMDS-REMIS synchronization programs are processed and errors are corrected prior to transfer. **(T-2)**.

14.3.6.2.2.2. Ensure an up-to-date Transfer of Equipment report and an AFTO Form 95 with current engine trend and performance data are placed in the aircraft jacket file. **(T-2)**.

14.3.6.2.2.3. Ensure a backup copy is maintained until receipt is verified by the gaining unit. **(T-2)**.

14.3.6.3. Losing PS&D will ensure an ADR is performed and conduct a transfer post dock meeting to ensure all required actions have been completed, all forms are current/accurate, and the MXG/CC (or equivalent) has certified each aircraft ready to transfer aircraft IAW TO 00-20-1, AFI 16-402 and AFI 21-103. **(T-1)**.

14.3.6.3.1. **(Added-AFMC)** MOF/AMU PS&D will generate two copies of the following products listed below and forward one copy of each to the gaining unit not later than (NLT) 30 days before the aircraft is scheduled to be transferred. Annotate changes in red on the remaining copy and include it with the aircraft record jacket file at time of transfer. **(T-2).**

14.3.6.3.1.1. **(Added-AFMC)** Automated records check (ARC). **(T-2).**

14.3.6.3.1.2. **(Added-AFMC)** Transfer of equipment (TRE) for aircraft and engine(s). **(T-2).**

14.3.6.3.1.3. **(Added-AFMC)** Significant history data (SHD) for aircraft and engine(s) CFT, W/B/T, and EFT. **(T-2).**

14.3.6.3.1.4. **(Added-AFMC)** AFTO Form 427, Aircraft Integral Fuel Tank Repair Historical Record, or AFTO Form 428, B-1B Aircraft Integral Fuel Tank Repair History Record. **(T-2).**

14.3.6.4. **(Added-AFMC)** During AGE Transfers. In addition to the inspection requirements in TO 00-20-1 and TO 35-1-4, QA may perform an assessment on each AGE item. The inspection includes a complete records check. When the capability exists, ensure all discrepancies are corrected prior to equipment transfer. Annotate in the equipment forms any discrepancy not corrected due to lack of parts. **(T-2).**

14.3.6.5. **(Added-AFMC)** Foreign country, other US Government agency, contractor owned, and/or sister service aircraft that will be flown/maintained by AFMC units will require a transfer inspection (reference T.O. 00-20-1 and 00-35D-54 Chapter 8). **(T-2).**

14.3.6.5.1. **(Added-AFMC)** Foreign country, other U.S. Government agencies, contractor-owned, and/or sister service loaner aircraft require a signed MOA, IAW AFI 16-402 and its AFMC Supplement, and AFI 21-103 and its AFMC Supplement. Also ensure the agreement contains the inspection requirements listed in **paragraph 14.3.6.1.1** – **paragraph 14.3.6.2.1**. Include any additional requirements the loaning organization affirms needed. **(T-2).**

14.3.6.6. **(Added-AFMC)** Loaner aircraft from another USAF unit require a signed MOA, IAW AFI 16-402 and its AFMC Supplement, and AFI 21-103 and its AFMC Supplement. Also ensure the agreement contains, the inspection requirements listed in **paragraph 14.3.6.1.1** – **paragraph 14.3.6.2.1** **(T-2).**

14.3.6.7. **(Added-AFMC)** In conjunction with MMA DBM, MOF PS&D personnel will process the aircraft transfer file from REMIS IAW AFCSM 21-576V2, Generic Configuration Status Accounting System (GCSAS), Software User Manual. **NOTE:** DBMs must process NFS6A0, screen 47 and 942, upon receipt of approved file from

REMIS. This must be accomplished prior to processing IMDS-CDB program NFS3W0 (actual configuration). **(T-2).**

14.3.6.8. **(Added-AFMC)** MOF PS&D personnel will request approved configuration tables for B-1, B-2, F-15 and F-16 units and actual configuration tables for all other MDSs using IMDS screen 334 (IMDS-CDB units only). **(T-2).**

14.3.6.9. **(Added-AFMC)** Ensure maintenance performs a complete aircraft Dash 21 series TO equipment inventory IAW AFI 21-103. **(T-2).**

14.3.6.10. **(Added-AFMC)** Complete an egress system CAD/PAD inspection on newly assigned aircraft and upon those returning from depot/PDM where the egress system has been work on by depot personnel. Inspection will include 100% MIS (IMDS/G081) verification, and all visible and disturbed systems. **(T-2).**

14.3.6.11. **(Added-AFMC)** An ADR must be completed prior to first flight after inspection. AMU PS&D or equivalent will make appropriate entries in the MIS aircraft automated history for all aircraft transfers detailing the date, current operating time, location, unit, and a general synopsis of worked performed or reason for transfer. **(T-2).**

14.3.7. Acceptance Inspections. Units perform acceptance inspections IAW TO 00-20-1, MAJCOM guidance and this instruction.

14.4. ENGINE MANAGEMENT (EM).

14.4. (AFMC) [DEV] Engine Management (EM). The 412 MXS Propulsion Flight Business Unit will perform duties and responsibilities of Engine Management (EM) Section listed in AFI 21-101

14.4.1. Engine Management (EM). EM manages unit efforts to maintain adequate engine support for mission requirements. EM monitors engine removals and replacements, component tracking, engine TCTOs and TCIs, engine records in the MIS and CEMS and performs engine manager duties.

14.4.1.1. The MXG/CC will:

14.4.1.1.1. Ensure EM is the wing focal point for both the ET&D, Engine Health Management (EHM+) and Condition Based Maintenance Plus (CBM+) program when applicable. **(T-1)**.

14.4.1.1.2. Appoint a qualified 2A6X1, minimum 7-skill level, (or civilian equivalent) technician to manage the EHM+ and CBM+ program IAW AFMAN 20-116 for EHM products managed by AFLCMC/LP. If EHM data is not managed by AFLCMC/LP, ensure Contractor Logistics Support (CLS) provided EHM products are managed according to respective contract. **(T-1)**.

14.4.1.2. EM will:

14.4.1.2.1. Manage the MIS and CEMS by referencing applicable information in this instruction, AFI 23-101, TO 00-25-254-1, TO 00-20-5-1-3, *Instructions for Jet Engine Parts Tracking of OC-ALC/LPA Managed Engines*. **(T-1)**. Reference AFCSM 21-558, *Comprehensive Engine Management System* and applicable aircraft -6 TOs.

14.4.1.2.2. Coordinate with Propulsion Flight CC/SUPT and organization leadership to support WRE requirements. **(T-2)**.

14.4.1.2.3. Ensure plans, schedules, and maintenance actions are documented on assigned engines. **(T-1)**.

14.4.1.2.4. Provide TCI information (cycles remaining, EOT) on serially-controlled items to the Propulsion Flight and AMXS/AMU for engine and engine component CANN actions. **(T-1)**.

14.4.1.2.5. Ensure all engine SIs are loaded in MIS against the engine, not against the aircraft. **(T-1)**.

14.4.1.2.6. Ensure all engine/module inspections/TCIs tracked by EOT, Calculated Cycles (CCY), Total Accumulated Cycles (TAC), are loaded/tracked in the MIS and CEMS databases. **(T-1)**.

14.4.1.2.7. Ensure serial numbers erroneously input into CEMS are followed by a Possessor Change (6D) Transaction Condition Code (TCC). **(T-1)**.

14.4.1.2.7. **(AFMC)** Ensure engine SIs are loaded in IMDS or G081 to ensure availability of information to all maintenance activities. Units are authorized to use a separate AFTO Form 781K for each engine to document and monitor SIs and TCTOs. **(T-2).**

14.4.1.2.7.1. After the TCC has successfully processed, notify the CEMS Program Management Office help desk stipulating the serial number was erroneously input and shall be deleted from CEMS, **cems.pmo.helpdesk@us.af.mil**. **(T-1)**.

14.4.1.2.7.2. Create a JCN for engine, module or component data plate changes, modifications, re-identifications and new etchings and document changes in CEMS automated history. **(T-1)**.

14.4.1.2.7.3. A matrix by engine type shall be developed to depict specific inspection and TCI quantities for each TMS. Inspections tracked by flight hours must be loaded in the MIS. **(T-1)**.

14.4.1.2.8. Items that are assigned with the same TMS, WUC, Part Number, but are not applicable to the TCTO will be loaded in "22" status (refer to TO 00-20-2). **(T-1)**. This ensures accurate accountability that all equipment has been verified as being affected or not applicable to TCTO.

14.4.1.2.8.1. Comply with TCTO duties and responsibilities for engine items IAW this **Chapter**. **(T-1)**.

14.4.1.2.9. Manage TCTOs on all assigned engines and engine components, installed and uninstalled, as well as, manage TCTOs for support equipment to include engine trailers. **(T-1)**.

14.4.1.2.10. Accomplish quarterly TCTO status reviews and reconciliations IAW TO 00-25-254-1. **(T-1)**.

14.4.1.2.11. Maintain records on TCTO kits and status for all engines installed on aircraft sent to depot. **(T-2)**.

14.4.1.2.12. Manage time changes on all engines and engine components. **(T-1)**.

14.4.1.2.12.1. EM will forecast parts requests and ensure requests are submitted to LRS up to 60 days (but not less than 10 days) prior to the need date of the scheduled time change or JEIM/CRF induction (see sections 14.2. and 14.3. of this instruction). **(T-1)**.

14.4.1.2.13. Reconcile all TCIs during the monthly TCI meeting with PS&D and LRS. **(T-2)**.

14.4.1.2.13. **(AFMC)** [DEV] Within the 412 MXG, Engine Management will provide data to PS&D for incorporation of engine-installed items for the monthly TCI meeting chaired by PS&D.

14.4.1.2.13.1. Reconciliation will consist of 100 percent validation of existing due-outs and a complete physical inventory of all issued TCIs. **(T-1)**.

14.4.1.2.13.2. Inform FSC of any "mark for" changes or items no longer required. **(T-2)**.

14.4.1.2.14. Maintain and update historical documents for all assigned engines, modules, and major assemblies that are not managed by a Performance Based Logistics or contractually by a Contract Logistics Support contract. **(T-1)**.

14.4.1.2.14. **(AFMC)** Perform and document annual reviews of both paper (if applicable/maintained) and automated engine records IAW TO 00-20-1. (Paper history can be maintained in conjunction with automated history). **(T-2).** In addition to TO 00-20-1 requirements, the following historical entries in MIS are required for serially tracked engines, modules, components and major assemblies:

14.4.1.2.14.1. **(Added-AFMC)** Engine removal. Conduct a detailed records review to ensure utilization was properly recorded against the engine and sub-components. A removal narrative is required for all removal actions, except for HOW MAL codes 866, 879, and 800. Use the correct Automated History Event indicator when processing MIS transactions to ensure removal times are posted to automated AFTO IMT 95. Ensure utilization is updated in the MIS before processing the engine removal. **(T-2).**

14.4.1.2.14.2. **(Added-AFMC)** SIs, occurrences, and all borescope inspections. Include total time (EOT, TACs, CCYs, etc.), findings (no defect noted, discrepancies noted, etc.) and other pertinent information. **(T-2).**

14.4.1.2.14.3. **(Added-AFMC)** Engine test cell rejects IAW TO 00-25-254-1. Include total time (EOT, TACs, CCYs, etc.), the reason for reject, any specific test cell data and a summary of work performed at the test cell. **(T-2).**

14.4.1.2.14.4. **(Added-AFMC)** FSE or modifications. Include total time (EOT, TACs, CCYs, etc.), a brief summary of modifications to include part number and serial number of modified items, and other pertinent information. **(T-2).**

14.4.1.2.14.5. **(Added-AFMC)** Shipping engine, module (uninstalled), and major assemblies (uninstalled). Include the reason for shipment, the destination, and other pertinent information.

14.4.1.2.14.6. **(Added-AFMC)** Receiving/acceptance inspections, transfers and shipment of engines to designated repair facilities for engine, module (uninstalled), and major assemblies (uninstalled). Include received or departing from unit, discrepancies, and other pertinent information. **(T-2).**

14.4.1.2.14.7. **(Added-AFMC)** Data corrections. Include corrections to erroneous entries and other pertinent information. **(T-2).**

14.4.1.2.14.8. **(Added-AFMC)** Work completed on engine, module (uninstalled), and major assemblies (uninstalled). Include total time (EOT, TACs, CCYs, etc.) and a brief maintenance summary to include major assemblies replaced, test cell run, engine preservation, annual engine records reviews and other pertinent information (e.g., FOD). **(T-2).**

14.4.1.2.15. Check life-limited components forecast for additional component changes, TCTOs and SIs on all removed engines. **(T-1)**.

14.4.1.2.16. Coordinate with the propulsion Flight CC/SUPT to develop a detailed 6-month engine and module TCI removal forecast and publish the forecast in the monthly flying and maintenance schedule. **(T-2)**.

14.4.1.2.16.1. This 6-month forecast must be accomplished monthly using CEMS product E373/MIS products and the projected unscheduled removals based on the Unscheduled Removal Rate. **(T-2)**.

14.4.1.2.16.2. Removal rate formula (total number of unscheduled removals divided by flying hours, multiplied by 1000). Provide a copy of the forecast to maintenance leaders, PS&D, AMU and the MAJCOM engine manager. **(T-2)**.

14.4.1.2.17. Publish scheduled engine changes in the weekly and monthly maintenance schedule. **(T-2)**.

14.4.1.2.18. Verify engine total time versus aircraft total time, flying hours and manual cycles with PS&D during aircraft document reviews. **(T-1)**.

14.4.1.2.19. Maintain the portion of the JML for engine inspections and time changes. **(T-1)**.

14.4.1.2.19.1. Maintain (load, delete, and change) and conduct a semi-annual review of the JML for engine inspections and time changes listed in the aircraft -6 TO. **(T-2)**.

14.4.1.2.20. Establish a CEMS and MIS contingency plan for when either or both systems are down for more than 48 hours. **(T-1)**.

14.4.1.2.20.1. The plan will include procedures for retaining data in date-time order for input when MIS/CEMS operation resumes. **(T-1)**. The plan will also address both home station and deployed procedures. **(T-1)**.

14.4.1.2.21. Develop local engine tracking procedures and documentation methods to be used at deployed locations. **(T-1)**.

14.4.1.2.21.1. Procedures must include the method of communication (message, e-mail or FAX), documentation and shipping responsibilities with SRAN addresses,

and reporting procedures for CANNs and engine removals. **(T-1)**.

14.4.1.2.21.2. Procedures will ensure units take immediate action to correct all reporting errors between the base MIS and CEMS using the engine manager's data list. **(T-1)**.

14.4.1.2.22. Accomplish UEM duties IAW, AFI 23-101, AFPAM 63-129, TOs 00-25-254-1, 00-20-5-1-3, AFCSM 21-558, applicable aircraft -6 TOs and this instruction. **(T-1)**.

14.4.1.2.22.1. Act as liaison to the SRAN engine manager when part of a tenant unit is supported by the host base engine manager. **(T-1)**.

14.4.1.2.22.2. Provide the primary SRAN engine manager all quarterly reporting information required for submission to higher headquarters. **(T-2)**.

14.4.1.2.22.3. **(Added-AFMC)** Coordinate with the propulsion flight to ensure a copy of the latest work folder accompanies permanent and transferred engines. **(T-2).**

14.4.1.3. SRAN Engine Manager. The MXG/CC (or equivalent), will appoint a SRAN engine manager (if a host), or a UEM (if a tenant) to accomplish the duties IAW TO 00-25-254-1 and this instruction. **(T-1)**. The SRAN engine manager will:

14.4.1.3.1. Be selected from AFSC 2A or 2R, minimum 7-skill level (or civilian equivalent). **(T-1)**.

14.4.1.3.1.1. The assistant will be a minimum 5-skill level from the same AFSCs or civilian equivalent. **(T-2)**.

14.4.1.3.1.2. Both individuals will be aligned under EM. **(T-1)**.

14.4.1.3.2. Advise CMS or MXS/CC and MXG/CC (or equivalent), on administration of the base EM Program, engine maintenance concepts, principles, policies, procedures and techniques. **(T-1)**.

14.4.1.3.3. Act as the single point of contact between the unit, MAJCOM and MMA for EM questions. **(T-2)**.

14.4.1.3.4. Establish written procedures to support EM responsibilities IAW TO 00-25-254-1 and this instruction. **(T-1)**. Unit procedures must:

14.4.1.3.4.1. Specify responsibilities of affected work centers for accurate and timely MIS/CEMS reporting of TCTO, SI, TCI, and other documentation requirements (such as, borescope inspections, blade blending, CANN actions). **(T-1)**.

14.4.1.3.4.2. Ensure engine, module, and component data is reported to EM no later than close of business the first duty day after the event (for example, part removal, installation, time update, TCTO status change). **(T-1)**.

14.4.1.3.4.3. Address tenant, transportation, maintenance, aircraft distribution, supply, and support personnel requirements and be coordinated with the MAJCOM EM prior to publication. **(T-2)**.

14.4.1.3.5. Request Initialization Decks (I-Deck) for engines and major modules (cores, High Pressure Turbine (HPT), Low Pressure Turbine (LPT), fans), to include embedded parts, part number, serial number, EOT, inspections, active TCTOs and TCIs, from CEMS Central Database (CDB) and ensure data in the MIS matches the CEMS CDB. **(T-1)**.

14.4.1.3.6. Ensure deployed engine monitors are identified and trained to perform duties while deployed. **(T-1)**.

14.4.1.3.6.1. Designated engine monitors will ensure all deployed spare engines have a copy (paper or electronic) of CEMS product E407, option 1 and 4, included in the deployment package. **(T-2)**.

14.4.1.3.6.2. **(Added-AFMC)** Maintain original copies of historical records at home station unless directed to transfer the engine to a gaining SRAN. **(T-2).**

14.4.1.3.6.3. **(Added-AFMC)** Perform engine manager duties for shipment and receipt of all assigned modules, related equipment, and shipping devices. **(T-2).**

14.4.1.3.7. Perform engine manager duties for shipment and receipt of all assigned engines. **(T-1)**.

14.4.1.3.8. Perform periodic quality audits to monitor accuracy and timeliness of reporting. **(T-1)**.

14.4.1.3.9. Perform annual EM training for all affected personnel (back shop, test cell, flightline, aircraft maintenance scheduler) who report engine status or are responsible for engine documentation and scheduling IAW AFCSM 21-558, TOs 00-25-254-1 and 00-20-1/-2. **(T-1)**.

14.4.1.3.10. Maintain a jacket file of engine shipping documents and receipts. **(T-1)**.

14.4.1.3.10.1. Obtain MAJCOM EM approval prior to returning engines to CRF/depot. **(T-2)**.

14.4.1.3.11. Perform duties and requirements for engine shipments IAW TOs 00-25-254-1, 00-85-20, 2J-1-18, and 2-1-18. **(T-1)**.

14.4.1.3.11.1. Engines requiring off-base shipment must be delivered to transportation within 24 hours of notification/decision to ship the engine and/or the engine change is complete. **(T-2)**. Notify MAJCOM EM and the owning SRAN EM if this time frame cannot be met.

14.4.1.3.12. The work folder will transfer with the engine. **(T-1)**.

14.4.1.3.12.1. A copy will be maintained by the losing organization until verification of receipt by gaining unit. **(T-1)**.

14.4.1.3.12.2. Gaining units will maintain the work folders and ship the documents with the engine to depot when appropriate. **(T-1)**.

14.4.1.3.12.2.1. Gaining units will retrieve a copy of the previous EAWP from the Data Repository Center or equivalent data in the applicable MIS upon receipt of the engine. **(T-1)**.

14.4.1.3.12.2.2. EAWP users are required to send completed EAWP files to the Data Repository Center or MIS equivalent within 3 duty days of EAWP close-out. **(T-1)**.

14.4.1.3.13. The SRAN EM will report the following in CEMS:

14.4.1.3.13.1. Receipt transactions for engines as of the date and time engines are delivered from the transportation hold area and accepted at the JEIM facility. **(T-1)**.

14.4.1.3.13.2. Shipment transactions with the "as of" date and time the engine(s) physically leave the base. **(T-1)**.

14.4.1.3.13.2.1. Once engine is received at gaining unit, ensure trailer and adapter are transferred in MIS. **(T-1)**.

14.4.1.3.13.3. All engine and tracked item removals, installations, and engine status changes. **(T-1)**.

14.4.1.3.13.4. All engine status transaction removals, installations, gains, Engine-Not-Mission Capable for Supply (ENMCS), work completed, test cell rejects, work stopped, work started, change in level of maintenance, awaiting disposition, intra-AF receipt and intra-AF shipments, transfer, and HOW MAL codes IAW TO 00-25-254-1. **(T-1)**.

14.4.1.3.13.5. **(Added-AFMC)** Use the MAJCOM's command code the aircraft is assigned to when processing engine installation in CEMS. Refer to TO 00-25-254-1 for guidance. **(T-2).**

14.4.1.3.13.6. **(Added-AFMC)** Develop a memorandum of agreement (MOA) IAW AFI 25-201, Support Agreements Procedures, with SRANs at pre-positioned sites to manage engines, and manage tenant spare engines. **(T-2).**

14.4.1.3.14. Verify all update transactions (such as, times, TCTO, part removal and installations) are input before reporting an engine removal or installation. **(T-2)**.

14.5. Maintenance and FHP Planning Cycle.

14.5.1. Responsibilities. MAJCOMs will develop procedures to ensure the intent of the maintenance and FHP planning cycle is met. The objective of the planning cycle is to execute the wing FHP consistent with operational requirements and maintenance capabilities. The maintenance and FHP planning cycle begins with the annual allocation of flying hours. Maintenance and operations schedulers propose an annual flying plan that balances both operational requirements and maintenance capabilities. Units should commit the fewest number of aircraft possible to meet programmed Utilization (UTE) rate standards and goals.

14.5.1. **(AFMC)** Refer to **Attachment 8**.

14.5.1.1. If applicable, MAJCOMs will develop scheduling procedures for units involved in Operational Test and Evaluation, Developmental Test and Evaluation, or Initial Operational Test and Evaluation to ensure the intent of the maintenance and FHP planning cycle is met.

14.5.1.1. **(AFMC)** Due to the non-standard nature of the test mission, typical daily, weekly, and monthly scheduling plans are not conducive to test mission requirements. Refer to **Attachment 8** for any additional maintenance and FHP planning cycle procedures. **(T-2).**

14.5.1.2. AMC units tasked by the 618th Air and Space Operations Center will adhere to Commander, Air Force Forces (COMAFFOR) Apportionment and Allocation Process (CAAP) policies and procedures.

14.5.1.3. The annual plan, detailed by month, will evaluate the capability of maintenance to support the annual FHP. **(T-1)**.

14.5.1.4. When developing the annual plan, units will utilize the MDS specific MxCAP2 model, or equivalent, if available. **(T-1)**.

14.5.1.4. **(AFMC)** See deviation at **paragraph 2.2.4.3**

14.5.1.5. Maintenance PS&D. PS&D builds, coordinates, publishes and distributes an integrated aircraft/system annual and quarterly plan & monthly and weekly schedule to support maintenance and operational requirements.

14.5.1.5. **(AFMC)** See **Attachment 8** for additional information on planning for test unit scheduling.

14.5.1.5.1. Plans will be developed, coordinated and consolidated jointly by the OSS's Current Operations Flight Scheduling, and PS&D. **(T-1)**.

14.5.1.5.2. The printed wing plan will include an assessment of the wing's ability to execute the FHP and will be coordinated with the OG/CC and MXG/CC before being approved by the WG/CC. **(T-1)**.

14.5.1.5.3. Plans and schedules may be published via electronic means (such as, web pages, SharePoint®, or e-mail) provided operations security is not compromised.

14.5.1.5.4. Normal daily operations and training schedules are For Official Use Only (FOUO) and shall not be restricted to classified systems. **(T-2)**.

14.5.1.5.5. **(Added-AFMC)** The principal area of concern is the overall flying/ground test schedule. For mission accomplishment and improved efficiency, the following must be considered: maximize crew training on all flights, plan alternate missions when possible, ensure configurations and fuel loads are accurate, and establish launch and recovery patterns, and utilize historical attrition data. **(T-2).**

14.5.2. First Look Requirements. The First Look report is an internal wing document intended to highlight potential maintenance-capacity and operational-requirement disconnects in the upcoming year. Every year, NLT 15 March, PS&D will coordinate with MMA, AMXS and MXS work centers to provide PS&D with historical attrition and projected manning production. **(T-2)**. This assessment will take into account personnel, facilities, and airfield infrastructure for each aircraft maintenance organization.

14.5.2.1. In wings operating aircraft supported by the MxCAP2 model, PS&D will coordinate with the AMXS Operations Officer/MX SUPT to establish local requirements, responsibilities and procedures for utilizing the MxCAP2 model to develop, sustain or reflow FHP/contingency requirements. **(T-2)**.

14.5.2.1. **(AFMC)** See deviation at **paragraph 2.2.4.3**.

14.5.2.2. The assessment will be provided to PS&D NLT the last workday of March. **(T-2)**. **Note:** AMC units tasked by the 618th Air and Space Operations Center will adhere to the CAAP policies and procedures.

14.5.2.3. PS&D will provide copies of the capability assessment to each OS scheduling section and maintenance supervision. **(T-1)**.

14.5.2.3.1. The assessment will provide first look maintenance capability projections in a monthly format IAW MAJCOM guidance. **(T-2)**.

14.5.2.3.1. **(AFMC)** Refer to **Attachment 8** **(T-2).**

14.5.2.3.2. The assessment will include operational requirements taking into consideration historical data that determines the average number of aircrew not available per month (DNIF, PME attendance, Leave, TDY, deployments), an assessment of maintenance ability to support the monthly requirement and an overall assessment of the unit's maintenance capability to meet the annual FHP (N/A for AMC units). **(T-2)**.

14.5.2.4. OS and maintenance responses are sent to PS&D and OSS's Current Operations Flight Scheduling and will be consolidated into a comprehensive package that includes a breakdown of the following items by OS:

14.5.2.4.1. Sortie UTE Rates (N/A to AMC units). **(T-2)**. Compute UTE rates by month for the entire FY for contracted (required) sorties and scheduled sorties using the formula: (number of sorties per month) divided by (number of Primary Aerospace Vehicle (Aircraft) Inventory (PAI) aircraft).

14.5.2.4.2. Sorties contracted/scheduled per day (N/A to AMC units). **(T-2)**. Compute the number of sorties required per operations and maintenance (O&M) day to meet the operational requirement using the following formula: (Number of Sorties Required) divided by (Number of O&M days in a Given Month). Sorties per day need to be computed by month for the entire FY.

14.5.2.4.3. Monthly scheduled sorties (N/A to AMC units). **(T-2)**. Compute monthly scheduled sortie requirements using the following formula: (Number of Sorties or Hours Required) divided by (1 Minus the Attrition Factor). For example, (1,000 sorties or hours required) divided by (1 minus 0.15) equals 1,177 sorties or hours to schedule. Round any part to the next whole sortie or hour.

14.5.2.4.4. Inspection dock capability. **(T-2)**.

14.5.2.4.4.1. Compute the number of PH/ISO inspections to be accomplished for each maintenance unit, by month, for the entire FY in order to meet operational requirements.

14.5.2.4.4.2. Compute dock capability using the following formula: (Number of O&M Days) divided by (Number of PH/ISO Days) multiplied by (Inspection Cycle) = Inspection Dock Capability. Inspection dock capability is provided at the wing level and provided by the squadron performing inspections.

14.5.2.5. Once compiled, first look packages will be presented to the OG and MXG/CCs before being presented to the WG/CC. **(T-1)**.

14.5.2.5. **(AFMC)** Final assessments of maintenance capabilities to support the operations "first look" projections will be sent to AFMC/A4/10, for awareness. If there are unresolved conflicts between operations and maintenance also send the assessment to AFMC/A3/6 and include any actions requested of MAJCOM **(T-2).**

14.5.3. Annual Maintenance Planning Cycle.

14.5.3.1. MAJCOMs will develop procedures to ensure the objectives of the annual maintenance planning cycle are met.

14.5.3.1.1. At a minimum, MAJCOM procedures will produce an annual flying and maintenance plan that allocates sorties and hours into quarters, is approved by the WG/CC, and published prior to the beginning of the FY.

14.5.3.1.1. **(AFMC)** Refer to **Attachment 8** for Annual Maintenance Planning Cycle procedures.

14.5.3.1.2. Due to the unpredictable nature of most future AMC mission requirements, units tasked by 618th Air and Space Operations Center will prepare flying and maintenance plans with focus on supporting local operational training requirements based on historical data as well as all known future maintenance and operational requirements.

14.5.3.2. Flying Hour Allocation. Using the MAJCOM Baseline Allocation message, PS&D, the OS, and OSS's Operations Scheduling will provide affected work centers the following planning factors NLT 20 August each year, or within 10 working days after receipt of the flying hour allocations:

14.5.3.2.1. PS&D will provide updated capabilities which are computed by MMA and the PDM schedule. **(T-2)**.

14.5.3.2.2. OSS will provide the:

14.5.3.2.2.1. Required flying hours and estimated sorties and missions in monthly increments. **(T-2)**.

14.5.3.2.2.2. Flying days in each month. **(T-2)**.

14.5.3.2.2.3. Aircraft and aircrew alert requirements. **(T-2)**.

14.5.3.2.2.4. Known and projected TDYs and special mission requirements. **(T-2)**.

14.5.3.2.2.5. Configuration and munitions requirements. **(T-2)**.

14.5.3.3. NLT 1 September, or within 10 working days after receipt of the planning factors, maintenance supervision will provide PS&D, SQ/CCs, and OSS's Operations Scheduling the following planning factors:

14.5.3.3.1. Estimated number of aircraft available by month, taking into consideration aircraft required for training. **(T-2)**.

14.5.3.3.2. A projected airframe capability statement. **(T-2)**.

14.5.3.3.3. Forecasted personnel capability, taking into consideration required training for maintenance personnel. **(T-2)**. (N/A to contract maintenance organizations).

14.5.3.3.4. The number of supportable sorties for each month. **(T-2)**.

14.5.3.3.5. An estimated monthly attrition factor provided by MMA. **(T-2)**.

14.5.3.3.5.1. The factor combines operations, weather and materiel (maintenance and supply) factors.

14.5.3.3.5.2. Maintenance is responsible for adding the attrition factor to operational requirements.

14.5.3.3.6. A recommended block scheduling pattern. **(T-2)**.

14.5.3.3.7. A statement of limitations. **(T-2)**.

14.5.3.3.7. **(AFMC)** Refer to **Attachment 8** for test organization limitations and planning factors.

14.5.4. Quarterly Maintenance and FHP Planning. Quarterly planning starts with the operational requirement for flying hours, UTE rate, airframe availability, alert and other related scheduling data.

14.5.4.1. MAJCOMs will develop procedures to ensure the objectives of the Quarterly Planning cycle are met.

14.5.4.1. **(AFMC)** Refer to **Attachment 8** for Test Wing scheduling planning factors. **(T-2).**

14.5.4.2. The OS Operations Officer will provide these requirements to maintenance supervision and PS&D NLT 25 days before the beginning of the quarter. **(T-2)**.

14.5.4.3. Maintenance supervision and the OS Operations Officer will discuss these requirements at the scheduling meeting before the quarter being planned. **(T-2)**.

14.5.4.4. Schedulers will ensure quarterly plans are as detailed and accurate as possible. **(T-2)**.

14.5.4.4.1. Plans should include known special missions, PDM schedules, HHQ commitments and lateral command support requirements.

14.5.4.4.2. All maintenance requirements will be consolidated into a single, quarterly plan using AF Form 2401, Equipment Utilization and Maintenance Schedule, or computer-generated form. **(T-1)**.

14.5.4.4.2.1. Specific locally-developed codes will be used to identify inspections, SI, TCI, and TCTO on the AF Form 2401. **(T-2)**.

14.5.4.4.3. As a minimum, the quarterly plan will show the next 3 months planned sorties and known maintenance requirements. **(T-1)**.

14.5.4.4.3.1. Known maintenance requirements include all maintenance events that impact aircraft availability and require management attention to ensure proper Time Distributed Index flow.

14.5.4.4.3.2. Consolidate as many scheduled maintenance events as practical, to

reduce individual aircraft downtime, increase Aircraft availability, and minimize the number of times per month an aircraft is removed from the schedule due to scheduled maintenance requirements.

14.5.4.4.3.2.1. The intent is to reduce the number of times per month an aircraft is removed from the schedule for scheduled maintenance, thus increasing aircraft availability.

14.5.4.4.3.2.2. Unit/Wing/MAJCOM requests to change the frequency of -6 TO requirements to increase bundling opportunities will be submitted through the applicable Lead Command for consideration and/or resolution. **(T-2)**.

14.5.4.4.3.3. To prevent operational utilization for that day(s) flying schedule, the quarterly plans will include, at a minimum, calendar inspections that hold an aircraft down, calendar TCIs, TCTOs in workable status, PDM schedules, training aircraft, cannibalization aircraft and aircraft ISO/PE/PH inspections. **(T-2)**.

14.5.4.4.3.4. Other maintenance requirements, such as engine changes, hourly requirements, acceptance/transfer inspections, training aircraft and cannibalization aircraft will be posted as they become known or planned. **(T-2)**.

14.5.4.4.3.5. Add AME inspections to the quarterly plan if the aircraft is scheduled to stay in that configuration to ensure the inspections are included in the monthly and weekly schedules. **(T-2)**.

14.5.4.4.4. Revise weekly schedule and monthly plan to meet the quarterly plan objectives while staying within the maintenance capability. **(T-2)**.

14.5.4.4.5. Use the following priority to determine which objectives to support if a lack of resources prevents meeting requirements:

14.5.4.4.5.1. Alert commitments. **(T-2)**.

14.5.4.4.5.2. HHQ directed missions. **(T-2)**.

14.5.4.4.5.3. Training. **(T-2)**.

14.5.4.5. The OG/CC and MXG/CC (or equivalent) chair a quarterly meeting NLT 14 days before the next quarter.

14.5.4.5.1. OSS's Current Operations Flight Scheduling will compile, coordinate and brief the unit's quarterly plan and include operational requirements, support capability and any difficulties expected. **(T-2)**.

14.5.4.5.2. Once an approved quarterly plan is established, OSS's Current Operations Flight, Scheduling will forward a copy to the OS, AMXS, OG/CC and MXG/CC along with all scheduling agencies. **(T-2)**.

14.5.4.5.3. The plan will be posted so it may be viewed by both maintenance and operations. **(T-2)**.

14.5.4.5.3. **(AFMC)** Refer to **Attachment 8** for annual flying plan additional requirements. **(T-2).**

14.5.5. Monthly Maintenance and FHP Planning.

14.5.5.1. Wings will develop procedures to ensure the objectives of the monthly planning cycle are met. **(T-2)**.

14.5.5.1. **(AFMC)** Refer to **Attachment 8** for test scheduling flexibility. **(T-2).**

14.5.5.1.1. Include predictable maintenance factors based on historical data along with other inputs, such as flow times for maintenance, turnaround times and parts replacement schedules.

14.5.5.1.2. MAJCOMs will develop maintenance scheduling effectiveness guidance in their supplements to this AFI. **(T-2)**.

14.5.5.1.2. **(AFMC)** Refer to **Attachment 8** for maintenance scheduling effectiveness guidance. **(T-2).**

14.5.5.2. The monthly flying and maintenance plan schedule refines the quarterly plan by combining all aspects of aircraft utilization and will include:

14.5.5.2.1. A detailed monthly operations utilization calendar that specifies total aircraft flying hours, total sorties and missions, alert requirements, scheduled sortie or mission requirements and daily turn plans for each MDS by squadron, group or wing. **(T-2)**.

14.5.5.2.1.1. Do not assign attrition sorties to a specific aircrew/mission for the monthly planning process. **(T-2)**.

14.5.5.2.2. Monthly maintenance requirements (as required). **(T-2)**.

14.5.5.2.3. Transient work schedule, if applicable. **(T-2)**.

14.5.5.2.4. Scheduled inspections, TCTOs, engine changes, time changes, DDs, contract or depot maintenance, washes, corrosion control, training aircraft and all other known maintenance requirements. **(T-2)**.

14.5.5.2.5. SE scheduled inspections, contract or depot maintenance, TCTOs, time changes, DDs, washes and corrosion control. **(T-2)**.

14.5.5.2.6. Avionics and other off-equipment maintenance scheduled inspections, TCTOs, assembly or repair operations. **(T-2)**.

14.5.5.2.7. Engine/module 6-month removal forecast and in-shop inspection requirements. **(T-2)**.

14.5.5.2.8. Munitions, photo, ECM and other mission loading or configuration requirements, including ammunition changes. **(T-2)**.

14.5.5.2.9. Total ordnance requirements for aircraft support. **(T-2)**.

14.5.5.2.10. Tanks, Racks, Adapters and Pylons and WRM scheduled inspections, TCTOs, assembly or repair operations. **(T-2)**.

14.5.5.2.11. Monthly training schedules, if not published separately. **(T-2)**.

14.5.5.2.12. Detailed support requirements (such as, Petroleum, Oil, and Lubricants servicing, supply, food service, fire department, security, civil engineer, and airfield operations requirements). **(T-2)**.

14.5.5.2.13. All known operational events (such as, exercises, deployments, surges) to determine maintenance capability to meet operational needs. **(T-2)**.

14.5.5.2.13. **(AFMC)** Refer to **Attachment 8** for test operational needs and maintenance requirements for monthly scheduling.

14.5.5.2.14. **(Added-AFMC)** The monthly maintenance plan may be published separately or as an annex to the last weekly schedule of the preceding month. If published separately, distribute the plan NLT five calendar days before the beginning of the month. **(T-2).**

14.5.5.3. Monthly planning cycle requirements.

14.5.5.3.1. NLT the first weekly scheduling meeting of the month, the OS Operations Officer will provide maintenance supervision and PS&D with the estimated operational needs for the following month in as much detail as possible. **(T-2)**.

14.5.5.3.1.1. To optimize aircraft and munitions support, CMS, EMS, MUNS, MXS, AMXS, and OS will ensure the number of aircraft, and/or munitions configurations, are minimized and standardized. **(T-2)**.

14.5.5.3.1.2. Include known takeoff times, landing times and flying hour windows. **(T-2)**. **Note:** Landing times are not required if the unit has an established and constant average sortie duration.

14.5.5.3.2. The OS Operations Officer and maintenance supervision will review their applicable portion of the monthly maintenance plan and weekly schedule prior to submission to PS&D. **(T-2)**.

14.5.5.3.3. NLT the second weekly scheduling meeting of the month, AMXS maintenance supervision will notify the OS Operations Officer whether requirements can be met or limitations exist and collectively make necessary adjustments to the proposed schedule to satisfy maintenance and operational requirements. **(T-2)**.

14.5.5.3.4. MXG/CC and OG/CC will formalize the next month's flying and maintenance plan prior to presenting it to the WG/CC for approval NLT the third scheduling meeting of the preceding month. **(T-2)**.

14.5.5.4. WG/CC's monthly scheduling meeting.

14.5.5.4.1. OS scheduling will outline past accomplishments, status of flying goals, problems encountered and detailed needs for the next month. **(T-2)**.

14.5.5.4.2. PS&D will outline projected maintenance capability and aircraft/equipment availability. **(T-2)**.

14.5.5.4.3. If conflicts arise between operational requirements and maintenance capability, present alternatives and limitations, the MXG/CC (or equivalent), OG/CC and WG/CC will decide what portion of the mission to support and to what degree. **(T-2)**.

14.5.5.5. When the WG/CC approves/signs the proposed monthly flying plan, PS&D will include it as a portion of the monthly flying and maintenance plan. **(T-2)**. Monthly plans may be published electronically provided local security requirements are met.

14.5.6. Weekly Scheduling. The weekly schedule is the final refinement to the monthly plan and results in the weekly flying and maintenance schedule.

14.5.6.1. Wings will develop procedures to ensure the objectives of the weekly scheduling process are met. **(T-2)**.

14.5.6.1. **(AFMC)** Refer to **Attachment 8** for Test Wing weekly scheduling guidance.

14.5.6.1.1. PS&D will review matrix/chart depicting the total number of SI and TCI requirements to be loaded in the MIS for each assigned aircraft/system and verify against the MIS totals weekly. **(T-1)**. Overdue and uncorrected discrepancies will be briefed weekly during a daily production/scheduling meeting chaired by the MXG/CD (or equivalent). **(T-2)**.

14.5.6.2. NLT 2 workdays before the weekly scheduling meeting, the OS Operations Officer will provide maintenance supervision the following information (as required for missile units):

14.5.6.2.1. Aircraft takeoff and landing times. **(T-2)**.

14.5.6.2.2. Configuration requirements. **(T-2)**.

14.5.6.2.3. Munitions requirements. **(T-2)**.

14.5.6.2.4. Fuel loads. **(T-2)**.

14.5.6.2.5. Special or peculiar mission support requirements. **(T-2)**.

14.5.6.2.6. Alert requirements. **(T-2)**.

14.5.6.2.7. Exercise vulnerability. **(T-2)**.

14.5.6.2.8. Deployments. **(T-2)**.

14.5.6.2.9. Off-base sorties. **(T-2)**.

14.5.6.2.10. On-equipment training requirements. **(T-2)**.

14.5.6.2.11. Other special requirements. **(T-2)**.

14.5.6.2.12. All mission unique requirements are annotated by OS Operations Officers on the weekly and daily flying schedule. **(T-2)**.

14.5.6.2.12. **(AFMC)** Refer to **Attachment 8** for additional maintenance debrief considerations for sorties considered “flown as scheduled”.

14.5.6.3. Home and deployed units will publish a weekly schedule. **(T-1)**. Include the following in the weekly flying and maintenance schedule:

14.5.6.3.1. Sortie sequence numbers, aircraft tail numbers (primary and spares), scheduled takeoff and landing times, aircraft or equipment scheduled use times, configurations, fuel loads, and special equipment requirements. **(T-2)**. Units that fly a published and constant average sortie duration need not publish land times.

14.5.6.3.2. Spare aircraft requirements. **(T-2)**. Spare requirements are printed by day for each maintenance unit. Generate only the absolute minimum of spare aircraft.

14.5.6.3.2. **(AFMC)** Refer to **Attachment 8** for test mission spare aircraft requirements. **(T-2)**

14.5.6.3.3. Scheduled maintenance actions, by aircraft and equipment serial number, to include inspections, TCTOs, time changes, contract and depot inputs, engine changes, washes or corrosion control, document reviews and DDs. **(T-2)**.

14.5.6.3.4. Required pre-inspection and other maintenance/scheduling meetings. **(T-2)**.

14.5.6.3.5. Wash rack use. **(T-2)**.

14.5.6.3.6. On-equipment training requirements. **(T-2)**.

14.5.6.3.7. AGE inspections or maintenance schedule by type and ID number. **(T-2)**.

14.5.6.3.8. MAJCOMs will develop standardized procedures to record and coordinate changes to the weekly schedule using an AF Form 2407 or electronic equivalent. Include minimum approval levels for approving changes to the weekly schedule.

14.5.6.3.8. **(AFMC)** See **Attachment 8** for changes to the weekly schedule and Pen-and-Ink processes.

14.5.6.3.9. Any change to the printed schedule will require an AF Form 2407 with the following exceptions: a change to the original printed takeoff or landing time of 15 minutes or less; a change of aircrew names, ranges, or airspace; or a change arising after the first crew ready time for the squadron's current day's scheduled flying window. **(T-2)**.

14.5.6.3.9. **(AFMC)** Refer to **Attachment 8** for specific AF 2407 requirements in test organizations. **(T-2).**

14.5.6.3.9.1. Changes made during the daily scheduling meeting also require an AF Form 2407. **(T-2)**.

14.5.6.3.9.2. The agency requesting the change initiates the AF Form 2407 and coordinates it IAW MAJCOM procedures. **(T-2)**.

14.5.6.3.9.2. **(AFMC)** Refer to **Attachment 8** under Changes to the Weekly Schedule. **(T-2).**

14.5.6.4. The OS Operations Officer and Maintenance Supervision will review and coordinate on the proposed weekly flying and maintenance schedule with OS, AMXS, MXS, CMS, and EMS prior to presenting it to the OG/CC and MXG/CC (or equivalent). **(T-1)**.

14.5.6.5. The approved schedule will be submitted to PS&D for compilation and a complete copy provided to the WG/CC. **(T-3)**.

14.5.6.6. At the weekly scheduling meeting wings will evaluate the past week's accomplishments (to include flying and MSE) and negotiate/approve refinements to the coming week's schedule. **(T-2)**.

14.5.6.6.1. The AF Form 2402, *Weekly Equipment Utilization and Maintenance Schedule*, or locally developed product, will be used to summarize the upcoming week's schedule. **(T-2)**.

14.5.6.6.2. The AF Form 2403, *Weekly Aircraft Utilization/Maintenance Schedule*, or locally-developed equivalent product that contains all requirements and creates a finite depiction of aircraft utilization and maintenance. **(T-2)**.

14.5.6.7. Once the weekly schedule is reviewed and signed by the OG/CC, MXG/CC (or equivalent), and WG/CC it becomes the final planning guide for both operations and maintenance and the basis for deviation reporting. **(T-1)**.

14.5.6.7.1. The schedule will be followed as printed or as amended by coordinated changes. **(T-1)**.

14.5.6.7.2. Coordinated changes do not negate reporting deviations IAW MAJCOM guidance.

14.5.6.8. PS&D will distribute the schedule to each appropriate activity and work center NLT time determined in MAJCOM supplements to this AFI. **(T-2)**.

14.5.6.8. **(AFMC)** PS&D distributes the schedule to each appropriate activity and work center NLT 1200 Friday preceding the effective week. **(T-2).**

14.5.6.8.1. Weekly schedules may be published electronically provided local security requirements are met.

14.6. Contingency and Expeditionary Responsibilities.

14.6.1. Responsibilities of Contingency/Expeditionary (Cont/Exp) units, for example, maintaining non-assigned aircraft. **Note:** This does not include AMC-established enroute stations.

14.6.1.1. Most planning and scheduling is the responsibility of units with assigned aircraft and is provided through reachback support to home stations. Contingency units have fewer responsibilities as described below. Commanders of expeditionary units will ensure the intent of the guidance is met, when the dynamic nature of a Cont/Exp organization make strict adherence impossible. **(T-1)**.

14.6.1.2. Cont/Exp PS&D will conduct the following programs as outlined below:

14.6.1.2.1. ADR, pre- and post-dock meetings, acceptance inspections (from DFT/CFTs) and the major work program. **(T-1)**.

14.6.1.2.1.1. Cont/Exp PS&D will use the procedures developed by the aircraft-owning organizations. **(T-1)**.

14.6.1.2.1.2. If aircraft from multiple bases/units are supported, procedures do not have to be standardized.

14.6.1.3. Ensure discrepancies noted by the aircraft-owning PS&D for the Aircraft Configuration Management, TCI and SI programs are corrected. **(T-1)**. Cont/Exp PS&D will not develop programs independent of the aircraft owning organization. **(T-1)**.

14.6.1.4. Develop local coordination procedures for contingency aircraft affected by Immediate and Urgent Action (I/UA) TCTOs. **(T-1)**.

14.6.1.5. When notified by the aircraft-owning organization of an I/UA TCTO, the Cont/Exp PS&D will host a TCTO meeting. **(T-1)**.

14.6.1.5.1. The purpose of the meeting is to determine if the Cont/Exp unit has the maintenance capability to perform the TCTO.

14.6.1.5.1.1. Invite AMU, QA and affected work centers. Cont/Exp will notify the Expeditionary Maintenance Group Commander (EMXG/CC) of the unit's capability to perform the TCTO. **(T-1)**.

14.6.1.5.1.2. Develop and implement local tracking methodology to track TCTO completion. **(T-1)**.

14.6.1.5.1.3. Update MIS when the aircraft-owning Cont/Exp PS&D loads the requisite JST/JCNS. **(T-1)**.

14.6.1.5.1.4. If the Cont/Exp unit does not have the maintenance capability to perform the TCTO, Cont/Exp PS&D will notify the owning organization of that inability. **(T-1)**.

14.6.1.5.2. Cont/Exp PS&D will only maintain aircraft I/UA TCTO files while active. **(T-1)**.

14.6.1.5.2.1. Once TCTOs are completed and loaded in MIS, records will be sent to home station for filing. **(T-1)**.

14.6.1.5.2.2. A TCTO meeting is not necessary for Routine Action aircraft TCTOs.

14.6.1.5.3. A full TCTO program IAW this **Chapter** is required for AGE and other special equipment which is assigned to the contingency unit. **(T-1)**. This is intended to cover equipment that does not rotate with aviation packages.

14.6.1.5.4. Monthly and weekly maintenance planning. Cont/Exp PS&D will produce maintenance plans detailing all known maintenance requirements for the upcoming month/week. **(T-1)**.

14.6.1.5.4.1. This plan will detail by tail number, due date, JST and a description of the scheduled maintenance required for the time period. **(T-1)**.

14.6.1.5.4.1.1. Use of the AF Form 2401 is not required.

14.6.1.5.4.1.2. The list will be published 2-days prior to the covered time period, coordinated through maintenance supervision, and approved by the EMXG/CC. **(T-3)**.

14.6.1.5.4.2. The weekly schedule will additionally identify those actions which will be deferred. **(T-1)**.

14.6.1.5.4.2.1. It will specifically identify if the action is deferred for mission requirements or due to a lack of capability. **(T-1)**.

14.6.1.5.4.2.2. Actions which are not identified as "pre-deferred" are expected to be accomplished during the upcoming week.

14.6.1.5.4.3. MSE will not be calculated for Cont/Exp units. **(T-2)**. It is anticipated that Cont/Exp units require a great deal of flexibility to meet mission requirements.

14.6.1.6. Cont/Exp organizations are not responsible for Aircraft Generation Planning, Transfer Inspections, Flying/Maintenance Planning Cycle, First Look, Annual/Quarterly Mx Planning, AVDO and 2R1 functional management responsibilities.

14.6.1.7. Cont/Exp PS&D will develop procedures with home station AVDOs to communicate and ensure AVDO responsibilities are performed. **(T-1)**.

14.7. (Added-AFMC) Depot Pre-Induction Inspection (DPII). DPIIs are designed to determine the aircraft condition lead-time before induction to depot maintenance. Depot teams use the aircraft condition knowledge to establish a supportable Bill of Work (BOW) process for specific repair actions, parts, tools, and equipment; i.e., generating what needs to be done, with what, and ensuring it will be there when planned. DPIIs are synchronized with the HSC, Phase, or ISO prior to depot input on MDS directed by program office. DPII can be a physical inspection or a pre-induction analysis of records. The determination on who will accomplish the DPII (Depot Team, Contract Team, or Field Unit) will be negotiated during the Fleet Scheduling Conferences. At that time the Depot schedules are established with arrival dates of the aircraft at the respective Air Logistic Complexes. As part of the conference the DPII will be "scheduled" ~9 months prior to induction to Programmed Depot Maintenance (PDM). The MAJCOM/Unit Representative will declare their intent to accomplish "Organizationally" or request DFT/CFT support for the DPII. If none of these options are feasible at a particular time, any aircraft not receiving a DPII would still be inducted into PDM. **(T-2).**

14.7.1. **(Added-AFMC)** If a depot or contract team is accomplishing the PII, the PS&D Section Chief or designated representative will:

14.7.1.1. **(Added-AFMC)** Be provided a visit agenda by the DPII team lead. **(T-2).**

14.7.1.2. **(Added-AFMC)** Coordinate with PII team lead to present situational awareness in/out-brief to the MXG as required. **(T-2).**

14.7.1.3. **(Added-AFMC)** Coordinate/request tail number data pull queries from applicable MIS. **(T-2).**

14.7.1.4. **(Added-AFMC)** Act as liaison and refer DPII team to maintenance units for equipment support as required. (T-2).

14.7.1.5. **(Added-AFMC)** Maintain a file copy of the DPII report from DPII Team Lead. **(T-2).**

Chapter 15

AIRCRAFT SUN SHADE SUSTAINMENT

15.1. Purpose: This **Chapter** outlines overall management responsibilities for aircraft sun shades, crew shelters and portable/inflatable shelters. Additionally, it provides guidance and a standardized approach to procure and sustain these equipment items.

15.2. Scope: Applies to all AF units possessing or procuring these equipment items to support logistics operations and flight line or maintenance areas. This includes conventional force logistics units; nuclear and nuclear support units; cyber and space; special operations; wholesale-level procurement, sustainment, and maintenance; aerial port squadrons; logistics readiness squadrons; research, test, and development units. It does not include medical logistics, civil engineering logistics, security forces units and communications units.

15.2.1. Aircraft sun shades and other shelter types as defined below and addressed in this **Chapter** are considered equipment items for accountability purposes and will be tracked/ accounted for on appropriate documents on a CA/CRL and managed IAW AFMAN 23-122. **(T-1)**.

15.2.1.1. These assets are not listed on unit authorized equipment tables of allowance because they are not required support equipment for weapons systems. These assets are the responsibility of the owning organization.

15.2.1.2. Commanders will ensure all other applicable organizations with appropriate subject matter expertise are involved in the procurement, installation, repair, sustainment, and replacement of these assets. **(T-1)**.

15.2.1.3. Aircraft sun shades are not considered as temporary or relocatable facilities associated with Military Construction (MILCON) projects. Procedures for temporary or relocatable facilities associated with MILCON projects are contained in AFI 32-1021, *Planning and Programming Military Construction (MILCON) Projects*. Relocatable buildings are designed to be readily erected, disassembled, stored, moved, and reused to meet a short-term requirement for facilities due to either transitory peak requirements or urgent requirements pending approval, such as construction of facilities via normal military construction programs. According to AFI 32-1021, **Chapter 6**, Relocatable and Temporary Facilities, the terms temporary and relocatable are interchangeable. Furthermore, AFI 32-1021 provides guidance on satisfying interim facility requirements using relocatable or temporary facilities. Aircraft sun shades are not incident or interim to a MILCON project, nor are they in place to meet a temporary requirement; therefore the terms temporary or relocatable as used in AFI 32-1021 do not apply to aircraft sunshades.

15.2.1.4. Aircraft sun shades are not intended to replace aircraft maintenance hangars and as such there is no requirement associated with aircraft specifications or square footage allowances contained in AFMAN 32-1084.

15.3. Definitions.

15.3.1. Aircraft Sun Shades: Structure with the sole purpose of providing minimal protection for personnel from the elements (sun, wind, rain, snow, excluding lightning) with a roof and a maximum of two sides.

15.3.2. Crew Shelters: Any portable or prefabricated structure placed inside, under or erected to support activities within an aircraft sun shade, hangar, hardened aircraft shelter or protective aircraft shelter. These should not be confused with other shelters that are designed for personnel protection only (such as, End-of-Runway shacks).

15.3.3. Portable/Inflatable shelters: A structure constructed using layers of membrane connected together using pressurized air to produce a structure which covers limited areas (such as, cargo aircraft engine, open fuel tanks) of an aircraft or equipment.

15.3.4. Allied support: Utilities (electrical, water, air, communications) provided up to a stub at each aircraft sun shade. Utilities are real property assets. Installation of new utility services carries a work classification of Construction. See **Paragraph 15.11**

15.4. Headquarters Air Force.

15.4.1. AF/A4L will:

15.4.1.1. Develop, articulate, and clarify all AF aircraft sun shade policies.

15.4.2. The Directorate of Civil Engineers (AF/A4C) will:

15.4.2.1. Provide input for development and clarification of aircraft sun shade policies.

15.4.2.2. Determine appropriate A4C agencies responsible for procurement consultation to the field.

15.4.2.3. Develop allied support guidance in relation to aircraft sun shades.

15.5. MAJCOM A4s will:

15.5.1. Provide input to AF/A4L on AF aircraft sun shade policies.

15.5.2. Review all plans for procurement, installation and sustainment of aircraft sun shades for initial procurement with assistance from MAJCOM/A3, A4, Safety, AF Installation and Mission Support Center (AFIMSC) or Primary Subordinate Unit (PSU) Air Force Civil Engineer Center (AFCEC) as outlined in **Paragraphs 15.7.1.11** and **15.8**.

15.5.3. Develop weather event baseline criteria if not previously developed so an organization can procure an acceptable aircraft sun shade suitable to its specific location. Consider annual days of sun, average wet bulb globe temperature, annual rainfall, and annual snowfall, UV index, snow load, snow removal capability, wind sustainment requirements and temperatures that may affect work-rest cycles and overall productivity.

15.5.4. Review and coordinate all plans with MAJCOM/A3, A4, Safety, AFIMSC or PSU AFCEC and the proper civilian airport authorities (when applicable) prior to approving the procurement or installation of aircraft sun shades.

15.5.5. Approve/disapprove submitted request(s) based on information contained under the owning organization responsibilities section of this **Chapter**.

15.5.6. Provide field operating and sustaining organizations direction on the specific types and sizes of aircraft sun shades to use for each application.

15.6. Owning Organization.

15.6.1. The owning organization is the group level or equivalent organization responsible for the planning, funding, procurement, installation, maintenance, and lifetime sustainment of the

aircraft sun shade including any installed utilities (lighting, obstructions in front of lighting, electrical, communications included in the project scope as defined in **Paragraphs 15.3.4** and **15.8.8**. **(T-1)**.

15.6.1.1. Owning organizations may install aircraft sun shades, upon MAJCOM/A4 approval, to provide protection from the sun or other weather events such as: rain, sleet, snow. **(T-1)**.

15.6.2. Owning organizations are responsible for the aircraft sun shade grounding system beginning at the single point service ground. Owning organizations shall test the aircraft sun shade grounding system IAW AFI 32-1065, *Grounding Systems*. **(T-1)**. **Note:** These responsibilities can be contracted as outlined in **Paragraph 15.8.8**

15.6.2.1. Owning organizations will ensure that Base Civil Engineer accepts the Lightning Protection Systems prior to accepting the facility, ensuring the lightning protection system is compliant and that the facility is immediately usable IAW AFI 32-1065. **(T-1)**.

15.6.3. The owning organization is responsible for maintaining and storing manufacturer design drawings and specifications, and providing ready access to installation agencies as necessary. **(T-1)**.

15.6.4. For each procurement, and each aircraft sun shade related contracting effort (such as inspection and sustainment contracts) referenced in **Paragraph 15.10.3**, the owning organization will provide and appoint a Contracting Officer Representative (COR) who reports to the contracting officer on all aspects of implementation of the contract. **(T-1)**.

15.6.4.1. For these same procurements and contracting actions, the owning organization will, in agreement with the local Civil Engineering organization request a Civil Engineering representative to advise on technical requirements of the procurement. **(T-1)**.

15.6.4.2. The CE advisor will assist the COR in:

15.6.4.2.1. Enforcing established engineering standards or inspection criteria as defined and incorporated in the procurement/sustainment contract in order to address safety and integrity of the structure. **(T-1)**.

15.6.4.2.2. Providing quality oversight authority for any technical/serviceability inspections performed on the structure by the contractor. **(T-1)**.

15.7. New Procurements.

15.7.1. The owning organization will:

15.7.1.1. Develop plans for purchase, installation, acceptance and sustainment then submit information to the MAJCOM/A4 for plan approval. **(T-2)**. If the owning organization intends to request allied support, the owning organization shall include these costs in the forecast. If allied support is required, submit an AF Form 332, *Base Civil Engineer Work Request*, or service/work request to Civil Engineering Customer Service prior to solicitations, purchases, or procurements. **(T-2)**.

15.7.1.2. Refer to AFI 65-601, Volume 1, *Budget Guidance and Procedures*, and AFI 65-601, Volume 2, *Budget Management for Operations* to determine correct appropriation for procurement and installation of aircraft sun shades or crew shelters described in this publication. Plan and fund current equipment sustainment IAW **Paragraph 15.10** **(T-1)**.

15.7.1.3. Use strategic sourcing, if available, for standardization and to leverage buying power from an enterprise perspective. **(T-1)**.

15.7.1.4. Ensure all facets of aircraft sun shade sustainment are considered; all applicable installation functional areas (CE community planner, Airfield Management, Comm, Safety, Medical) are involved in the siting and selection process, and is approved by the installation's facility board prior to solicitation and procurement. **(T-1)**.

15.7.1.4.1. If expertise is not available in the owning organization, contact the appropriate MAJCOM representative for further guidance. All new sun shades will be compliant with current applicable structural, environmental and safety standards. **(T-1)**. Ensure compliance with criteria and design as outlined in **Paragraph 15.8**

15.7.1.5. Submit planning materials to include drawings, dimensions, cost estimates and statements of work, as well as ramp work striping and support equipment requirements to their applicable MAJCOM/A4. **(T-2)**. **Note:** This must be completed as early as possible in the planning phase to facilitate a smooth execution phase.

15.7.1.6. Ensure use of reflective markings on corner structural supports regardless of lighting used. **(T-2)**.

15.7.1.7. Ensure use of retro reflective beads for all apron, taxiway and taxilane markings near aircraft sun shades. **(T-1)**. Reference Engineering Technical Letter 04-2, *Standard Airfield Pavement Marking Schemes* and Unified Facilities Guide Specifications 32-17-23, *Pavement Markings* and AFMAN 32-1040, *Civil Engineering Airfield Infrastructure Systems.*

15.7.1.8. Perform an evaluation of all proposed sun shade installation plans to ensure requirements in Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design* are met. If waivers are required, those waivers must be approved prior to contract award of the sun shade. **(T-1)**.

15.7.1.8.1. Ensure waiver authorities do not undermine contract requirements or federal regulations (example Federal Acquisition Regulation, Department of Defense Federal Acquisition Regulation Supplement). **(T-0)**.

15.7.1.9. Ensure aircraft sun shades that penetrate an airfield imaginary surface defined in UFC 3-260-01 have obstruction lights installed IAW UFC 3-535-01, *Visual Air Navigation Facilities*, and conform to requirements contained in AFMAN 32-1040. **(T-1)**.

15.7.1.10. Ensure compliance with fuel servicing safety requirements in accordance with TO 00-25-172. **(T-1)**.

15.7.1.11. Address the following items and those in **Paragraph 15.8** and below as a minimum in installation plans submitted to applicable MAJCOM/A4 for approval. **(T-1)**.

15.7.1.11.1. Aircraft sun shade protection characteristics such as hail size, snow, ice and water accumulation (weight and/or inches, consider water runoff, ice mitigation), maximum winds (sustained and gusts), aircraft tie down and lightning/grounding protection determined in conjunction with proper local authorities or AFIMSC/PSU AFCEC. **(T-1)**.

15.7.1.11.2. Ensure Sun shades are designed in accordance with UFC 3-301-01, *Structural Engineering*, and UFC 3-310-04, *Seismic Design*. **(T-1)**. **Note:** Consider jet blast potential in aircraft sun shade design and siting.

15.7.1.11.3. Number of spots to be covered. Consider ramp space capacity for both peacetime and contingency requirements (reception and bed down). **(T-1)**.

15.7.1.11.4. Number of parking spaces lost due to aircraft sun shade placement. Consider ramp requirements, future mission changes, and impact on overall aircraft parking plan. **(T-1)**.

15.7.1.11.5. Design life expectancy and warranty information. **(T-1)**.

15.7.1.11.6. Expected costs including procurement, installation, and projected annual sustainment costs, to include inspection services. Ensure adequate resources are established to maintain aircraft sun shade serviceability and mission accomplishment. **(T-1)**.

15.7.1.11.7. Sustainment methodology (owning organization supported, manufacturer supported, supplemental contractor). Ensure minimum requirements outlined in **Paragraph 15.10.3** are addressed. **(T-1)**.

15.7.1.11.7.1. Ensures the sustainment tail is covered and doesn't need to survive only on end of year fall out. **(T-1)**.

15.7.1.11.8. Foreign Object Damage (FOD) mitigation and prevention. **(T-1)**.

15.7.1.11.9. Planned storage of Aerospace Ground Equipment (AGE) and other related support equipment in aircraft sun shades within the maintenance area. **(T-1)**.

15.7.1.11.10. Provisions for electrical power units or powered AGE placement and protection from equipment exhaust and aircraft jet blast while operating in/near aircraft sun shades. **(T-1)**.

15.7.1.11.11. Environmental impacts and mitigation plans. Ensure the host Environmental Planning Function reviews proposals for installation of aircraft sun shades and associated utilities as early in the planning process as possible. The Environmental Planning Function is responsible for determining the level of environmental impact analysis required. Environmental impact analysis must be completed prior to contract award or implementation. **(T-0)**.

15.7.1.11.12. Conduct and include a Risk Management (RM) assessment IAW AFPD 90-8, *Environment, Safety, and Occupational Health Management and Risk Management*, and AFI 90-802, to determine potential impact to personnel, environmental, safety, occupational health and airfield operations before procurement and installation activities begin. **(T-1)**.

15.7.1.11.13. Mitigate any issues affecting control tower visibility or security to include security lighting and illumination and any issues affecting navigational aids. **(T-1)**.

15.7.1.11.14. Mitigate obstructions to airspace and file FAA Form 7460-1, *Notice of Proposed Construction or Alteration*, with the FAA for new construction. **(T-0)**.

15.7.1.11.15. Communications requirements. If communication (Local Area Network (LAN), wireless communications) is placed in aircraft sun shades, provide explanation of how communications will be procured, installed and sustained. Include in procurement, installation, and sustainment cost estimates. **(T-2)**.

15.7.1.11.16. Mitigate any limitations on emergency and maintenance vehicle access to aircraft. **(T-1)**.

15.7.1.11.17. Fall protection for personnel working above 4' off the ground IAW AFMAN 91-203. **(T-1)**.

15.8. Design Criteria/Standards of New or Replacement Aircraft Sun Shades.

15.8.1. Type of material used. Select materials as appropriate for location, type of aircraft sun shade, and the mission being served. The aircraft sun shade and side material shall be fabric, reinforced aramid fiber, carbon fiber, galvanized steel or shop/factory painted steel. **(T-2)**.

15.8.1.1. The frame material will be galvanized steel or other suitable newly designed building material with strength and durability characteristics that replicate or exceed that of galvanized steel. **(T-2)**.

15.8.1.2. Current aircraft sun shades that don't meet these requirements of current design standardization are authorized for use until time of replacement. If repairs become significant or not cost effective, owning organizations shall consider replacement to the new standard or removal of the aircraft sun shade. **(T-2)**.

15.8.1.3. To minimize diversity of types of aircraft sun shades across the enterprise and to establish better efficiencies in procurement and long-term sustainment, use strategic sourcing, if available. If strategic sourcing is not available, seek additional guidance from MAJCOM A4 on aircraft sun shade standardization. **(T-2)**.

15.8.2. Aircraft sun shade height and width. Aircraft sun shades must meet minimum clearance requirements for interior aircraft movement, as well as, entrances and exit points including taxi lanes or taxiways in close proximity to the exterior of the structure. Refer to UFC 3-260-01, **Chapters 6** and **Chapter 8** for these dimensions. **(T-1)**.

15.8.2.1. Consider AGE transport and maintenance/emergency vehicle height requirements. Also, consider exhaust blast from jet engines and auxiliary power units, and future mission changes that may impact aircraft sun shade height and width requirements.

15.8.3. Wing tip and tail height clearances will meet the requirements outlined in AFMAN 91-203 and UFC 03- 260-01. **(T-1)**.

15.8.4. Bird nesting/roosting mitigation. Ensure no bird roosting or nesting locations are present, all holes in support structure and beneath roof must be covered or screened. **(T-1)**.

15.8.4.1. The metal structure should minimize potential nesting sites for birds.

15.8.4.2. Anti-perching devices shall be installed to deter birds from perching on or under the structure. **(T-1)**.

15.8.5. Airfield waivers. The owning organization will make every effort to prevent submission of new airfield waivers. **(T-1)**.

15.8.6. Ensure Terminal Instrument Procedures personnel evaluate plans for potential impacts on aircraft approach/departure procedures. **(T-1)**.

15.8.7. Lighting requirements. If lighting is placed in or on the aircraft sun shades, provide explanation of how electricity will be provided to and within the aircraft sun shade. Ensure lighting provides sufficient illumination for security, but does not interfere with flightline visual references. The procurement of lighting, installation, maintenance and sustainment shall be included in aircraft sun shade cost estimates. **(T-1)**.

15.8.7.1. Lighting designs and fixture specifications shall be IAW UFC 3-530-01, *Interior and Exterior Lighting Systems and Control*. **(T-1)**.

15.8.7.2. Light mounts shall be designed to handle wind loads on the light fixtures without damaging the lights and without compromising the structural integrity of the aircraft sun shade. **(T-1)**.

15.8.8. Electrical requirements. If electrical power is to be placed in aircraft sunshades, provide explanation of how electricity will be provided to and within the aircraft sun shade. Procurement, installation, maintenance and sustainment of electrical requirements on the load side of the power supply point/stub shall be included in aircraft sun shade cost estimates. **(T-1)**.

15.8.8.1. Electrical power system design shall be in accordance with AFI 32-1062, *Electric Systems, Power Plants and Generators*, AFI 32-1065. **(T-1)**. Reference UFC 3-501-01, *Electrical Engineering*, UFC 3-520-01, *Interior Electrical Systems*, UFC 3-530-01, and UFC 3-550-01, *Exterior Electrical Power Distribution*, UFC 3-600-01, *Fire Protection Engineering for Facilities*, and Engineering Technical Letter 02-15, F*ire Protection Engineering Criteria - New Aircraft Facilities*.

15.8.9. The cost of running power (such as, lighting and electrical) from prime or temporary power sources to the sunshades shall be included in the cost estimate and will be borne by the owning unit. **(T-1)**.

15.8.10. In no case will the loss of parking spots resulting from the purchase or installation of aircraft sun shades be a primary factor used to propose or construct additional aircraft parking spots or upgrade existing pavements to support aircraft. Procedures on construction of additional parking spots or pavement upgrades will be IAW AFI 32-1020, *Planning and Programming Built Infrastructure Projects* and AFI 32-1021.

15.8.10.1. Whenever possible, aircraft sun shades will be installed on existing pavement without driving a requirement to expand or upgrade the underlying features. When the addition of pavement is necessary to make the sunshade complete and usable, the cost of the structure must be included with the cost to installation of the pavement for a total sun shade construction project cost. **(T-1)**.

15.8.11. Aircraft sun shades are airfield fixed-structure obstructions and will meet MIL-STD-3007, *Department of Defense Standard Practice for Unified Facilities Criteria and Unified Facilities Guide Specifications* and AF criteria included in referenced UFCs and AFIs, as well as, local and national fire, safety, and electrical standards and codes as applicable. **(T-1)**.

15.8.12. Consider location specific design requirements (snow load, maximum wind ratings). In addition to the requirements in UFC 3-301-01, for adjacent sunshades which share bracing frames, each fourth frame shall provide twice the required lateral bracing strength. **(T-1)**.

15.8.12.1. Particular attention shall be focused on the design of lateral bracing for wind and jet blast loads, fatigue strength of steel lateral bracing members, and the design and location of anchor bolts near joints in runway aprons. **(T-1)**.

15.8.13. Aircraft sun shades must meet ventilation and exhaust air requirements referenced in the International Mechanical Code. **(T-0)**. **Note:** Achieve minimum exhaust and/or ventilation air requirements utilizing either mechanical or natural systems.

15.9. Current Aircraft Sun Shades.

15.9.1. To replace currently installed aircraft sun shades, select materials as appropriate for location, type of aircraft sun shade, and the mission being served. The aircraft sun shade and side material shall be fabric, reinforced aramid fiber, carbon fiber, galvanized steel or shop/factory painted steel. **(T-2)**.

15.9.1.1. The frame material will be galvanized steel or other suitable newly designed building material with strength and durability characteristics that replicate or exceed that of galvanized steel. **(T-2)**.

15.9.1.2. Current aircraft sun shades that don't meet these requirements of current design standardization are authorized for use until time of replacement. **(T-2)**.

15.9.1.3. If repairs become significant or not cost effective, owning organizations shall consider replacement to the new standard or removal of the aircraft sun shade. **(T-2)**.

15.9.1.4. To minimize diversity of types of aircraft sun shades across the enterprise and to establish better efficiencies in procurement and long-term sustainment, use strategic sourcing, if available. **(T-1)**.

15.9.1.5. If strategic sourcing is not available, seek guidance from higher headquarters on aircraft sun shade standardization. **(T-1)**.

15.9.2. Owning organizations will sustain aircraft sun shades and other shelter types described in this publication IAW AFI 65-601, to ensure no degradation of safety to personnel or mission accomplishment occurs. **(T-1)**.

15.9.3. Owning organizations will conduct a risk management assessment IAW AFI 90-802 in conjunction with proper local authorities on current aircraft sun shades for FOD mitigation, markings, bird roosting mitigation, sustainability, safety, structural integrity, wind-load capacity, snow-load capacity, and ability to withstand hail. **(T-1)**.

15.9.3.1. The owning organization is responsible for repairing any deficient areas identified during the risk management assessment. **(T-1)**.

15.9.4. There is no requirement to upgrade current aircraft sun shades to meet the full requirements outlined in **Paragraphs 15.7.1** through **15.7.1.11.16** and **15.8.1** through **15.8.13** except where codes apply and are mandatory. However, any replacement or significant repair of current aircraft sun shades will meet requirements as outlined in **Paragraphs 15.7.1** through **15.7.1.11.16** and **15.8.1** through **15.8.13** **(T-1)**.

15.9.5. Alterations can significantly impact loading on the structure. Conduct a structural analysis certified by a licensed professional engineer or government structural engineer to ensure the alterations do not compromise the structural integrity of the sunshade structure. Sun shades will not be altered to have more than two total walls or bay(s).

15.10. Sustainment and Accountability. Owning organization Group Commander or equivalent will:

15.10.1. Appoint a local aircraft sun shade manager and establish an aircraft sun shade user and operations plan. Ensure assets are tracked as equipment items on the appropriate documents on the CA/CRL IAW AFMAN 23-122.

15.10.2. Ensure appropriate authorities (Maintenance Group (MXG), Contracting, Comm, CE, Safety) at the installation level accept installation of aircraft sun shades and allied support IAW manufacturer specifications, contract specifications, and AFIs. **(T-1)**.

15.10.3. Develop an organically supported or contractor supported replacement/sustainment plan that will be included in the 10-year facility plan IAW this AFI. **(T-1)**. **Note:** This statement does not limit the plan from exceeding the minimum 10-year requirement.

15.10.3.1. Sustainment plan at a minimum will address the following as appropriate:

15.10.3.1.1. Certification and acceptance of installation as needed. **(T-1)**.

15.10.3.1.2. Routine maintenance/sustainment and inspection criteria/services which meets manufacturer or qualified engineering authority (such as, personnel officially trained to inspect or provide technical guidance on that specific Sunshade) guidance as needed and appropriate **(T-1)**.

15.10.3.1.3. Periodic and recurring in-depth inspections with prescribed interval/frequency and items to be inspected to determine structural integrity as appropriately defined for each type of structure by the manufacturer or qualified engineering authority as needed and appropriate **(T-2)**.

15.10.3.1.4. Non-routine maintenance/sustainment and inspection services as needed and appropriate. **(T-2)**.

15.10.4. Ensure development of local policy that establishes PE criteria as recommended by original manufacturer (interval not to exceed 6 months) approved by a qualified engineering authority for aircraft sun shades and document on AFTO Form 244, or equivalent. **(T-1)**.

15.10.4.1. Inspection actions to include upcoming and completed inspections will be tracked in the MIS. **(T-2)**.

15.10.4.2. As a minimum, the owning organization will ensure inspection of:

15.10.4.2.1. Structural Supports for signs of corrosion, excessive movement, cracking or damage; lateral bracing for signs of corrosion, loosening, cracking, missing hardware, or fatigue damage, particularly at the connections; structural anchorage for signs of loosening and cracking around anchorage points on apron. **(T-1)**.

15.10.4.2.2. Foreign Object, cleanliness and serviceability of installed safety markings. **(T-1)**.

15.10.4.2.3. Lighting (if installed) for security and serviceability. **(T-1)**.

15.10.4.2.4. Electrical system equipment, including electrical panels, receptacles, lighting systems, solar panels and conduit (if installed) for security and serviceability. **(T-1)**.

15.10.5. Any discrepancy identified during routine, non-routine maintenance or other visual inspection will be documented on the AFTO Form 244 or equivalent; appropriate condition symbol will be used IAW TO 00-20-1. **(T-1)**.

15.10.5.1. Additionally, all discrepancies will be annotated in the MIS. **(T-1)**.

15.10.5.2. If a discrepancy is discovered which could affect safety or structural integrity this information will immediately be directed to the owning organization group commander or equivalent. **(T-1)**.

15.10.5.3. The owning organization group commander or equivalent with advisement from the qualified engineering authority and safety personnel will make a determination/decision on whether the sun shade is in an acceptable condition to continue performing its intended purpose or whether the sun shade shall be removed from service and all assets and personnel vacated from the sun shade until repair is completed. **(T-1)**.

15.10.6. Establish an emergency evacuation plan to protect both personnel and equipment from inclement/severe weather that may compromise the integrity of the aircraft sun shade roof or support structure. **(T-1)**.

15.10.6.1. During inclement/severe weather situations including but not limited to high winds, thunderstorms, lightning, hail, tornadoes, hurricanes or other adverse weather warning situation, personnel will be evacuated from the aircraft sun shade, not to the aircraft sun shade. **(T-1)**.

15.10.6.1.1. The aircraft sun shade is not intended to be used as a protective shelter in these situations.

15.11. Allied Support (Electricity, Water, Communications, Lighting).

15.11.1. If elected, electrical power shall be provided to a connection point at the aircraft sun shade in accordance with UFC 3-550-01, *Exterior Electrical Power Distribution* and will be installed and maintained by Civil Engineering as real property IAW AFI 32-9005, *Real Property Accountability and Reporting*. **(T-1)**.

15.11.1.1. Allied support funding requirements will be prioritized along with other facility and infrastructure requirements through the Facilities Board process or applicable installation facility project prioritization process. **(T-1)**.

15.11.2. If elected, water lines can be installed to a stub at the aircraft sun shade site and will be installed and maintained by Civil Engineering as real property IAW AFI 32-9005. **(T-1)**. Water stubs and/or connections must be appropriately protected from frost/freeze and other environmental conditions. **(T-1)**.

15.11.2.1. These stubs and/or connections must be prominently marked to prevent hazards and accidents. **(T-1)**.

15.11.2.2. Allied support funding requirements will be prioritized along with other facility and infrastructure requirements through the facilities board process or applicable installation facility project prioritization process. **(T-1)**.

15.11.3. If elected, communications shall be provided to the aircraft sun shade in accordance with UFC 3-580-01, *Telecommunications Interior Infrastructure Planning and Design*, and will be installed and maintained by qualified communications personnel. **(T-1)**.

15.11.3.1. Allied support funding requirements for the communication real property elements of a project (example, conduit, manholes, duct banks) will be prioritized along with other facility and infrastructure requirements through the facilities board process or applicable installation facility project prioritization process. **(T-1)**.

15.11.4. Lighting installation will be considered during procurement and/or sustainment phases and will be purchased and maintained by the owning organization from the light to the power stub. **(T-1)**.

15.11.4.1. If lighting is to be included in an aircraft sun shade, the owning organization shall include this in the procurement, installation, and sustainment plan. **(T-1)**.

15.11.4.2. Owning organizations shall use criteria and consultation as outlined in **Paragraphs 15.7** through **15.9** Energy efficient lighting will be considered where allowable. **(T-1)**.

15.11.5. Power receptacles will be considered during the procurement and/or sustainment phases and will be purchased and maintained by the owning organization from the power receptacles to the power stub. **(T-1)**.

15.11.5.1. If power is to be included, the owning organization shall include this in the procurement, installation, and sustainment plan. **(T-1)**. Owning organizations shall use criteria and consultation as outlined in **Paragraphs 15.7** through **15.9** **(T-1)**.

15.12. Crew Shelters and Portable/Inflatable Shelters.

15.12.1. Owning organizations will address the following items as a minimum in installation plans submitted to applicable MAJCOM/A4 for approval:

15.12.1.1. Annual procurement and sustainment costs, including allied support infrastructure costs. See **Paragraph 15.11** for allied support procedures. **(T-1)**.

15.12.1.2. Ensure shelter meets all standards and codes as applicable. Crew shelters and inflatable or fabric structures must comply with the minimum Antiterrorism Standard requirements of UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*. **(T-0)**.

15.12.1.3. Ensure a FOD mitigation plan is implemented. **(T-1)**.

15.12.1.4. Warranty information. **(T-1)**.

15.12.1.5. Wing tip and tail height clearances will meet the requirements outlined in AFMAN 91-203 and UFC 03-260-01. **(T-0)**.

15.12.1.6. Appoint a shelter manager and establish a shelter user and operations plan. Ensure assets are tracked as equipment items on the appropriate documents on the CA/CRL IAW AFMAN 23-122. **(T-1)**.

15.12.2. Crew shelters will be configured to minimum ventilation standards referenced in the International Mechanical Code when occupied. **(T-0)**.

Chapter 16 (Added-AFMC)

412TH LOGISTICS TEST SQUADRON

16.1. (AFMC) Purpose: This Chapter outlines general Logistics Test and Evaluation (LT&E) activities. Provides continued emphasis and awareness of LT&E activities and the necessity for early LT&E involvement in Developmental Testing. Establishes standards and procedures for accomplishment of LT&E. Ensures compliance with statutory directives; Air Force environmental management, safety, security instructions; and TOs. Develops and provides training and tools to improve the LT&E process within the acquisition community. Assists in developing logistics test plans, data analysis plans, and technical reports. Assists local management in test execution during LT&E program involvement. Acts as a focal point with Engineering and Program Management for LT&E activities. Technical and Safety reviews independent of test program are required IAW AFI 99-103, Capabilities-Based Test and Evaluation. Plans, directs, and manages the development and acquisition of technical data in support of System Groups. Manages the Operating Locations' Central Technical Order Control Units. Provides staff assistance in the development and implementation of Technical Order Development policies and procedures.

16.2. (AFMC) Logistics Test and Evaluation. The test methodology, criteria, and tools for evaluating and analyzing the product support elements as they apply to a system under test. The objective is to influence system design as early as possible in the acquisition cycle, and verify that the logistics support being developed is capable of meeting peacetime and wartime employment objectives.

16.3. (AFMC) Test Support Manager. Responsibilities include, but are not limited to:.

16.3.1. **(AFMC)** Identify opportunities for LT&E, initiate the test process, and assign management responsibilities.

16.3.2. **(AFMC)** Manage the LT&E plan and report writing process.

16.3.3. **(AFMC)** Manage the creation, modification, and usage of data collection tools.

16.3.4. **(AFMC)** Manage test data software development, installation and training.

16.3.5. **(AFMC)** Identifies test support needed in training, facilities, special equipment, funding, and other logistics areas as required.

16.3.6. **(AFMC)** Provide long range and intermediate logistical planning and support for tests and programs.

16.3.7. **(AFMC)** Work with program engineers, test designers, developmental engineers, and program managers regarding plans for the test and evaluation workload.

16.4. (AFMC) Technical Order Development. Plan, direct and manage the development and acquisition of technical data in support of system group requirements.

16.5. (AFMC) Technical Order Control Unit Manager. Responsibilities include, but are not limited to:.

16.5.1. **(AFMC)** Assist Systems Technical Order Manager in development of technical manual contractual requirements.

16.5.2. **(AFMC)** Assist in establishing and supporting technical order control units.

16.5.3. **(AFMC)** Schedule/witness technical order certification/verification events.

16.5.4. **(AFMC)** Participates in contractor quality assurance (QA) processes.

16.5.5. **(AFMC)** Schedules/attends guidance conferences.

16.5.6. **(AFMC)** Chairs technical interchange meetings.

16.5.7. **(AFMC)** Supervises/performs in-process reviews.

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Director of Logistics, Civil Engineering, Force Protection, and Nuclear Integration

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

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Prescribed Forms

AF Form 596, Quick Engine Change Kit Inventory

AF Form 861, Base/Transient Job Control Number Register

AF Form 864, Daily Requirement and Dispatch Record

AF Form 2001, Notification of TCTO Kit Requirements

AF Form 2400, Functional Check Flight Log

AF Form 2401, Equipment Utilization and Maintenance Schedule

AF Form 2402, Weekly Equipment Utilization and Maintenance Schedule

AF Form 2403, Weekly Aircraft Utilization/Maintenance Schedule

AF Form 2407, Weekly/Daily Flying Schedule Coordination

AF Form 2410, Inspection/TCTO Planning Checklist

AF Form 2411, Inspection Document

AF Form 2419, Routing and Review of Quality Control Reports

AF Form 2426, Training Request and Completion

AF Form 2430, Specialist Dispatch Control Log

AF Form 2434, Munitions Configuration and Expenditure Document

AF IMT 2408, Generation Maintenance Plan

AF IMT 2409, Generation Sequence Action Schedule

Adopted Forms

AF Form 55, Employee Safety and Health Record

AF Form 332, Base Civil Engineer Work Request

AF Form 504, Weapons Custody Transfer Document

AF Form 623, Individual Training Record

AF Form 726, Transient Aircraft Service Record

AF Form 797, Job Qualification Standard Continuation

AF Form 847, Recommendation for Change of Publication

AF Form 1067, Modification Proposal

AF Form 1098, Special Tasks Certification and Recurring Training

AF Form 1297, Temporary Issue Receipt

AF Form 1492, Warning Tag

AF Form 2005, Issue/Turn-In Request

AF Form 2096, Classification/On the Job Training Action

AF Form 3580, USAF Museum Aerospace Vehicle Static Display Egress and Safety Certificate

AFTO Form 20, Caution and Inspection Record

AFTO Form 66, TMDE Bar Codes (Polyester Film)

AFTO Form 82, TCTO Verification Certificate

AFTO Form 95, Significant Historical Data

AFTO Form 97, Aerospace Vehicle Battle Damage Incident Debrief/Assessment/Repair Record

AFTO Form 97B, Aircraft Battle Damage Evaluator Checklist

AFTO Form 103, Aircraft/Missile Condition Data

AFTO Form 242, Nondestructive Inspection Data

AFTO Form 244, Industrial/Support Equipment Record

AFTO Form 252, Technical Order Publications Change Request

AFTO Form 345, Aerospace Vehicle Transfer Inspection Checklist and Certification

AFTO Form 349, Maintenance Data Collection Record

AFTO Form 375, Selected Support Equipment Repair Cost Estimate

AFTO Form 492, Maintenance Warning Tag

AFTO Form 781, Arms Aircrew/Mission Flight Data Document

AFTO Form 781A, Maintenance Discrepancy and Work Document

AFTO Form 781C, Avionics Configuration and Load Status Document

AFTO Form 781H, Aerospace Vehicle Flight Status and Maintenance

AFTO Form 781J, Aerospace Vehicle - Engine Flight Document

AFTO Form 781K, Aerospace Vehicle Inspection, Engine Data, Calendar Inspection and Delayed Discrepancy Document

DD Form 250, Material Inspection and Receiving Report

DD Form 1348-6, DoD Single Line Item Requisition System Document

DD Form 1610, Request and Authorization for TDY Travel of DoD Personnel

DD Form 2861, Cross-Reference

FAA Form 7460-1, Notice of Proposed Construction or Alteration

Abbreviations and Acronyms

ABDR—Aircraft Battle Damage Repair

AC—Aircraft Commander

ACC—Air Combat Command

ACFT—Aircraft

ACR—Authorization Change Requests

AD—Airworthiness Directives

ADR—Aircraft Document Review

AETC—Air Education and Training Command

AFCSM—Air Force Computer Systems Manual

AFETS—Air Force Engineering and Technical Service

AFI—Air Force Instruction

AFLCMC—Air Force Life Cycle Management Center

AFMAN—Air Force Manual

AFMC—Air Force Materiel Command

AFPAM—Air Force Pamphlet

AFPD—Air Force Policy Directive

AFR—Air Force Reserve Command

AFREP—Air Force Repair and Enhancement Program

AFRIMS—Air Force Records Information Management System

AFSC—Air Force Specialty Code

AFSCI—Air Force Sustainment Center Instruction

AFSOC—Air Force Special Operations Command

AFTO—Air Force Technical Order

AGE—Aerospace Ground Equipment

AGM—Air-to-Ground Missile

AIRCAT—Automated Inspection, Repair, Corrosion, and Aircraft Tracking

ALC—Air Logistics Complex

ALIS—Autonomic Logistics Information System

AMC—Air Mobility Command

AME—Alternate Mission Equipment

AMU—Aircraft Maintenance Unit

AMS—Air Mobility Squadron

AMXS—Aircraft Maintenance Squadron

ANG—Air National Guard

APU—Auxiliary Power Unit

AQL—Acceptable Quality Level

ARC—Air Reserve Component

AS—Allowance Standard

ASC—Aircraft Service Changes

ASIP—Aircraft Structural Integrity Program

ASM—Aircraft Structural Maintenance

AVDO—Aerospace Vehicle Distribution Office

AWM—Awaiting Maintenance

AWP—Awaiting Parts

BCS—Bench Check Serviceable

BSL—Basic Systems Listing

BSP—Base Support Plan

CA—Cannibalization Authority

CAAP—COMAFFOR Apportionment and Allocation Process

CA/CRL—Custodian Authorization/Custody Receipt Listing

CAD/PAD—Cartridge Actuated Device/Propellant Actuated Device

CAI—Critical Application Items

CANN—Cannibalization

CAT I—Category I

CAT II—Category II

CB—Customer Bulletins

CBM+—Condition-Based Maintenance Plus

CBRNE—Chemical, Biological, Radiological, Nuclear and high-yield Explosive

CBU—Cluster Bomb Unit

CCY—Calculated Cycles

CD—Deputy Commander (MXG/CD)

CDA—Commercial Derivative Aircraft

CDB—Central Database

CDDAR—Crashed, Damaged or Disabled Aircraft Recovery

CE—Civil Engineer

CEMS—Comprehensive Engine Management System

CETS—Contractor Engineering and Technical Services

CFETP—Career Field Education and Training Plan

CFT—Contract Field Team

CM—Configuration Management

CMS—Component Maintenance Squadron

CND—Can Not Duplicate

COMAFFOR—Commander, Air Force Forces

Cont/Exp—Contingency/Expeditionary

COMSEC—Communications Security

CONUS—Continental United States

CPINS—Computer Program Identification Numbering System

CRF—Centralized Repair Facility

CSI—Critical Safety Items

CTK—Composite Tool Kit

CCW—Counter Chemical Warfare

DBM—Database Manager

DCA—Design Control Activity

DCC—Dedicated Crew Chief

DCMA—Defense Contract Management Agency

DDR—Daily Demand Rate

EV—Deviation

DFT—Depot Field Team

DIAMONDS—Defense Integration and Management of Nuclear Data Services

DIFM—Due-in From Maintenance

DISA—Defense Information System Agency

DIT—Data Integrity Team

DLA—Defense Logistics Agency

DMS—Decentralized Materiel Support

D23—Repair Cycle Asset Management Listing

DOC—Designed Operational Capability

DoD—Department of Defense

DoDI—Department of Defense Instruction

DoDD—Department of Defense Directive

DOI—Date of Installation

DOM—Date of Manufacture / Director of Maintenance

DOP—Dropped Object Prevention / Director of Propulsion

DR—Deficiency Report

DLADS—Defense Logistics Agency Disposition Service

DRU—Direct Report Unit

DSV—Detected Safety Violations

eTools—Electronic Tools

E&E—Electrical & Environmental

EAWP—Engine Automated Work Package

ECM—Electronic Countermeasures

ED—Incapacitated

EHM+—Engine Health Management

EHR—Event History Recorder

E&I—Evaluation and Inspection

EID—Event Identification Description / Equipment Identification Designator

EM—Engine Management/Emergency Management

EMS—Equipment Maintenance Squadron

EMXG/CC—Expeditionary Maintenance Group Commander

ENMCS—Engine Not Mission Capable for Supply

EOD—Explosive Ordnance Disposal

EOR—End of Runway

EOT—Engine Operating Time

EPE—Evaluator Proficiency Evaluation

ER—Exceptional Release

ERRC—Expendability, Recoverability, Reparability Code

ES—Equipment Specialist

ESOH—Environment Safety and Occupational Health

ESOHMS—Environment, Safety, and Occupational Health Management System

ESP—Expeditionary Site Plan

ESS—Environmental Stress Screening

ETIC—Estimated Time in Commission

ETIMS—Enhanced Technical Information Management System

ET&D—Engine Trending and Diagnostics

ETS—Engineering and Technical Services/Engine Test Stand

EW—Electronic Warfare

EWS—Electronic Warfare System

EX—Exercises/Contingencies

FAA—Federal Aviation Administration

FAR—Federal Acquisition Regulation

FCC—Flying Crew Chief

FCF—Functional Check Flight

FHP—Flying Hour Program

FO—Foreign Object

FOA—Field Operating Unit

FOD—Foreign Object Damage

FOM—Facilitate Other Maintenance

FOUO—For Official Use Only

FSL—Full Systems Listing

FSR—Field Service Representatives

FY—Fiscal Year

GBU—Guided Bomb Unit

GEOLOC—Geographical Location

GITA—Ground Instructional Trainer Aircraft

GOX—Gaseous Oxygen

GP—Group

GSU—Geographically Separated Units

HAF—Headquarters, US Air Force

HAZMAT—Hazardous Material

HC/D—Hazard Class Division

HF—High Frequency

HHQ—Higher Headquarters

HPO—Hourly Post-flight

HPT—High Pressure Turbine

HQ—Headquarters

HSC—Home Station Check

IAW—In Accordance With

ID—Identification / Integrated Defense

I—Deck—Initialization Deck

IETM—Interactive Electronic Technical Manuals

IFCS—Instrument and Flight Control Systems

IFE—In-Flight Emergency

IFR—In Flight Refueling

ILS-S—Integrated Logistics Systems-Supply

IMDS—Integrated Maintenance Data System

IMIS—Integrated Maintenance Information System

IP—Instructor Pilot

IPCOT—In-Place Consecutive Overseas Tour

IPI—In-Process Inspection

ISO—Isochronal Inspection

I/UA—Immediate and Urgent Action

ISU/DOR—Issue/Due-Out Release

JCN—Job Control Number

JDD—Job Data Documentation

JDRS—Joint Deficiency Reporting System

JEDMICS—Joint Engineering Data management Information and Control System

JEIM—Jet Engine Intermediate Maintenance

JML—Job Standard Master Listing

JOAP—Joint Oil Analysis Program

JST—Job Standard

KTL—Key Task List

LAN—Local Area Network

LCN—Logistics Control Number

LEAP—Logistics Evaluation Assurance Program

LM—Limited-use Munition

LME—Locally Manufactured Equipment

LMR—Land Mobile Radio

LO—Low Observable

LOX—Liquid Oxygen

LPT—Low Pressure Turbine

LRS—Logistics Readiness Squadron

LRU—Line Replaceable Unit

LSC—Load Standardization Crew

LV—Emergency Leave

MAJCOM—Major Command

MC—Mission Capable

MDF—Mission Data File

MDS—Mission Design Series

MEL—Minimum Equipment Level

MESL—Minimum Essential Subsystems List

MFG—Munitions Family Group

MFM—MAJCOM Functional Manager

MGN—Mission Generation Networks

MI—Management Inspection

MICAP—Mission Impaired Capability Awaiting Parts

MIL—Master Inventory List

MILSPEC—Military Specification

MIL-STD—Military Standard

MIS—Maintenance Information Systems

MMA—Maintenance Management Analysis

MMHE—Munitions Materiel Handling Equipment

MOA—Memorandum of Agreement

MOC—Maintenance Operations Center

MOU—Memorandum of Understanding

MPS—Military Personnel Section

MRPL—Minimum Required Proficiency Load

MRSP—Mobility Readiness Spares Package

MSA—Munitions Storage Area

MSE—Maintenance Scheduling Effectiveness

MSEP—Maintenance Standardization & Evaluation Program

MSG—Mission Support Group

MT—Maintenance Training

MSM—DS Maintenance Scheduling Module

MUNS—Munitions Squadron

MX—Maintenance

MxCAP2—Maintenance Capability and Capacity (model)

MXG—Maintenance Group

MXG/CC—Maintenance Group Commander

MXG/CD—Maintenance Group Deputy Commander

MXO—Maintenance Operations

MXS—Maintenance Squadron

MX SUPT—Maintenance Superintendent

NAF—Numbered Air Force

NATO—North Atlantic Treaty Organization

NCE—Nuclear Certified Equipment

NCOIC—Non-Commissioned Officer in Charge

NDI—Nondestructive Inspection

NIE—Normally Installed Equipment

NLT—Not Later Than

NMC—Non Mission Capable

NPA—Non-Powered AGE

NORAD—North American Aerospace Defense Command

NRTS—Not Repairable This Station

NSN—National Stock Number

NSS—Noise Suppression System

NWRM—Nuclear Weapons-Related Materiel

O&M—Operations and Maintenance

OAP—Oil Analysis Program

OBIGGS—On-Board Inert Gas Generating Systems

OBOGS—On-Board Oxygen Generating Systems

OCF—Operational Check Flight

OCONUS—Outside Continental U.S.

OFP—Operations Flight Program

OG—Operations Group

G/CC—Operations Group Commander

OI—Operating Instruction

OIC—Officer in Charge

OJT—On-the-Job Training

OPLAN—Operational Plan

OPR—Office of Primary Responsibility

ORE—Operational Readiness Exercises

OS—Operational Squadron

OSS—Operations Support Squadron

OSS&E—Operational Safety Suitability and Effectiveness

OTI—One Time Inspection

OWC—Owning Work Center

P&R—Programs and Resources

PAA—Primary Aerospace Vehicle (Aircraft) Authorized

PACAF—Pacific Air Forces

PAFSC—Primary AFSC

PAI—Primary Aerospace Vehicle (Aircraft) Inventory

PAS—Protective Aircraft Shelter / Personnel Assignment Symbol (Code)

PBR—Percent of Base Repair

PCS—Permanent Change of Station

PDM—Programmed Depot Maintenance

PE—Personnel Evaluation/Periodic Inspection

PED—Portable Electronic Device

PH—Phase

PIC—Purpose Identifier Code / Pilot In Charge

PIM—Product Improvement Manager

PIP—Product Improvement Program

PM—Primary Munition/Program Manager

PMA—Portable Maintenance Aids

PMC—Partially Mission Capable

PME—Precision Measurement Equipment

PMEL—Precision Measurement Equipment Laboratory

PMO—Program Management Office

PO—Program Office

POC—Point of Contact

PPE—Personal Protective Equipment

PRP—Personnel Reliability Program

PRS—Performance Requirements Statement

PS&D—Plans, Scheduling, and Documentation

PWS—Performance Work Statement

QA—Quality Assurance

QASP—Quality Assurance Surveillance Plan

QE—Quarterly Evaluation

QEC—Quick Engine Change

QRL—Quick Reference List

QVI—Quality Verification Inspections

RAMPOD—Reliability, Availability, Maintainability for Pods

RC—Recommended Change

RegAF—Regular Air Force

REMIS—Reliability and Maintainability Information System

RIL—Routine Inspection List

RN—Repair Network

RNM—Repair Network Manager

RPA—Remotely Piloted Aircraft

SB—Service Bulletins

SCR—Special Certification Roster

SDAP—Special Duty Assignment Pay

SE—Support Equipment

SEI—Special Experience Identifier

SI—Special Inspection

SIPRNET—Secret Internet Protocol Router Network

SM—Support Munitions

SME—Subject Matter Expert

SMR—Source of Maintenance and Recoverability

SNCO—Senior Non-Commissioned Officer

SOW—Statement of Work

SPRAM—Special Purpose Recoverables Authorized Maintenance

SQ—Squadron

SQ/CC—Squadron Commander

SRAN—Stock Record Account Number

SRU—Shop Replaceable Unit

SUPT—Superintendent (Enlisted Duties)

TA—Transient Alert

TAA—Training Aid Aircraft

TAC—Total Accumulated Cycles

TBA—Training Business Area

TCC—Transaction Condition Code

TCI—Time Change Item

TCTO—Time Compliance Technical Order

TD—Training Detachment

TDV—Technical Data Violation

TDY—Temporary Duty

TFI—Total Force Integration

TMDE—Test Measurement and Diagnostic Equipment

TMS—Type Model Series

TNB—Tail Number Bin

TO—Technical Order

TODA—Technical Order Distribution Account

TODO—Technical Order Distribution Office

TTML—Test/Training Munitions List

TTP—Tactics, Techniques & Procedures

UCML—Unit Committed Munitions List

UCR—Unsatisfactory Condition Report

UEM—Unit Engine Manager

UFC—Unified Facilities Criteria

UHF—Ultra High Frequency

UII—Unique Item Identifier

UMD—Unit Manpower Document

UPMR—Unit Personnel Management Roster

USAF—United States Air Force

USAFE—United States Air Forces in Europe

UTC—Unit Type Code

UTE—Utilization (rate)

UTM—Unit Training Manager

VHF—Very High Frequency

W&B—Weight and Balance

WASP—Web Applications Software Product

WCE—Work Center Event

WG—Wing

WG/CC—Wing Commander

WG/CV—Vice Wing Commander

WJQS—Work Center Job Qualification Standard

WLCMT—Weapons Load Crew Management Tool

WLCTP—Weapons Load Crew Training Program

WLT—Weapons Load Training

WRE—War Readiness Engine

WRM—War Reserve Materiel

WS—Weapons Standardization

WSM—Weapon System Manager

TQC—Weapons Task Qualification Crew

WTQM—Weapons Task Qualification Training Manager

WWID—Worldwide Identification (code for TCMax®)

WWM—Wing Weapons Manager

WX—Weather

WUC—Work Unit Code

Terms

Aircraft and Equipment Impoundment—Isolation of an aircraft or equipment due to an unknown malfunction or condition making it unsafe for use or flight.

Aircraft Purpose Identifier Codes (PIC)—specified in AFI 21-103, PIC are applied to assigned aerospace vehicles to facilitate standardization of reporting. Examples of PIC are: CC=Combat, BQ=major maintenance awaiting AFMC decision or action; DJ=awaiting depot level maintenance work. Refer to AFI 21-103 for a listing of all specific PIC.

Air Reserve Component—The Air National Guard and Air Force Reserve together form the ARC.

Allowance Standard (AS)—Authorized document that identifies the amount and type of equipment for an organization.

Alternate Mission Equipment (AME)—Equipment identified to a higher end-item, not listed in the table of allowance. Normally, -21 equipment.

Automated Inspection, Repair, Corrosion, and Aircraft Tracking (AIRCAT)—is the

Individual Aircraft Tracking Program (IATP) of record for the C—130 as mandated by the USAF Aircraft Structural Integrity Program (ASIP). This effort includes development and maintenance of an extensive Oracle database and a wide variety of both client, server and web-based applications to provide data entry, reporting, and analysis.

Awaiting Maintenance (AWM)—Designation for a deferred discrepancy on an aircraft awaiting maintenance.

Awaiting Parts (AWP)—Designation for a deferred discrepancy on an aircraft awaiting parts.

Bench Stocks—Stores of expendability, recoverability, reparability coded (ERRC) XB3 items kept on-hand in a work center to enhance maintenance productivity.

Cannibalization—Authorized removals of a specific assembly, subassembly, or part from one weapons system, system, support system, or equipment end-item for installation on another end-item to meet priority mission requirements with an obligation to replace the removed item.

Centralized Repair Facility—A facility that performs repairs for a specified region or bases.

Certified Load Crew Member—A load crew member trained and certified by position according to Chapter 10 of this instruction.

Classified Processing Area (CPA)—Areas identified by the unit which have had an Emission Security assessment and have been approved by the by the wing Information Assurance office to be utilized to discuss or process classified information IAW AFI 16-1404.

Code 1, Code 2, Code 3, Code 4, Code 5—Landing status codes used by aircrew to inform maintenance of their inbound aircraft's condition. A Code 1 aircraft has no additional discrepancies other than those it had when it last departed; a code 2 aircraft has minor discrepancies, but is capable of further mission assignments; a code 3 aircraft has major discrepancies in mission-essential equipment that may require repair or replacement prior to further mission tasking; a code 4 indicates suspected or known nuclear, biological, or chemical contamination; and a code 5 indicates battle damage. Codes 4 and 5 are entered into the MIS as code 8.

Commercial Derivative Aircraft (CDA)—Any fixed or rotary-wing aircraft procured as a commercial Type Certified off-the-shelf aircraft, and whose serial number is listed on an FAA-approved Type Certified Data Sheet.

Commodity Time Compliance Technical Order—TCTO concerning a designated item, subsystem, or system that is not identified as a weapon or military system.

Composite Tool Kit (CTK)—A controlled area or container used to store tools or equipment and maintain order, positive control, and ease of inventory. CTKs are assembled as a kit and designed to provide quick, easy visual inventory and accountability of all tools and equipment. CTKs may be in the form of a toolbox, a shadow board, shelves, system of drawers (Stanley Vidmar®, Lista®), cabinets, or other similar areas or containers. The CTK contains tools and equipment necessary to accomplish maintenance tasks, troubleshooting, and repair.

Condition—Based Maintenance Plus—A set of maintenance processes and capabilities derived from real-time assessment of weapon system condition obtained from embedded sensors, external tests and measurements using portable equipment. The goal of CBM+ is to perform maintenance only when internal and/or external sensors indicate the need instead of performing maintenance on a periodic basis. Consumable Items—Also known as "Consumption" or "Expendable" Items designated XB3. Items which are consumed in use or which lose their original identity during periods of use by incorporation into or attachments upon another assembly. Issued on an as required basis and consist of such supplies as maintenance parts or office supplies.

Contracting Officer Representative (COR)—A COR is an individual designated in accordance with Department of Defense Federal Acquisition Regulation Supplement subsection 201.602-2 and authorized in writing by the contracting officer to perform specific technical or administrative functions.

Crashed, Damaged or Disabled Aircraft Recovery (CDDAR)—The ability to move damaged or disabled aircraft using specialized equipment.

Critical Application Item (CAI)—An item that is essential to weapon system performance or operation, or the preservation of life or safety of operating personnel, as determined by the military services. The subset of CAI whose failure could have catastrophic or critical safety consequences is called CSIs. Refer to Attachment 7.

Critical Safety Item (CSI)—A part, assembly, installation equipment, launch equipment, recovery equipment, or support equipment for an aircraft or aviation weapons system that contains a characteristic any failure, malfunction, or absence of which could cause a catastrophic or critical failure resulting in the loss or serious damage to the aircraft or weapons system, an unacceptable risk of personal injury or loss of life, or an uncommanded engine shutdown that jeopardizes safety. Damage is considered serious or substantial when sufficient to cause a 'Class A' mishap. The determining factor in CSIs is the consequence of failure, not the probability that the failure or consequence may occur. For the purpose of this instruction "Critical Safety Item", "Flight Safety Critical Aircraft Part", "Flight Safety Part", "Safety of Flight Item", and similar terms are synonymous.

Cross-tell—Cross-tells are used to highlight trends, benchmarks or safety conditions relating to maintenance equipment, personnel, training or processes. A cross-tell is initiated to assist other maintenance or logistics personnel with similar equipment to do their jobs more safely and/or efficiently. Typically a cross-tell will be initiated when a condition or trend is discovered regarding, but not limited to, a weapon system or common components that should be shared with other users or potential users. This information should be transmitted using signed and encrypted e-mail to ensure widest dissemination and ensure it is brought to the attention of unit commanders in order to prevent or mitigate mishaps, injury or damage to AF personnel, equipment or property. Typically cross-tells will provide relevant background information and history and can include such information as NSNs, part numbers, specific location of problem areas.

Customer Wait Time—Customer Wait Time for LRUs is the total elapsed time between the issuance of a customer order and satisfaction of that order, regardless of source (immediate issues or backorders), and can include issues from wholesale and/or retail stocks as well as various other arrangements. Customer Wait Time for end items (engines and pods) includes time for the retrograde and serviceable transportation legs.

Debriefing—Program designed to ensure malfunctions identified by aircrews are properly reported and documented.

Decertification—The removal of certification status from a person for a specific task

Dedicated Crew Chief—DCCs are first-level supervisors in the flightline management structure who manage and supervise all maintenance on their aircraft, and are selected on the basis of initiative, management and leadership ability, and technical knowledge.

Delayed or Deferred Discrepancies—Malfunctions or discrepancies not creating NMC or PMC status that are not immediately corrected.

Delayed Release—Munition or store that fails to eject from an aircraft upon firing of impulse cartridge, but releases sometime afterwards. Release times qualifying “delayed” bombs are outlined in MDS-specific technical orders.

Demand Response Team—Two-member team where one person reads technical order steps and the other person performs the task and responds when each step is completed.

Depot Level Maintenance—Provides the capability to maintain materiel coded for organizational, intermediate and depot levels of maintenance. Includes maintenance requiring the overhaul, upgrading, or rebuilding of parts, assemblies, or subassemblies, and the testing and reclamation of equipment as necessary IAW AFPD 21-1

Dispatchable CTK—CTK issued out and is designed to be used outside the work center.

Equipment Custodian—Individual responsible for all in-use equipment at the organizational level whose duties include requisitioning, receiving, and controlling of all equipment assets.

Equipment Identification Designator (EID)—A number assigned to a piece of shop equipment, used to track status and accountability.

Equipment Items—Item authorized in the allowance standard within an organization.

Evaluated Load—A loading task that is assessed according to Chapter 10 of this instruction.

Expendability, Recoverability, Reparability, Category (ERRC)—Used to categorize Air Force inventory into various management groupings. The grouping determine the type of management used throughout the logistics cycle, designates the process to be used in computing requirements and are used in the correction and reporting of asset and usage data. (such as, XB3, XF3, XD2, NF2, NF4).

Flight Chief—NCO responsible to the maintenance officer or superintendent for management, supervision, and training of assigned personnel.

FK or FV—Prefix used to identify the munitions supply account. FV denotes units utilizing the Combat Ammunition System and FK denotes units utilizing ILS-S or manual records supply point within a munitions'' operations unit for conventional munitions.

Functional Checklist—locally developed checklists used to identify the steps required to react to specific events. Functional checklists are required for use by functional area(s) during actions such as aircraft crash, mass loads, severe weather warning or evacuation, self-inspections.

Hung Ordnance—Any item attached to the aircraft for the purpose of dropping or firing which has malfunctioned or failed to release. In addition, hung ordnance includes the following items: (1) External fuel tanks after unsuccessful jettison attempt; (2) Remaining ordnance after an inadvertent release; (3) 20/30 mm ammunition after a gun malfunction (no fire, unplanned cease fire, runaway gun, or gun unsafe indication); (4) Any stores determined to be in an unsafe condition.

Inadvertent Release—Uncommanded launch or release of a store or ordnance, or launch or release of a store or ordnance other than those selected when a launch or release command was generated (system malfunction); does not include an unintentional release. If commanding a single release, do not consider a double bomb release as an inadvertent release if the releases occur from a practice bomb dispenser.

Individual Tools and Equipment—Tools and equipment that are available for individual sign-out but stored in the tool room in storage bins, cabinets, shelves with every item having an assigned location (example, flashlights, ladders).

Integrated Logistics System—Supply (ILS-S)—is the overarching term used to describe the system(s) used by base retail materiel management operations. ILS-S is comprised of the Enterprise Solution–Supply. In many cases the term ILS-S is used to identify system related functions and/or references.

Intermediate-Level Maintenance—Maintenance consisting of those off-equipment tasks normally performed using the resources of the operating command at an operating location or at a centralized intermediate repair facility.

In Process Inspection (IPI)—Inspection performed during the assembly or reassembly of systems, subsystems, or components with applicable technical orders. An IPI is accomplished and documented by an authorized IPI inspector other than the technician performing the specific step of a task that requires the IPI.

"Knock It Off"—"Knock it Off" empowers all Airman regardless of rank to terminate an operation or situation which they perceive is unsafe or too dangerous. "Knock it Off" includes using a recognizable "audible" (capable of being heard) from anyone in an effort to prevent a potential mishap.

Lead Crews—A load crew certified by the load standardization crew (LSC), which is assigned to WS to assist in conducting the weapons standardization program. Levels—Computed and authorized requirements for a quantity of assets.

Loading Standardization Crew (LSC)—A load crew designated by the WWM and the WS superintendent to administer the weapons standardization program. LSC members have certification and decertification authority.

Loading Task—The actions required by one crew member, in a designated position, to accomplish a munitions load.

Local Commander—The group commander with responsibility for maintenance (as applicable to loading technical data).

Maintenance Capability—Unit's ability to generate and sustain weapon systems to support the mission. It is composed of personnel, capacity (facilities, support equipment, and parts), and weapons systems and is affected by policies and business practices.

Maintenance Cyber Discipline—A focus on daily cyber hygiene activities which requires continuous attention in order to mitigate daily threats by creating a culture of cyber awareness, discipline, and strict compliance.

Maintenance Training—Any proficiency, qualification, or certification tasking required by a technician to perform duties in their primary AFSC.

Master Inventory List (MIL)—Primary source document for inventory of CTKs. The MIL indicates the total number of items in each drawer or section of the tool kit. MIL may be automated.

Mission Design Series (MDS)—Alpha and numeric characters denoting primary mission and model of a military weapons system.

Mission Generation Network—The MGN supports all Organizational-level, on-equipment and off-equipment maintenance and is optimized at the Wing-level across the USAF. MGN consists of the cumulative effort required to generate, and sustain sortie and mission production to meet assigned mission requirements.

Minimum Required Proficiency Load (MRPL)—Recurring loading of munitions for which a person is certified.

Munitions Decertification—Removal of the certification status of a person that precludes them from loading a specific type munitions or MFG.

Normally Installed Equipment (NIE)—launchers, and pylons normally installed on an aircraft.

No-Lone Zone—Area where the two-person concept must be enforced because it contains nuclear weapons, nuclear weapons systems, or certified critical components.

Non-Consumable Item—Also referred to as a "non-expendable" or "equipment" item. Durable items that are capable of continuing or repetitive use by an individual or organization.

Non-Release—System malfunction in which a weapon does not release from the delivery system.

Off-Equipment Maintenance—Maintenance tasks that are not or cannot be effectively accomplished on or at the weapon system or end-item of equipment, but require the removal of the component to a shop or facility for repair.

On-Equipment Maintenance—Maintenance tasks that are or can be effectively performed on or at the weapon system or end-item of equipment.

Operating Stock—The bits and pieces needed to support a maintenance work center that does not meet the criteria of bench stock. It includes reusable items such as dust covers, hydraulic line covers, caps, items leftover from work orders, TCTOs. Items deleted from bench stock that are less than a full Unit of Issue (UI) are not considered operating stock but may be retained as work order residue.

Operational Safety, Suitability & Effectiveness (OSS&E)—OSS&E is an outcome of properly applied systems engineering principles, processes, and practices. Well-integrated configuration management and control, deficiency reporting and response, reliability, maintainability, integrity, and other engineering practices ensure that base-lined engineering characteristics of systems and end items are not allowed to degrade as a result of maintenance, repairs, parts substitutions, and similar activities. The PM is responsible for the assurance OSS&E throughout the life cycle of each configuration of each component of each system.

Organizational Level Maintenance—Maintenance consisting of those on-equipment tasks normally performed using the resources of an operating command at an operating location.

PACER WARE—is the unclassified term for an actual change or notification of a deficiency to an Electronic Warfare system.

Personnel Protective Equipment (PPE)—Equipment required to do a job or task in a safe manner.

Plan—A forecasted scheme of sequenced and timed events for accomplishing broad objectives. The plan is the product of annual, quarterly, and monthly planning of scalable operations and maintenance activities necessary to achieve long term mission requirements.

Preload—A complete munition and suspension equipment package ready for loading.

Primary Aerospace Vehicle Authorization (PAA)—The number of aircraft authorized to a unit for performance of its operational mission. The primary authorization forms the basis for the allocation of operating resources to include manpower, support equipment, and flying-hour funds.

Primary Aerospace Vehicle Inventory (PAI)—The aircraft assigned to meet the primary aircraft authorization. Includes PMAI, PTAI, PDAI and POAI.

Production Superintendent (Pro Super)—Senior NCO responsible for squadron maintenance production. Directs the maintenance repair effort.

Program Manager (PM)—The designated individual with responsibility for and authority to accomplish program objectives for development, production, and sustainment to meet the user's operational needs. The PM shall be accountable for credible cost, schedule, and performance reporting to the Milestone Decision Authority.

Programmed Depot Maintenance (PDM)—Maintenance activities requiring skills, equipment, or facilities not normally possessed by operating locations.

Project Funds Management Records—a record maintained in the material accounting system to provide for control over that portion of each responsibility center manager operating budget programmed for purchase of expense materials from the Defense Business Operations Funds stock activity fund. It is used to record available expense authority, current month and fiscal year-to-date sales, sales returns, and due-outs for both supplies and expense equipment.

Quality Assurance (QA)—Office or individual who monitors maintenance (organic or contractor) on a daily basis.

Quarterly Evaluation (QE)—Recurring calendar task evaluations required by munitions and weapons personnel.

Quick Reference List (QRL)—Listing of fast moving, high use items required for primary mission aircraft. The basic purpose of the QRL is to provide maintenance personnel with a speedy way to place a demand on the supply system.

Rag—A remnant of cloth purchased in bulk or a standardized, commercial quality, vendor-supplied shop cloth (uniform size and color) or similar material used in general industrial, shop, and flightline operations.

(Added-AFMC) Ready Line—Designated parking area for AGE that is ready for use. Prior to parking AGE on the ready line a service inspection shall be performed and annotated in Part II of the AFTO Form 244. Ready lines are established by the AGE Flight Chief (or equivalent) as needed, in coordination with OSS's Airfield Operations Flight. The terms READY LINE and SUB-POOL are not synonymous. See SUB-POOL for definition.

Reclama—A request to a duly constituted authority to re-consider its decision or its proposed action (see JP 1-02).

Recoverability Code—A one position code assigned to end items and support items to indicate the recoverability intention and the level of maintenance authorized disposition action on unserviceable support items; and for reparable items, it is used to indicate the lowest maintenance level responsible for repair, disposition or condemnation of the item.

Recurring Discrepancy—A recurring discrepancy is one that occurs on the second through fourth sortie or attempted sortie after corrective action has been taken and the system or sub- system indicates the same malfunction when operated.

Reliability-Centered Maintenance—A logical discipline for developing a scheduled-maintenance program that will realize the inherent reliability levels of complex equipment at minimum cost.

Remote Split Operations—Occurs when the ground control stations, the Unmanned Aerial Vehicle (UAV) launch and recovery functions, and the satellite uplink are geographically separated.

Repair Cycle Asset—Any recoverable item with an expendability, recoverability, reparability code (ERRC) category of XD or XF.

Repair Recommendation—An idea or proposal to repair an item that is not currently repaired or is beyond the capability of the work center. An AFREP initiative is generated when an asset has a demand level of "greater than three" per calendar year. All new AFREP initiatives will be staffed through the applicable organizations.

Repairable—Unserviceable items that can be economically repaired and restored to a serviceable condition.

Repeat Discrepancy—A repeat discrepancy is a pilot reported discrepancy (PRD) occurring on the same system or subsystem on the first sortie or sortie attempt after that PRD has been signed off.

Retrograde—Returning assets (reparable assets) from the field to their source of repair.

Schedule—Planned events that result in final review and agreement of how to execute a proposed plan of sequenced and timed events. Results in a binding commitment captured in writing and approved by signature between operations and maintenance to complete activities required to accomplish agreed upon objectives. Refers to the execution phase of weekly and daily operations and maintenance activities.

SEEK EAGLE—The Air Force certification program for determining safe carriage, employment and jettison limits, safe escape, and ballistics accuracy, when applicable, for all stores in specified loading configurations on USAF aircraft.

SERENE BYTE—is the unclassified term for an exercise change or deficiency notification to an Electronic Warfare system.

Shop CTK—Tool kits (not dispatched) used by work center personnel during a shift, provided a single person is responsible for the tool kit.

Shop Stock—Includes items such as sheet metal, electrical wire, fabric, and metal stock, used and stored within a maintenance work center to facilitate maintenance.

Source Code—Codes assigned to end items and support items to indicate the manner of acquiring items for the maintenance, repair, or overhaul of end items.

Source, Maintenance, Recoverability (SMR) Code—A code assigned to parts and assemblies that provides maintenance activities with repair level responsibilities, support method and disposition instructions. The SMR codes are also input into the supply and maintenance automated data system. The uniform SMR code is composed of three parts, consisting of a two position source code, a two position maintenance code, and one position recoverability code.

Spares—Serviceable assets that are available for future use, and in the logistics pipeline. The term spare carries the assumption that there are already enough assets in the AF inventory to satisfy end item or quantity per aircraft requirements.

Special Certification Roster (SCR)—Management tool that provides supervisors a listing of personnel authorized to perform, evaluate, and inspect critical work.

Special Purpose CTK—Small individually issued tool kits that because of the nature of contents or type of container could preclude shadowing or silhouetting (example, launch kits, recovery kits, cartridge cleaning kits, oxygen servicing kits).

Subcrew—Two or more certified and/or qualified personnel who may perform specific tasks.

(Added-AFMC) Sub-Pool—Designated, temporary holding area used as a pick-up/drop-off point for AGE. AGE is not required to be fully serviced when parked in a sub-pool. Additionally, a current service inspection is not required to be signed off in Part II of the AFTO Form 244. GP/CC may require an operator inspection to be annotated in Part II of the AFTO Form 244 prior to placement in a sub-pool. AGE Flight is responsible for monitoring sub-pools at least once per standard length shift (each work center that co-utilizes sub-pools is responsible for monitoring their own equipment). Sub-pools are established by the AGE Flight Chief (or equivalent) as needed, in coordination with OSS's Airfield Operations Flight. The terms SUB-POOL and READY LINE are not synonymous. See READY LINE for definition.

Supply Point—Forward warehouse located within or near the maintenance work center.

Supply Reports—There are many examples of "Supply Reports" used to record supply transactions. The Daily Document Register (D04) provides a means for organizations to review all document numbers processed during the day by the SBSS. The Project Funds Management Records and Organization Cost Center Record Update and Reconciliation (D11) show the current status and internal balance of the Project Funds Management Record by supplies and equipment. The Repair Cycle Asset Management Listing (D23) is used to monitor repair cycle assets and as a management product to monitor the stock position and repair cycle status of repairable (DIFM) assets. It may be produced in several sequences and is provided to the customer daily.

Sub-Pool—A parking area designated by the Airfield Operations Flight that provides authorized pooling of serviceable AGE to enhance close proximity support to using organizations.

Tactical/Theater Airborne Reconnaissance System (TARS)—is a sensor package offers improved timeliness, reduced support costs, and improved operational capability over film systems. Once fielded, this system will provide the tactical commander with an organic system capable of responding in Near Real-Time (NRT) (in time) to battlefield requirements.

Tail Number Bins (TNB)—Locations established and controlled to store issued parts awaiting installation and parts removed to FOM. Holding bins are set up by tail number, serial number, or identification number.

Task Assignment List—Functional grouping of procedural steps from applicable -33 series TOs, by crew position, to be accomplished in sequence by each crew member during an operation.

Technical Administrative Function—Function responsible for ordering and posting instructions, processing all orders, enlisted performance ratings, and general administrative tasks for the section.

Technical Data—Information (regardless of the form or method of the recording) of a scientific or technical nature, including computer software documentation. As applied in this publication, it includes information required for the design, development, production, manufacture, assembly, operation, training, testing, repair, maintenance, or modification of defense articles.

Technical Order Distribution Office (TODO)—Function required to maintain records on TOs received and distributed.

(Added-AFMC) Temporary Modifications—Temporary modifications change the configuration of an item to enable short-term operational mission accomplishment, or to conduct T&E of new and modified equipment. Temporary modification proposals are validated, reviewed, approved as described in AFI 10-601, Operational Capability Requirements Development, and AFI 63-101/20-101. Refer to AFMAN 65-601, Vol. 1, Budget Guidance and Technical Procedures, for AF policy on funding. There are two kinds of temporary modifications: Temporary-1 (T-1) and Temporary-2 (T-2).

Time Compliance Technical Order (TCTO)—Authorized method of directing and providing instructions for modifying equipment, and performing or initially establishing one-time inspections.

Tool Storage Facility/Tool Room—A controlled area within a work center designated for storage and issue of tools and equipment.

Total Asset Visibility—The capability to provide users with timely and accurate information on the location, movement, status, and identity of units, personnel, equipment, materiel, and supplies. It also includes the capability to act upon that information to improve overall performance of the Department of Defense's logistic practices.

Unintentional Release—Store or ordnance launched or released through pilot error.

Unique Item Identifier (UII)—The set of data elements marked on items that are globally unique, unambiguous, and robust enough to ensure data information quality throughout life, and to support multi-faceted business applications and users.

Unit Committed Munitions List (UCML)/Test/Training Munitions List (TTML)—The UCML/TTML is a list of primary munitions (PM), support munitions (SM), and limited-use munitions (LM) necessary to meet unit operational and training requirements.

Unmanned Aerial Vehicle (UAV)—An unmanned aircraft that is either remotely piloted (such as, Predator) or programmed (such as, Global Hawk).

Urgency Justification Code—Two-digit code used to reflect the impact and type of need. The Urgency of Need Designator fills the first position of the Urgency Justification Code. Use of Urgency of Need Designator 1, A and J is restricted and is verified by designated personnel.

Utilization Rate (UTE Rate)—Average number of sorties or hours flown per primary assigned aircraft per period. Usually time period is based on a monthly rate.

War Readiness Engine (WRE) Levels—The quantity of net serviceable engines required to support the Air Force war tasking and to sustain operational units' war efforts until pipelines are filled and repair capabilities are available. These engines are to be available to support a weapon system from the start of the war until re-supply (via base, intermediate, CRF or depot repair) is established.

War Reserve Materiel (WRM)—Consists of enterprise managed, dynamically positioned equipment and consumables that contribute to initial operations and provide initial support cross the full range of military operations. It enhances Agile Combat Support capability to reduce the time required to achieve an operational capability and/or produce an operational effect.

Weapons Certification—The act of verifying and documenting a person's ability to load a particular type of aircraft, and munition or MFG within established standards.

Weapons Locally-Manufactured Equipment (LME)—All equipment that measures, tests, or verifies system, subsystem, component, or item integrity. It also includes equipment such as handling dollies, storage racks (except storage shelves), maintenance stands, or transport adapters. It does not include simple adapter cables and plugs constructed as troubleshooting aids to replace pin-to-pin jumper wires specified in TOs.

Weapons Standardization (WS)—Organization comprised of the WWM, a Superintendent, the Load Standardization Crew, an academic instructor, and lead crews.

Weapons Task Qualification—A munitions related task not requiring certification.

Weight and Balance (W&B) Program—Program used in calculating, verifying, updating, and computing weight and balance on a weapon system.

Attachment 2

AIRCRAFT COMMANDER FEEDBACK ON FCC

Figure A2.1. Aircraft Commander Feedback on FCC.

MEMORANDUM FOR <Unit Designation/Office Symbol> *Date*

<Street>

<Base, State, and Zip Code>

FROM: <Aircraft Commander>

<Street>

<Base, State, and Zip Code>

SUBJECT: Aircraft Commander Feedback of the Flying Crew Chief (FCC) Was the FCC knowledgeable of the aircraft and the systems?

a - Extremely knowledgeable c - Lacks knowledge b - Sufficient knowledge d - Not observed

Did the FCC know the status of PMC and NMC discrepancies?

a - Always c - Rarely

b - Most of the time d - Never

Did the FCC perform duties willingly and enthusiastically?

a - Always c - Never b - Sometimes d - Not Observed

What type of working relationship did the FCC have with the aircrew?

a - Outstanding c - Fair

b - Good d - Poor

Rate the overall maintenance support provided by the FCC:

a - Outstanding c - Fair

b - Good d - Poor

This FCC was:

a - An asset to the FCC program c - Just getting by b - A hard worker, but needs more experience d - Detriment to the FCC program Remarks:

POC is <FCC Program Manager's Name, office symbol, duty phone number>.<signed> Aircraft Commander

Note*:* Please fold and return to the squadron FCC Program Manager upon return to home station.

Attachment 3

QUARTERLY FCC REPORT FORMAT

Figure A3.1. Quarterly FCC Report Format

MEMORANDUM FOR MAJCOM/A4L *Date*

FROM: <Unit Designation/Office Symbol>

<Street>

<Base and Zip Code>

SUBJECT: <State fiscal quarter (FY20/1)> Quarterly Flying Crew Chief Report (RCS: AF/A4L(Q&A)0011)

In accordance with AFI 21-101 <unit designations> report is submitted.

Number of C-coded FCC positions on the Unit Manpower Document entitled to be filled. Include approved changes (losses/increases):

Number of people filling C-coded positions:

Number of qualifying missions flown per quarter by C-coded crew chiefs. Include the number of TO directed missions:

Number of qualifying missions flown by personnel without C-coded prefix. Include TO directed missions flown by non c-coded prefix personnel:

Number of all missions away from home station that required FCCs:

Total number of days TDY for all C-coded crew chiefs on qualifying missions:

Total number of days TDY for all non C-coded crew chiefs on qualifying missions:

Unit and MAJCOM remarks and overall program assessment. Include remarks to justify vacant positions: FCC Program Manager is <rank, name>, office symbol, DSN number.

<Sign>

Commander, <Unit Designation>

Attachment 4

ANNUAL FCC REPORT

Figure A4.1. Annual FCC Report

MEMORANDUM FOR MAJCOM/A4L or DOM *Date*

FROM: <Unit designation/Office Symbol>

<Street>

<Base and Zip Code>

SUBJECT:<state fiscal year (FY20)> Annual Flying Crew Chief Report RCS: AF/A4L(Q&A)0011) In accordance with AFI 21-101<unit designations> report is submitted.

Number of C-coded FCC positions on the Unit Manpower Document entitled to be filled. Include approved changes (losses/increases):

Number of people filling C-coded positions:

Number of qualifying missions flown per quarter by C-coded crew chiefs. Include the number of TO directed missions:

Number of qualifying missions flown by personnel without C-coded prefix. Include TO directed missions flown by non c-coded prefix personnel:

Number of all missions away from home station that required FCCs:

Total number of days TDY for all C-coded crew chiefs on qualifying missions:

Total number of days TDY for all non C-coded crew chiefs on qualifying missions:

Unit and MAJCOM remarks and overall program assessment. Include remarks to justify vacant positions: FCC Program Manager is <rank, name>, office symbol, DSN number.

<Sign>

Commander, <Unit Designation>

Attachment 5

FCC SDAP REQUEST

Figure A5.1. FCC SDAP Request

MEMORANDUM FOR MAJCOM/A4L or DOM *Date*

FROM: <Unit Designation/Office Symbol>

<Street>

<Base and Zip Code>

SUBJECT: Flying Crew Chief (FCC) SDAP Positions <Increase/Decrease> Request

In accordance with <unit designations> requests <increase or decrease> of <state quantity of positions>.

Provide brief justification; include comments about force structure changes, additional mission requirements. FCC Program Manager is <rank, name>, office symbol, DSN number.

<Sign>

Commander, <Unit Designation>

Attachment 6

FOREIGN OBJECT DAMAGE (FOD) REPORT

Figure A6.1. Foreign Object Damage (FOD) Report

MEMORANDUM FOR *Date*

FROM:<Unit Designation/Office Symbol> <Street> <Base and Zip Code>

SUBJECT: <Foreign Object Report>. FOD program report number (unit, year, and month, followed by sequence number -- example, 301FW-060501).

Type of report: Initial/Formal Update/Final FOD Report Date and Time of Incident:

Unit and Base of Incident:

Origin of Sortie:

When discovered (Preflight, Postflight, In-Coming, ETS)

Owning Unit, Base and MAJCOM

MDS and Tail Number (N/A for ETS incidents) Engine Type, Model, Series (TMS):

Engine S/N:

Engine Position (If Applicable):

Time Since Overhaul:

Description of Incident:

Material Failure: (Yes or No)

Tech Data Deficiency: (Yes/No) Preventable/Non-Preventable:

Investigation Findings:

Action Taken to Prevent Recurrence:

Parts Cost: Labor Cost: Total Cost:

Additional Comments (if necessary):

<Sign>

FOD Monitor, <Unit Designation>

Attachment 7

CRITICAL APPLICATION ITEMS & CRITICAL SAFETY ITEMS

A7.1. CRITICAL APPLICATION ITEMS (CAIs). For the purpose of this instruction, it is an item that is essential to weapon system performance or operation, or the operating personnel as determined by AFI 20-106IP, *Management of Aviation Critical Safety Items*.

A7.1.1. Includes flight safety items, life support, critical safety items (CSI), and nuclear hardened items. For systems including radar, avionics, munitions, contact the PO for the system to obtain the CAI designation.

A7.1.2. The management of CAIs (contains unique repair and manufacturing qualifications; material and manufacturing process requirements; and extensive testing requirements after repair) is a complex process. These specified procedures rest with the program manager.

A7.1.3. Other than TO and PO approved repairs, Electronic Warfare (EW) Systems are Critical Application Items and prohibited from consideration under the AFREP program. Performing repairs on EW system components may render the entire EW system degraded. Environmental Stress Screening (ESS) of repaired EW components is mandatory. Many EW components cannot be repaired due to electrical characteristics that are not visible or evident without special test facilities and procedures, none of which are available to field personnel or unqualified contractors.

A7.2. CRITICAL SAFETY ITEMS (CSIs). For the purpose of this instruction, CSIs are items whose failure may cause loss of life, permanent physical disability or major injury, loss of a system, or significant damage to equipment.

A7.2.1. Special attention is placed on CSIs due to potential catastrophic or critical consequences of failure; Public Law 108-136, sec 802, *Quality Control in Procurement of Aviation Critical Safety Items and Related Services*, was enacted to address aviation CSIs. The public law addresses three concerns:

A7.2.1.1. The Design Control Activity (DCA) is responsible for processes related to identification and management of CSIs used in procurement, modification, repair, and overhaul of aviation systems. The DCA is defined as the systems command of a military Service responsible for the airworthiness certification of the system in which a CSI is used.

A7.2.1.2. For contracts involving CSIs, DoD is restricted to DCA approved sources.

A7.2.1.3. The law requires that CSI deliveries and services meet the technical and quality requirements established by the DCA.

A7.2.2. ODM 4140.01, *DoD Supply Chain Materiel Management Procedures*, establishes procedures for the management of aviation CSIs. AFI 20-106IP, *Management of Aviation Critical Safety Items*, addresses requirements for identification, acquisition, quality assurance, management, repair, and disposition of aviation CSIs.

Attachment 8 (Added-AFMC)

TEST WING MAINTENANCE AND FLYING SCHEDULING PROCEDURES

A8.1. (AFMC) General Responsibility and Policy.

A8.1.1. **(AFMC)** Goals and Objectives. The goal of this attachment is to provide the most effective guidance for unit planning and execution of operations flying and maintenance scheduling activities in support of the AFMC flying hour program. The principal area of concern is the overall flying/ground test schedule execution balanced against the health of the fleet. For mission accomplishment and improved efficiency, the following must be considered: maximize crew training on all flights, plan alternate missions when possible, ensure configurations and fuel loads are accurate, and establish launch and recovery patterns, and utilize historical attrition data. The objectives of this guidance are to:

A8.1.1.1. **(AFMC)** Provide methods for units to develop and improve their flying and maintenance scheduling programs.

A8.1.1.2. **(AFMC)** Provide audit methods so that units may analyze their effectiveness.

A8.1.1.3. **(AFMC)** Provide methods for local commanders, and the MAJCOM, to assess effectiveness of unit performance in schedule planning and execution.

A8.1.2. **(AFMC)** Guidance. These instructions provide procedures and audit methods for units to develop their flying and maintenance scheduling program and analyze their effectiveness. It is intended to be a local tool for operations and maintenance activities to use in support of their programs. Reviewing flying and maintenance schedule deviations, and the reasons for those deviations, allows wing commanders (WG/CC) and their staffs/subordinates to evaluate unit flying program and scheduling procedures for efficiencies and effectiveness. Higher Headquarters (HHQ) management attention is directed to those areas beyond a unit's control.

A8.1.3. **(AFMC)** Applicability. This publication is applicable to all AFMC Centers and activities listed in the PURPOSE section, possessing, flying or supporting aircraft, to include contractor maintained operations.

A8.1.4. **(AFMC)** Standardization. Wings will develop a maintenance and operations coordinated supplement to this instruction standardizing attrition rate, spare factors, maximum aircraft commitment rate, and scheduling practices for the wing and each assigned mission design series (MDS). This local supplement will be reviewed and updated annually. Minimum topics should include quiet hour policies, cross country takeoffs and returns, minimum turn times, crew ready times, etc. Supplements will include local schedule input and publishing deadlines along with any wing unique requirements. (**T-2).**

A8.1.5. **(AFMC)** Reporting Requirements. Flying scheduling deviation recording and reporting is required for all AFTC and AFLCMC possessed aircraft while status, inventory, and utilization reporting is required for all AFMC units and activities possessing or supporting AFMC possessed aircraft to include those possessed for the AFMC mission by contractors.

A8.1.5.1. **(AFMC)** Reporting procedures are contained in **Chapter 2**. Operations, maintenance, test agencies, and others share in the responsibility for monitoring and controlling deviations. Schedule deviations altering the planned use of resources generally

have a domino effect that upsets future and near-term events. Every effort must be made to reduce or eliminate deviations.

A8.1.5.2. **(AFMC)** Units will use approved MIS reporting procedures. This includes contractor-maintained, AFMC assigned and possessed aircraft. In the event that the contractor is not obligated to utilize the MIS, the MXG commander or equivalent is responsible to ensure all reporting procedures are complied with. **(T-2).**

A8.1.6. **(AFMC)** First Look. The maintenance planning cycle ensures proper and effective use of maintenance resources. Maintenance schedulers use both maintenance and operational long-range planning to assess maintenance's ability to support the wing flying program, Programmed Depot Maintenance (PDM) schedules, Time Compliance Technical Order programs, scheduled inspections and exercises. PS&D, or equivalent, will coordinate with AMUs in performing the long range planning function and use local products and MIS products such as time distribution index (TDI), planning requirements (PRA), and workable TCTO report (WTR), and modification schedules to determine long range maintenance requirements. PS&D will forecast and monitor requirements for the planned fiscal year. Maintenance requirements are included in long-range plans to project aircraft availability.

A8.1.6.1. **(AFMC)** Every year, no later than (NLT) 15 March, MOF PS&D will request Maintenance Management Analysis (MMA) accomplish airframe, personnel, and facility capabilities for each AMU based on historical data to start the First Look requirements. The capabilities are due back to MOF PS&D NLT the last workday of March.

A8.1.6.2. **(AFMC)** MOF PS&D will provide copies of the capability study to each Operations Squadron (OS) operations scheduling and maintenance supervision. AMU PS&D will refine the initial MMA airframe capability by applying projected maintenance requirements to the historical data. AMU PS&D will provide first look maintenance capability projections in a monthly format to OS operations officer, AMU OIC/ NCOIC, AMXS/CC/MOO, and MOF PS&D by 15 May. Projections include known operational and test requirements, an assessment of maintenance's ability to support the monthly contract requirements, and an overall assessment of the unit's maintenance capability to meet the annual flying hour program. **(T-2).**

A8.1.6.3. **(AFMC)** MOF PS&D will gather the AMXS and OS coordinated operational capability and forward them to OSS Operations Flight scheduling section for consolidation into a comprehensive package that includes a breakdown of the following items by OS/AMU: **(T-2).**

A8.1.6.3.1. **(AFMC)** Sorties contracted/scheduled per day. Compute the number of sorties (hours) required per operations and maintenance (O&M) day to meet the operational and test requirement using the formula: Number of sorties (hours) required divided by number of O&M days in a given month. Sorties (hours) per day will be computed by month for each operational squadron/AMU.

A8.1.6.3.2. **(AFMC)** Monthly scheduled sorties. Compute monthly scheduled sortie requirements using the formula: (Number of sorties or hours required) divided by (1 minus the attrition factor). Example: 1,000 sorties or hours required divided by (1 minus 0.15) equals 1,177 sorties or hours to schedule. Remember to round any part up to the next whole sortie or hour.

A8.1.6.3.3. **(AFMC)** Inspection dock capabilities. Compute the number of Phases/ISO inspections to be accomplished in order to meet operational and test requirements for each AMU, by month, for the entire fiscal year. Compute dock capability using the formula (number of O&M days) divided by (number of phase days) times (inspection cycle). Inspection dock capabilities is provided at the wing level and provided by the squadron performing inspections.

A8.1.6.3.4. **(AFMC)** Sortie UTE Rates. Compute UTE rates by month for the entire fiscal year for contracted (required) sorties and scheduled sorties using formula: (number of sorties per month) divided by (number of PAI aircraft).

A8.1.6.4. **(AFMC)** Once compiled, the annual maintenance plan will be presented to the OG and MXG CCs (or equivalents) before being presented to the WG/CC for final approval. MOF PS&D will review the comprehensive package submitted to OSS Operations Flight scheduling section and provide feedback to AMU PS&D and MXG/CC if required. Final assessments of maintenance capabilities to support the operations ―first look‖ projections are sent to AFMC/A4/10. **(T-2).**

A8.1.6.4.1. **(AFMC)** Final assessments of maintenance capabilities to support the operations "first look" projections will be sent to AFMC A4 NLT 30 June.

A8.1.7. **(AFMC)** Flying Hour Allocation/Annual Maintenance Planning Cycle.

A8.1.7.1. **(AFMC)** Flying Hour Allocation. Using funding guidance from the Financial Management organization in the chain of command, PS&D and OS/OSS scheduling provide affected work centers the following planning factors NLT 20 August each year, or within 10 working days after receipt of the flying hour allocations:

A8.1.7.1.1. **(AFMC)** Updated capabilities computed by MMA, provided by PS&D.

A8.1.7.1.2. **(AFMC)** Required flying hours and estimated sorties and missions, provided by OSS, in monthly increments.

A8.1.7.1.3. **(AFMC)** Flying days in each month, provided by OSS.

A8.1.7.1.4. **(AFMC)** Aircraft and aircrew alert requirements, provided by OSS.

A8.1.7.1.5. **(AFMC)** Known and projected TDY and special mission requirements, provided by OSS.

A8.1.7.1.6. **(AFMC)** PDM schedule, provided by PS&D.

A8.1.7.1.7. **(AFMC)** Configuration and munitions requirements, provided by OSS.

A8.1.7.1.8. **(AFMC)** Special mission and test requirements.

A8.1.7.2. **(AFMC)** NLT 1 September, or within 10 working days after receipt of the planning factors, AMU and AMXS maintenance supervision provides PS&D, SQ/CCs, and OSS operations scheduling the following planning factors:

A8.1.7.2.1. **(AFMC)** Estimated number of aircraft available by month, taking into consideration aircraft required for training.

A8.1.7.2.2. **(AFMC)** A projected airframe capability statement.

A8.1.7.2.3. **(AFMC)** Forecasted personnel capability, taking into consideration required annual training for maintenance personnel. (Not applicable to contract maintenance organizations).

A8.1.7.2.4. **(AFMC)** The number of supportable sorties for each month.

A8.1.7.2.5. **(AFMC)** An estimated monthly attrition factor provided by MMA. This factor combines operations weather and materiel (maintenance and supply) factors. Maintenance is responsible for adding the attrition factor to operational requirements. AMUs supporting multiple flying squadrons will not utilize a joint, or combined, attrition rate.

A8.1.7.2.6. **(AFMC)** A recommended block scheduling pattern.

A8.1.7.2.7. **(AFMC)** A statement of limitations.

A8.1.7.3. **(AFMC)** The OSS Operations Flight commander consolidates unit inputs into a final package and coordinates a combined OG and MXG CC concurrence meeting before final approval from the WG/CC. MOF PS&D will review the package and provide feedback to AMU PS&D and MXG/CC, if required. The final approved package constitutes the wing annual FHP. A copy of the approved annual plan and changes thereafter will be forwarded to MOF PS&D and the Analysis section. Units will submit the annual FHP (contract) to AFMC/A3F and AFMC/A4M around the 15th of September for awareness. **(T-2).**

A8.1.7.4. **(AFMC)** The annual plan will show the number of flying hours projected to fly by aircraft MDS. AFTC flying hours will be subdivided into planned test/test support (Program Element Code (PEC) 65807F), test pilot school (PEC 65807F), and an all other category (i.e. proficiency, maintenance, ferry, etc. (by applicable PEC)). **(T-2).**

A8.1.7.5. **(AFMC)** Maintenance requirements are included in long-range plans to project aircraft availability. Develop long-range maintenance plans in as much detail as possible. All maintenance requirements will be consolidated into a single long-range plan using AF Form 2401, Equipment Utilization and Maintenance Schedule, or computer generated form. As a minimum, the long-range plan shows the current month and the next 2 months known maintenance requirements. As a minimum, include the next due date for all calendar inspections, calendar time change items, TCTOs in workable status, PDM schedules, and at least the next 3 aircraft ISO/PE/Phase inspections. Other maintenance requirements such as engine changes, hourly requirements, acceptance/transfer inspections, training and cannibalization aircraft will be posted as they become known or planned. Add Alternate Mission Equipment (AME) inspections to the long-range plan if the aircraft is scheduled to stay in that configuration to ensure the inspections are included in the monthly and weekly schedules. **(T-2).**

A8.1.7.6. **(AFMC)** Maintenance planning includes predictable maintenance factors based on historical data and other staff inputs (e.g., flow times for maintenance, turnaround times, and parts replacement schedules). **(T-2).**

A8.1.7.7. **(AFMC)** Include all known operational events (e.g., exercises, deployments, and development tests) during maintenance planning to determine the maintenance capability to meet operational needs. **(T-2).**

A8.1.7.8. **(AFMC)** The Test Wing scheduling office will use the following priority as a guide to determine which objectives to support if a lack of resources prevents meeting requirements such as: alert commitments, HHQ directed missions, training, and test and test support missions.

A8.1.8. **(AFMC)** Quarterly Scheduling. The quarterly plan applies to Test Wing training missions and all known test missions.

A8.1.8.1. **(AFMC)** Quarterly planning starts with the operational requirements for the flying hours, UTE rate, and airframe availability, alert and other related scheduling data. The OS operations officer provides these requirements to maintenance supervision and PS&D NLT 25 days before the beginning of the quarter. Maintenance supervision and the OS operations officer discuss these requirements at the scheduling meeting before the quarter being planned.

A8.1.8.1.1. **(AFMC)** The Test Wing scheduling office will use the following priority as a guide to determine which objectives to support if a lack of resources prevents meeting requirements such as: alert commitments, HHQ directed missions, training, and test and test support missions.

A8.1.8.2. **(AFMC)** The unit's rolling 3-month maintenance plan briefed each month meets the intent of the quarterly scheduling process. The meeting may be held in conjunction with the weekly or as a separate scheduling meeting. The plan will be posted so it may be viewed by both maintenance and operations.

A8.1.9. **(AFMC)** Monthly Scheduling. Due to the nature of the test mission, publishing the monthly flying schedule according to AFI 21-101 may not be conducive to mission requirements; however, a tentative monthly plan will be created for planning purposes. Every effort will be made to create a realistic monthly plan to accurately plan resource utilization. **(T-2).**

A8.1.9.1. **(AFMC)** The monthly scheduling meeting may be held in conjunction with the weekly scheduling meeting or as a separate scheduling meeting, NLT the third week of the month prior.

A8.1.9.2. **(AFMC)** Included in the monthly flying and maintenance plan are:

A8.1.9.2.1. **(AFMC)** Follow guidelines in **Chapter 14** with the following exceptions:

A8.1.9.2.1.1. **(AFMC)** Only known operational and test requirements are reported (not detailed utilization).

A8.1.9.2.1.2. **(AFMC)** Known ground test/mount requirements are included.

A8.1.9.3. **(AFMC)** Post the monthly flying and maintenance plan NLT 1200 Friday of the third week. All agencies will submit their monthly schedule inputs to PS&D for consolidation and coordination.

A8.1.9.4. **(AFMC)** QA scheduled inspections listed by type and quantities are included in the monthly flying and maintenance plan unless published separately by QA. **(T-2).**

A8.1.10. **(AFMC)** Weekly Scheduling. Refer to details within this attachment along with **paragraph 14.5.5** for any additional guidance.

A8.1.10.1. **(AFMC)** Also included in the weekly flying and maintenance schedule will be:

A8.1.10.1.1. **(AFMC)** Sortie sequence numbers, aircraft tail numbers (primary and spares), scheduled take-off and landing times, aircraft or equipment scheduled use times, configurations, fuel loads and special equipment requirements. **(T-2).**

A8.1.10.1.2. **(AFMC)** Scheduled maintenance actions by aircraft and equipment serial number to include inspections, TCTOs, time changes, contract and depot inputs, engine changes, washes or corrosion control, documents review, deferred discrepancies, modifications and hours remaining to phase. **(T-2).**

A8.1.10.1.3. **(AFMC)** Spare aircraft requirements are based on projected test mission needs. The following factors are used to determine spares and are not hard limits but guidelines, and as such, it is up to the AMU to actually schedule what it can support:

A8.1.10.1.3.1. **(AFMC)** The spare requirement may be adjusted to compensate for multiple configurations and test or school syllabus constraints. **(T-2).**

A8.1.10.1.3.2. **(AFMC)** Additional spares are authorized to support HHQ taskings and special missions (if required by the tasking). **(T-2).**

A8.1.10.2. **(AFMC)** AF Form 2407, Approval Authority. All AF Form 2407 changes that add aircraft, sorties, or increase the flying window require both OG and MXG commander (or designated group level representative) approval. MXG/CD or equivalent will approve changes to the final schedule and coordinated through affected AMXS Operations Officer/MX SUPT, AMU OIC/SUPT, MXS Operations Officer/MX SUPT, operations group representative, maintenance group, and wing staff agencies. (e.g., MOC, PS&D, Analysis, etc.) using an AF Form 2407. MOC will coordinate higher headquarters directed taskings that require immediate execution. **(T-2).**

A8.1.10.2.1. **(AFMC)** Changes to the Weekly Schedule. Pen-and-Ink. The pen-and-ink AF Form 2407, Weekly/Daily Flying Schedule Coordination is not intended to be used as a tool to extend the scheduling process by another day. Pen-and-ink changes made to next week's schedule are authorized, provided they are submitted to the PS&D by 1600 hours Friday or at the daily maintenance scheduling/production meeting, whichever occurs first (**Exception:** NLT 2 hours after the last landing during printed wing night flying weeks). They are non-reportable and become part of the printed weekly flying schedule. An AF Form 2407 is required stating the changes are pen-and-ink. **Note:** The intent of the pen-and-ink AF Form 2407 is not to create complete revisions of the previously Wing/CC approved schedule. **(T-2).**

A8.1.10.2.2. **(AFMC)** AFMC units are authorized to use the Center Scheduling Enterprise (CSE) in recording and coordinating changes to the weekly schedule in place of AF Form 2407. Electronic coordination is acceptable provided receipt is acknowledged and the sender enters the name of the person notified, along with date/time of notification, and logged-in accordance with requirements on the AF Form 2407. **(T-2).**

A8.1.10.3. **(AFMC)** The MXG/CC/CL, OG/CC, and/or director(s) will approve the proposed weekly flying schedule and forward to the WG/CC for final approval. Once the

weekly schedule is reviewed and signed by the OG/CC, MXG/CC and WG/CC it becomes the final planning guide for both operations and maintenance and the basis for deviation reporting. The schedule will be followed as printed or as amended by coordinated changes. MOF PS&D will publish the final weekly flying schedule. **(T-2).**

A8.1.10.4. **(AFMC)** Rapid Crew Swap (RCS). To meet mission requirements, MXG/CC may authorize the use of RCSs for fighter/attack aircraft. Local Checklists (LCLs) will be developed in coordination with applicable MDS specific -6 TO or maintenance manual, that standardizes specific procedures when performing RCS tasks. RCSs involves turnaround of an aircraft incorporating partial or full crew change between two separate sorties after engine shutdown. The returning aircrew must brief the departing aircrew at the aircraft. The difference between RCS and the policy for continuation sorties is RCSs allow minor servicing (i.e. fuel, hydraulics, oil/sampling) to be performed between sorties. If at any time the aircraft is returned to maintenance for anything other than minor servicing, the RCS is terminated. RCS sorties will be published in the weekly flying schedule; deviations will apply to each sortie.

A8.1.10.5. **(AFMC)** MOF PS&D will record maintenance scheduling deviations and forward the computations to MOF maintenance analysis weekly for publication in the monthly maintenance summary. **(T-2).**

A8.1.11. **(AFMC)** Daily Scheduling Process. Daily Scheduling Process. Daily scheduling must be approved by the MXG/CC. If utilized, units must effectively plan and execute operations and maintenance schedules. Each day, no later than 1600 local time, the OG and MXG CCs or their designated group representative will review and publish the daily flying and maintenance schedule, agree on revisions, and coordinate with other agencies to confirm the next day's activities. Use AF IMT 2407 or authorized automated system in coordinating the final schedule through the affected production superintendent, AMU OIC/SUPT, AMXS Maintenance Supervision (MS), MXS MS, operations group representative, maintenance group, and wing staff agencies. (i.e. MOC/ROC, PS&D, Analysis, etc.). Deviations will be recorded based on this final daily flying schedule. Additional scheduling reporting procedures are located in **paragraph 2.3** and **5.1** of this Attachment. **(T-2).**

A8.1.11.1. **(AFMC)** The finalized daily flying schedule will include, at a minimum, the following details: **(T-2).**

A8.1.11.1.1. **(AFMC)** Aircraft tail numbers.

A8.1.11.1.2. **(AFMC)** Aircraft takeoff and landing times.

A8.1.11.1.3. **(AFMC)** Configuration requirements.

A8.1.11.1.4. **(AFMC)** Munitions requirements.

A8.1.11.1.5. **(AFMC)** Fuel loads.

A8.1.11.1.6. **(AFMC)** Special or peculiar test support requirements.

A8.1.11.1.7. **(AFMC)** Special or peculiar mission support requirements.

A8.1.11.1.8. **(AFMC)** Off station sorties.

A8.1.11.1.9. **(AFMC)** On equipment training requirements.

A8.1.11.1.10. **(AFMC)** Other special requirements (i.e. ground test/mount).

A8.1.11.2. **(AFMC)** Maintenance Debrief will load all Functional Check Flights (FCF)/Operational Check Flight (OCF), Ferry and cross country returns as "flown as scheduled" in the MIS. (**T-2).**

A8.2. (AFMC) Total Scheduling Effectiveness

A8.2.1. **(AFMC)** Purpose. This section defines flying schedule deviations and provides formulas for computing Total Scheduling Effectiveness (TSE). A cornerstone of successful flying scheduling and execution is an understanding of how the schedule is executed versus how it was planned to be executed. These differences in scheduled versus actual events, are only recorded in the execution phase of the scheduling process and are called deviations. Deviation data must be recorded so that follow-up analysis can identify appropriate corrective actions, if any. Deviation data recording and analysis is the beginning of the process that will, in the end, improve unit's flying operations. The unit is responsible for documenting deviations to the flying schedule and determining the cause for each deviation. Deviations must be coordinated with the appropriate agency before being assigned to a specific category. Schedule deviations that result from a sequence of events will be assigned a primary cause. A determination of the primary cause will be made by the parties involved to arrive at a unit position. The Operations representative and the AMU/AMXS MS will monitor deviations to ensure they meet the criteria in this publication. When conflicts arise, leadership of involved units will resolve them at the lowest level. All deviations will be recorded as described in this publication. Although every attempt will be made to properly schedule and reduce deviations, this metric must be viewed in conjunction with additional mission execution metrics to allow a more comprehensive assessment of maintenance effectiveness. Add narrative to read: Although every attempt will be made to properly schedule and reduce deviations, this metric must be viewed in conjunction with additional mission execution metrics to allow a more comprehensive assessment of maintenance effectiveness. The previous week's deviations will be briefed by the responsible organizations at the Weekly Wing Scheduling Meeting. **(T-2).**

A8.2.2. **(AFMC)** Requirements. Total scheduling effectiveness computation and deviation recording are required for all AFMC assigned aircraft. Reporting procedures are contained in **paragraph 2.5**

A8.2.3. **(AFMC)** Deviations.

A8.2.3.1. **(AFMC)** Deviations apply to the respective Test Wing's final/approved weekly or daily (if utilized) flying schedule. Any change to the approved daily flying schedule after 1600 the day prior will be recorded as a deviation. Multiple deviations will not be recorded against a single line entry except for (a) additions that air abort, (b) additions that cancel or ground abort, (c) added sorties that take-off late, and (d) late take-offs that air abort; however, all deviations will be recorded. The AFTO Form 781, ARMS Aircrew/Mission Flight Data Document is the official source document for takeoff and landing data. For all deviations, the person recording the deviations in the MIS will provide a detailed explanation in the remarks section and a Job Control Number/Event ID in IMDS screen 350, if applicable. Schedule deviations fall into one of the following categories:

A8.2.3.2. **(AFMC)** Ground Deviations. Ground deviations are events occurring before aircraft takeoff or scheduled ground test. All ground deviations are recorded and used in

total scheduling effectiveness calculations unless otherwise noted. FCF and OCF whose primary purpose is to perform maintenance checks and sorties originating off-station without home-unit support will be considered "flown as scheduled" without recording deviations with the exception of aborts. Specific ground deviations are:

A8.2.3.2.1. **(AFMC)** Addition (AD). An aircraft or event (including both sortie and ground test) added to the approved flying schedule. Will be recorded against the agency (OP, MX, HQ, Test Agency, etc.) requesting the additional sortie or aircraft. (**T-2).**

A8.2.3.2.2. **(AFMC)** Cancellation (CX). Cancellation (CX). A sortie or ground-test event that is removed from the printed schedule for any reason before crew show. Cancellations occur when it is determined the originally scheduled mission cannot be met. For training sorties, if the sortie can launch and recover during the squadron's flying window and perform its original mission with the original crew, a cancellation is not recorded. If any sortie does not launch within the late takeoff criteria, a late takeoff is recorded. Any cancellations will be recorded against the agency (OP, MX, HQ, Test Agency, etc.) that is responsible for the cancellation. **(T-2).**

A8.2.3.2.3. **(AFMC)** Early Takeoff (ET). An early takeoff is a scheduled sortie launching more than 30 minutes prior to the published takeoff time.

A8.2.3.2.4. **(AFMC)** Ground Abort (GA). A ground abort is an event, after crew show, which prevents a —crew ready aircraft against the responsible agency or condition that caused the abort. Ground aborts are categorized as maintenance (GAA/GAB/GAC), operations, higher headquarters, weather, sympathy, project, other, etc.

A8.2.3.2.5. **(AFMC)** Late Takeoff (LT). A late takeoff occurs when a scheduled sortie becomes airborne more than 30 minutes after the scheduled takeoff time. If a LT is driven by a late land, the deviation for the LT will be charged against the responsible agency for the late land.

A8.2.3.2.6. **(AFMC)** Spare (SP). A spare is a designated aircraft on the printed schedule to be used in case a scheduled aircraft cannot fly its scheduled sortie. Spares can include aircraft that have canceled, aborted, flown earlier or an aircraft released after FCF/OCF. The aircraft production supervisor will manage scheduling and use of spare aircraft. Do not count printed spares flown in scheduled lines as deviations when computing TSE. Spare aircraft requirements are based on projected test mission needs. The following factors are used to determine spares and are not hard limits but guidelines, and as such, it is up to the AMU to actually schedule what it can support.

A8.2.3.2.6.1. **(AFMC)** The spare requirements may be canceled (when deviations are not used for computing TSE) if test requirements are accomplished/met.

A8.2.3.2.6.2. **(AFMC)** Additional spares are authorized to support HHQ taskings and special missions (if required by tasking).

A8.2.3.2.7. **(AFMC)** Interchange/Tail Number Swap (TS). Interchanges are changes to the printed flying schedule involving aircraft tail numbers printed on the flying schedule. Interchanges may be used to prevent reconfigurations and unnecessary expenditures of man-hours, or to replace a printed tail number with another tail number

on the signed scheduled. Interchanges between aircraft on the flying schedule, including FCF/OCF and cross country returns that have flown, will not be recorded as deviations. Interchanges include the following:

A8.2.3.2.7.1. **(AFMC)** Changing aircraft in printed line numbers with printed spare aircraft.

A8.2.3.2.7.2. **(AFMC)** Changing aircraft in printed line numbers to different printed line numbers (tail number swap).

A8.2.3.2.7.3. **(AFMC)** Interchanges may be made up to any time prior to aircraft takeoff. The MOC must be notified of all interchanges for proper coordination with affected work centers. Record all interchanges in the MIS. Do not count Interchanges/Tail Number Swaps as deviations when computing TSE.

A8.2.3.3. **(AFMC)** Air Deviations. Air deviations are events occurring after takeoff. They are recorded in the MIS, but are not included in total scheduling effectiveness calculations. Air deviations fall into the following categories:

A8.2.3.3.1. **(AFMC)** Air Abort (AA). An aircraft/sortie that cannot complete its primary or alternate mission for any reason. Air aborts are considered a sortie flown when reporting total sorties flown. Air aborts will be recorded against the agency or condition that caused the aborted mission. An air abort will not be recorded when malfunctions occur during the "Before Takeoff Checklist" portion of helicopter sorties. Air aborts caused by specific test mission will not be counted in abort rate computations. **Note:** Effective sortie decisions will be made by operations.

A8.2.3.3.2. **(AFMC)** Air Abort, IFE (AI). An air aborted aircraft/sortie with a situation resulting in an in-flight emergency declared by the aircrew.

A8.2.3.3.3. **(AFMC)** IFE (FE). An aircraft/sortie with a situation resulting in an in-flight emergency declared by the aircrew after the mission is accomplished.

A8.2.3.3.4. **(AFMC)** Late Landing (LL). An aircraft/sortie landing more than 15 minutes after the scheduled landing time. If the sortie originated on time, record any subsequent late takeoff or cancellation against the agency that caused the late landing. Late landings are included in TSE calculations. **Note:** LTs do not justify LLs.

A8.2.3.3.5. **(AFMC)** Early Landing (EL). An early landing is an aircraft/sortie landing more than 30 minutes before the scheduled landing time. Early Landing deviations are not used when computing TSE.

Table A8.1. (AFMC) Common Total Scheduling Effectiveness (TSE) Deviation Determination Matrix.

Event	Is the deviation		Remarks
	Recorded in IMDS/MIS?	Calculated in TSE?	

Pen-and-Ink changes to the schedule are made on an AF Form 2407 (IAW Chapter 14)	No	No	Pen-and-Ink changes are not deviations and are considered part of the printed schedule. See Chapter 14
Take-off or landing time is changed after approved Pen-and-Ink submissions via AF Form 2407	Yes	Yes	See paragraphs in Chapter 14. Calculation in TSE is determined by late and early criteria
Aircraft configuration is changed after approved Pen-and-Ink submissions via AF Form 2407	Yes	No	Changes will be tracked to prevent reoccurrence and get a true picture of the total scheduling turmoil.
A sortie is added to the flying schedule (excluding OCFs/FCFs, XC return)	Yes	Yes	
A sortie is added for an OCF/FCF/OCF/FCF "Chase"	No	No	These are considered flown as scheduled.
A sortie is canceled	Yes	Yes	Once the decision is made to cancel the sortie, it is a cancel. If a decision is made after the cancel to go ahead and fly the sortie, it becomes an added line.
A sortie is determined to be non-effective	No	No	Not a deviation. The determination is made by operations and has no bearing on TSE.
A take-off is determined to be late	Yes	Yes	
A take-off is determined to be early	Yes	Yes	
A landing is determined to be early	Yes	No	
A landing is determined to be late	Yes	Yes	A late landing may result in a late take-off on a subsequent sortie.

During a surge, more sorties are flown than were printed and the statement “Sortie Surge” is NOT printed in the remarks section of the affected day’s flying schedule	Yes	Yes	Sorties printed in the weekly schedule will be flown as printed. Additional sorties not printed will be considered added lines.
During a surge, more sorties are flown than were printed and the weekly schedule contains “Sortie Surge” in the remarks section of the affected day	No	No	During planned and printed surges and combat sortie generations, additional lines are considered flown as scheduled.
During a surge, an aircraft turn sortie takes off early or late	No	No	Units should track late take-offs of turn sorties locally during surges to prevent reoccurrence. Late take-offs are recorded for surge first go sorties.
Maintenance is performed during a stop in a continuation sortie and the mission continues	Yes	Yes	An “add” is recorded for the subsequent sortie. Be sure the added line is designated as a continuation sortie to prevent further deviations for other scheduled stops.
A sortie is added to the schedule for weather attrition	Yes	No	
A sortie is added to the schedule for weather attrition when planned weather attrition has been meet	Yes	No	See A8.2.6.1
A sortie is canceled at any time due to weather	Yes	Yes	Prior to crew show it is a cancel, after crew show, it is a weather abort.
A spare aircraft printed on the flying schedule is used in a printed line.	Yes	No	

An aircraft in the printed schedule is swapped with an aircraft in another printed line.	Yes	No	
An aircraft not printed in the flying schedule is used in a printed line. (excluding aircraft already flown that day such as OCF/FCF, X-Country returns)	Yes	Yes	One deviation is recorded for the added aircraft. The result is the same as adding an aircraft as a spare, then tail swapping it into a printed line.
An aircraft not on the printed flying schedule is added as a spare.	No	Yes	Counts as a TSE deviation even if the aircraft does not fly. This has to be manually done by MMA because there is no required IMDS/MIS transaction that captures this.
An aircraft not printed in the flying schedule that has flown that day is flown/used in a printed line	Yes	No	Examples include previously flown FCF/OCF aircraft as well as cross country returns.
A ground abort is replaced with a another aircraft/spare on the printed schedule	Yes	No	Both the ground abort and spare action will be recorded in IMDS/MIS. If the replacement aircraft takes-off on time, no deviation is recorded.
A printed aircraft ground aborts and is replaced with an aircraft **NOT** on the printed schedule and the second aircraft also ground aborts and the original aircraft is fixed, takes off late, and flies the sortie.	Yes	Yes	The original aircraft is recorded as a ground abort and late take-off. The second aircraft is recorded as an “add” and a ground abort. Ground aborts in themselves are not deviations calculated in the TSE rate, but are calculated in the ground abort rate.

A8.2.4. **(AFMC)** Deviation Causes. Deviations will be assigned a primary cause. The WG/CC will resolve questions concerning assigning deviations between maintenance and operations. The OS/CC, AMXS/CC, and LRS/CC will resolve questions concerning deviations involving supply and POL. Deviations will be assigned one of the following causes: (**T-2).**

A8.2.4.1. **(AFMC)** Maintenance (MT). Deviations resulting from aircraft discrepancies, unscheduled maintenance, or for actions taken for maintenance consideration. **Note:** Maintenance-related ground aborts will use one of the —GAx cause codes (See **paragraph 5.2.4**).

A8.2.4.2. **(AFMC)** Operations (OP). Deviations resulting from operations/aircrew actions, mission changes causing an early/late takeoff, or cancellation including substitution/aircrew illness, and over- stressing the aircraft. OP are also deviations resulting from unit controlled operations factors including those caused by mission/load planning, life support, intelligence, base operations, and passengers.

A8.2.4.3. **(AFMC)** Project/Test Agency (PJ). Deviations to flight that result from rescheduling, reconfiguration, test item malfunctions, failures, or necessary adjustments to equipment undergoing tests or evaluations associated with Operational Testing and Evaluation (OT&E). Development Testing and Evaluation (DT&E), or Initial Operational Testing and Evaluation (IOT&E).

A8.2.4.4. **(AFMC)** Supply (SU). Deviations resulting from a Partially Mission Capable Supply (PMCS) or Not Mission Capable Supply (NMCS) condition or for late Supply or Petroleum Oil Lubricant (POL) delivery. Contract Logistics Support (CLS) items are included. In accordance with local MOAs/operating instructions. **Note:** The actual time required for installation and ops check will be considered. Maintenance has up to the end of the original parts plus estimated time in commission (ETIC), deviations after the ETIC has expired are charged against maintenance.

A8.2.4.5. **(AFMC)** Higher Headquarters (HHQ). Deviations resulting from a higher headquarters tasking including closing of low level routes/ranges or external customer driven mission change. When an aircraft that was scheduled for a higher headquarters directed off-base mission is replaced by a spare refer to **paragraphs 2.3.2.6** and **2.3.2.7** for unit options.

A8.2.4.6. **(AFMC)** Weather (WX). Deviations for aircraft which takeoff early, late, abort, or are added or canceled due to weather conditions. For example, if an aircraft taxied to the end of runway and the wing commander cancels all flying due to weather, the aircraft is a weather abort. Sorties/Aircraft cancelled prior to crew show are weather cancels.

A8.2.4.7. **(AFMC)** Sympathy (SY). Deviations occurring when an event of two or more aircraft, under the command of a flight leader or instructor pilot are canceled, aborted, or late due to a cancellation, abort, or delay of one of the aircraft in the flight or a supporting flight. Events, which are to replace sympathy aborts or cancellations on the same day, will be recorded as sympathy additions. Events lost caused by the aircraft's scheduled mated tanker/receiver/mission event will be recorded as sympathy. Examples of mission events are: loss of release times, Airborne Warning and Control System (AWACS) support, Minimum Interval Take Off (MITO) causing takeoff delay or cancellation, or for another unit's or command's support should be coded as sympathy deviations. **Note:** Deviations

caused by aircraft/missions earlier scheduled lines will be assigned to the cause of the earlier deviation, not sympathy (SY).

A8.2.4.8. **(AFMC)** Air Traffic Control (AT). Deviations resulting from air traffic control problems (for example, flight clearance delays, tower communication failure, conflicting air traffic, runway change, or runway closure).

A8.2.4.9. **(AFMC)** Contractor Support (CS). A deviation resulting from a test or system contractor not being able to support the mission in accordance with the requirements of the contract.

A8.2.4.10. **(AFMC)** Range Availability (RN). A deviation resulting from the Range not being available.

A8.2.4.11. **(AFMC)** Other (OT). Deviations resulting from unusual circumstances not covered by other causes listed. OT may include:

A8.2.4.11.1. **(AFMC)** Unusual circumstances (e.g.., bird strikes, damage during air refueling, unscheduled exercises) may use this code.

A8.2.4.11.2. **(AFMC)** Equipment, non-AFMC. Deviations caused by National Airborne Operations Center NAOC) or Air Intelligence Agency (AIA), and other non-AFMC support and equipment.

A8.2.4.11.3. **(AFMC)** When an aircraft is off station and cannot return for its scheduled sortie/mission, a deviation will be recorded for the reasons the aircraft was unable to return. The reasons will be specific (maintenance, operations, weather, etc.). A printed spare aircraft may be used for any sorties scheduled for the aircraft that did not return.

A8.2.4.11.4. **(AFMC)** Ferry Sorties. Ferry sortie requirement too late for inclusion in the flying schedule will be documented as a new line for the day and “flown as scheduled”.

A8.2.4.11.5. **(AFMC)** Hot Spare Aircraft. Properly configured aerospace vehicle that is listed on the flying schedule as a spare with a specific takeoff time and not utilized. If not used will be recorded as a cancel other.

A8.2.4.11.6. **(AFMC)** Airborne Instrumentation.

A8.2.4.11.7. **(AFMC)** Laboratories.

A8.2.4.12. **(AFMC)** Exercise, Higher Headquarters (EXH). Deviations resulting from higher headquarters directed exercises, including alarm/force protection conditions. Deviations in this category will not be included in TSE calculations.

A8.2.4.13. **(AFMC)** Exercise, Local (EXL). Deviations resulting from wing/unit directed exercises, including alarm/force protection conditions. Deviations in this category will not be included in TSE calculations.

A8.2.4.14. **(AFMC)** Special Instrumentation (SI). Deviations that directly result from issues with SI support.

A8.2.5. **(AFMC)** Rules for Reporting Schedule Deviations. The unit is responsible for documenting deviations to the weekly flying schedule and determining the cause for each

deviation. Deviations must be coordinated with the appropriate agency before being assigned to a specific category. The operations representative and AMU/AMXS MS will monitor deviations to make sure they meet the criteria in this instruction. When disparities exist, they will be referred to the OG and MXG CCs or designated representative for resolution. Schedule deviations that result from a sequence of events will be assigned a primary cause. A determination of the primary cause will be decided upon by all parties involved to arrive at a unit position.

A8.2.6. **(AFMC)** Scheduling Exceptions.

A8.2.6.1. **(AFMC)** Adverse Weather. Units/flying squadron(s) may add sorties to the flying schedule to make up for weather losses. Sorties will only be added to the schedule when the planned weather attrition for the month has been exceeded for that month. The number of sorties added will not exceed the difference between the planned weather attrition and actual weather losses. Weather attrition will be computed by the MMA Section. (Example: Planned weather attrition for the month equals 30 sorties. On the 20th of the month 40 sorties are lost. Ten non-chargeable sorties may be added. The maintenance schedule and the ability of maintenance to support the additional requirements must be carefully considered before adding sorties.

A8.2.6.2. **(AFMC)** Unscheduled Tasking. When a unit is tasked with an unscheduled higher headquarters tasking or self-initiated tasking (mobility exercises or weather evacuations), or other services tasking which significantly impacts the flying schedule, the printed schedule may be revised or deleted from the MIS by AMU PS&D and replaced with a new schedule without recording deviations. For weather evacuations, the schedule will be cancelled in the MIS, not deleted, so the data is available for historical attrition. (**T-2). Note: Local unscheduled tasking will not be used solely to recoup sortie losses.**

A8.2.6.2.1. **(AFMC)** If the schedule is revised or canceled and reprinted, the following procedures will be used: **(T-2).**

A8.2.6.2.1.1. **(AFMC)** Follow normal deviation reporting procedures once the revised/reprinted schedule is finalized. The revised schedule will be finalized a minimum of 2 hours before the first scheduled launch.

A8.2.6.2.1.2. **(AFMC)** Once the tasking terminates, the original schedule may be used or it may be revised or reprinted for the tasking period, as required. Normal deviation reporting is to be used once the revised or reprinted schedule is finalized.

A8.2.6.2.1.3. **(AFMC)** Normal deviation reporting procedures will be followed after a takeoff time is established to a tasking by higher headquarters or other services.

A8.2.7. **(AFMC)** Utilization Reporting. All aircraft flying hours are required to be reported in REMIS in accordance with AFI 21-103. This requirement is not waived for contractor-maintained aircraft.

A8.2.8. **(AFMC)** Scheduling Effectiveness Computation

A8.2.8.1. **(AFMC)** TSE Rate. Similar to the Flying Schedule Effectiveness for the CAF, TSE is a leading indicator and is a measure of how well the unit planned and executed the weekly flying and ground test event schedule. TSE is derived by comparing each day's

deviations to the flying and ground test schedule. Deviations that decrease the TSE from 100 percent include: scheduled sorties/ground test events not accomplished because of maintenance, supply, operations, weather, HHQ, air traffic control, sympathy, or other reasons; scheduled events that actually start more than 30 minutes prior to scheduled start time; scheduled events that begin more than 30 minutes after their scheduled start time and events that are added to the schedule. Disruptions to the flying or ground test schedule, or constant configuration changes to test assets can cause turmoil on the flightline, send a ripple effect throughout other agencies, and adversely impact scheduled maintenance actions.

Table A8.2. (AFMC) Test Scheduling Effectiveness Computation.

TSE (%) = Total Ground and Sortie Events Scheduled – Total Deviations x 100 / Total Ground and Sortie Events Scheduled

A8.2.9. **(AFMC)** Maintenance Deviation Rate (MX Dev). Although all deviations to the test schedule are counted in the TSE calculation, the Maintenance Deviation Rate represents deviations to the flying/ground test schedule that are, for the most part, are within the maintenance community's control. All maintenance late take offs, ground aborts, cancellations, and maintenance additions are counted towards the rate. Although all deviations from the published schedule can cause turmoil on the flightline, maintenance supervision should focus on eliminating or minimizing schedule deviations due to maintenance.

Table A8.3. (AFMC) Maintenance Deviation Rate Computation.

Maint Dev Rate (%) = Total Maintenance Deviations x 100 / Total Ground and Sortie Events Scheduled

A8.3. (AFMC) Maintenance Scheduling Effectiveness (MSE).

A8.3.1. **(AFMC)** Purpose. This chapter provides a means to measure maintenance management effectiveness, reflected by how well the maintenance schedule is carried out. Maintenance efforts should be directed toward the timely accomplishment of all scheduled maintenance actions. The AFMC Maintenance Scheduling Effectiveness (MSE) goal is 95%.

A8.3.2. **(AFMC)** Computations.

A8.3.2.1. **(AFMC)** Scheduled maintenance events and respective weighted factor points in **Table 3.1** are used to compute the MSE rate. Credit is received for actions completed on, or prior to, the scheduled date as printed in the weekly schedule. The MIS database and the published schedule will be used to determine whether or not the maintenance actions were completed on-time. **Exception:** Phase/PE and ISO inspection, and all maintenance requiring more than 24 work hours to complete will be measured against the scheduled start time/date.

A8.3.2.2. **(AFMC)** The MXG/CC may select additional areas (such as AGE, AIS, AME, etc.) for local scheduling effectiveness tracking. The unit will establish standards for these programs and develop a computation table in the format of **Table 3.1**. This data will not be included in aircraft maintenance scheduling effectiveness when reported to higher headquarters.

A8.3.2.3. **(AFMC)** MOF PS&D will record maintenance scheduling deviations and forward the computations to MOF maintenance analysis weekly for publications in the monthly maintenance summary. **(T-2).**

A8.3.2.4. **(AFMC)** When a unit is tasked with a test acceleration, quick reaction test, unscheduled tasking, unannounced exercise/real world contingency, or higher headquarters exercise that significantly impacts the printed weekly maintenance schedule, the plan may be revised or reprinted without incurring deviations. Normal deviation reporting procedures will be followed once the revised or reprinted plan is finalized. The unaccomplished portion of the maintenance schedule that was revised will not be included in the scheduling effectiveness formula. **(T-2).**

A8.3.2.5. **(AFMC)** Establish local written procedures to ensure coordination of changed/cancelled/added scheduled maintenance.

A8.3.2.6. **(AFMC)** Maintenance Scheduling Deviation Categories.

A8.3.2.6.1. **(AFMC)** Maintenance (MT). Actions canceled or not completed as a result of adding aircraft to the flying schedule, mismanagement, or a lack of manpower or equipment.

A8.3.2.6.2. **(AFMC)** Higher headquarters (HHQ). Actions canceled or not completed as a result of higher headquarters tasking from outside of the wing.

A8.3.2.6.3. **(AFMC)** Weather (WX). Actions canceled or not completed as a result of weather conditions.

A8.3.2.6.4. **(AFMC)** Supply (SU). Actions canceled or not completed as a result of verified parts back order condition.

A8.3.2.6.5. **(AFMC)** Other (OT). Actions canceled or not completed as a result of impounded aircraft (after the weekly schedule is published), major maintenance where technical data restrictions do not allow the scheduled maintenance, or aircraft is off-base and unable to return.

Table A8.4. (AFMC) Maintenance Scheduling Effectiveness Computation.

SCHEDULED EVENT	A WEIGHTED POINTS	B NUMBER OF EVENTS	C POSSIBLE POINTS (A x B)	D COMPLETED SCHEDULED	E POINTS EARNED (A x D)
Periodic/Isochronal/ Phase Inspections	5				
Home Station Checks/ Hourly Post Flights	5				
Engine Changes	5				
Time Changes	4				
TCTOs	4				

Corrosion Control/ Paint	4				
Special Inspections	3				
Document Reviews	2				
Delayed Discrepancies	3				
Total Points Possible:_____ Total Points Earned:_____ Total O&M Points Possible: _____ Total O&M Points Earned:					

A8.4. (AFMC) TDY/Deployed Sorties

A8.4.1. **(AFMC)** Purpose. This chapter establishes rules and procedures used in planning, executing, evaluating, and reporting of unit flying and maintenance schedules at deployed/TDY locations where unit maintenance is provided. Sorties flown at deployed/TDY locations where no parent unit maintenance is provided are considered off-station sorties. If parent unit support is deployed, this is considered the same as home station support and normal deviation reporting applies. Limited launch support is not considered parent unit maintenance.

A8.4.2. **(AFMC)** General. Normal deviation reporting applies to deployed operations except as noted in this chapter. Data from deployed operations will be transmitted or forwarded back to home station.

A8.4.3. **(AFMC)** Scheduling. In addition to the procedures established at home station for scheduling and reporting, deployed units will use the following procedures when developing a flying schedule and reporting deviations: Separate block(s) of sortie sequence numbers will be assigned for deployment/TDY location(s). **(T-2).**

A8.4.3.1. **(AFMC)** Additions and cancellations at deployed/TDY locations, which are required to accomplish specific test and aircrew training requirements and make optimum use of available range time, are considered flown as scheduled. This does not relieve operations and maintenance from developing a viable and realistic flying schedule at the deployed location. The primary purpose of this flexibility is to allow the unit to make up non-effective sorties to ensure accomplishment of the training plan. Procedures for changing the flying schedule in **Chapter 2** apply to deployment/TDY location flying and maintenance schedules. Additions and cancellations caused by ineffective planning are recorded.

A8.4.3.2. **(AFMC)** Sorties scheduled at other than home station are not required to be input into the home station's operations scheduling system to be counted as scheduled sorties. Once tail numbers are plugged in at the daily meeting; this becomes the firm schedule‖ and deviations are reported from that point on.

A8.4.4. **(AFMC)** Deployed/TDY Daily Activity Report. Required information for deployed/TDY AFMC units will be transmitted to home station IAW applicable unit deployment/TDY plans. **(T-2).**

A8.4.5. **(AFMC)** Off-Station Sorties. Off-station sorties are sorties flown from other than home station where parent unit maintenance is not provided (e.g., cross-country sorties). **Note:** If the off-station aircraft can fly its scheduled mission from its location, no deviation is recorded.

A8.5. (AFMC) Scheduling Reporting Procedures

A8.5.1. **(AFMC)** Purpose. This chapter provides instructions on flying scheduling reporting procedures. The flying schedule must be loaded into the MIS to track scheduling and deviation data. Once loaded, the mission schedule or proposed maintenance plan background programs will provide base-level retrieval of flying and maintenance schedule information, and will complete higher headquarters reporting of aircraft utilization.

A8.5.2. **(AFMC)** Responsibilities.

A8.5.2.1. **(AFMC)** The MXG/CC will ensure procedures are established to verify the accuracy of all scheduling and deviation data. **(T-2).**

A8.5.2.2. **(AFMC)** The OG and MXG CCs or their designated group representative will publish the flying schedule IAW **Chapter 2** on AF Forms 2400 series or computer generated forms. Units will load changes to the flying schedule into the MIS by 1600L one workday prior to date of execution. **(T-2).**

A8.5.2.3. **(AFMC)** The MOC will review the previous day's activity reports to ensure accurate deviation accounting and reporting. The MOC will record additions, cancellations before crew show, interchanges, and the use of spare aircraft as deviations occur. The debrief section will record, late and early takeoffs and landing aborts, and in-flight emergency incidents during the automated debriefing process. The MOC will coordinate with the squadron/AMU on all changes and deviations to the flying schedule to assist in determining correct debriefing status codes. The MOC will provide sortie sequence numbers and sortie numbers to the squadron/AMU for all additions and cross-country sorties. Sortie numbers assigned to a specific tail number must be in sequential order (for example sortie number 101 must be used on a specific tail number before sortie number 102). Unique sortie sequence numbers will be developed for deployed sorties. **(T-2).**

A8.5.2.4. **(AFMC)** Cause Code. Enter one of the following codes to indicate the reason for a deviation or the agency, which caused a deviation.

Table A8.5. (AFMC) Code Function.

ATx . . . . . Air Traffic
EXH . . . . . .Exercise, HHQ
EXL . . . . . .Exercise, Local
GAA . . . . . Ground Abort, before engine start, maintenance
GAB . . . . . .Ground Abort, after engine start, before taxi, maintenance
GAC . . . . . .Ground Abort, after taxi, maintenance
GAT. . . . . Ground Abort, test induced

HQT	.Higher Headquarters, MAJCOM (non-exercise)
HQN	Higher Headquarters, NAF (non-exercise)
HQP	.Higher Headquarters, other (non-exercise)
MTx	.Maintenance
OPx	Operations
SIx	.Special Instrumentation
SUx	.Supply
SYx	.Sympathy
RNx.	Range
WXx	Weather
OTx	.Other
PJx……...	Project/Test Agency
CSx.	Contractor Support

A8.6. (AFMC) Attrition and Spare Factors.

A8.6.1. **(AFMC)** Attrition. Attrition factors represent historical percentage of scheduled sorties lost to causes outside unit control. Maintenance and operations schedulers add attrition sorties to monthly contracts to ensure mission goals are met. Operations and maintenance personnel must ensure the contract includes flexibility to accept attrition requirements during acquisition planning. Units may make a conscious decision, with MXG/CC approval, to use different attrition factors from statistical attrition rates calculated by MMA.

A8.6.1.1. **(AFMC)** Attrition sorties are not substitutes for capability shortfalls, they are additive to the contract to ensure mission goals are met. The monthly flying and maintenance plan will clearly identify attrition sorties for management purposes. If attrition is less or more than planned, adjustments to the weekly flying and maintenance schedule will be made to prevent over-extending maintenance or exceeding the unit's contract. A sortie lost will normally be flown in the same month the loss occurred. If at the end of a quarter combined losses exceed attrition figures, the OG and MXG CCs will negotiate a resolution to the shortfall.

A8.6.1.2. **(AFMC)** The factors used to compute attrition will be MXx, OPx, SUx, WXx, ATx, SYx, OTx, EXH, EXL, and HQx sortie losses. Attrition factors are used to compensate for non-unit controlled factors. Spares are used to compensate for unit controlled factors. Attrition and spare factors will be computed for and applied to each flying squadron/AMU. Monthly statistical attrition anomalies should be identified, documented and factored out of attrition calculations if necessary. MMA will compute attrition factors monthly for each OS/AMU and provide the results to MOF PS&D for dissemination to the OS and AMU PS&D schedulers. During the annual first look, MMA will provide attrition factors by month for the entire next fiscal year. **(T-2). Note:** Attrition

and spare factors need not be developed for test and evaluation (CB) possession identifier coded aircraft.

A8.6.2. **(AFMC)** Attrition Factor Application.

A8.6.2.1. **(AFMC)** Attrition computation is based on at least 5 years of unit historical data from previous flying months. For example, when computing attrition for Jan 12, use historical data for Jan 11, Jan 10, Jan 09, Jan 08, Jan 07, etc. Use as much historical data as required ensuring seasonal variations are considered to determine a basis for attrition. When computing attrition, use the total sorties lost in a particular category. Do not use the difference between the sorties lost and those sorties added to make up for the losses. The formula for computing the attrition factor is Historical Sorties Lost divided by Historical Sorties Scheduled.

Table A8.6. (AFMC) Attrition Computation Example.

Sortie Losses:	
MX Sortie Losses .02	
OP Sortie Losses	.01
SU Sortie Losses	.01
OT Sortie Losses	.01
AT Sortie Losses	.01
EXH Sortie Losses	.01
EXL Sortie Losses	.01
HQ Sortie Losses	.01
Sortie loss attrition factor:	0.09
WX Sortie Losses:	.03
Total Attrition factor:	.12
Overall attrition factor is:	.12 or 12 %

Table A8.7. (AFMC) Sample Application of Total Attrition Factor.

Sorties Required 1,000
Subtract attrition factor from 1 (1-.12)=0.88
Divide 1,000 by 0.88
Required sorties to schedule 1,136.36 , round up to 1,137.
Based on historical attrition of 12%, the unit can expect to lose 137 sorties to meet the

required 1,000 sorties.

A8.6.3. **(AFMC)** Spares. The spare requirements will not exceed 20 percent (30 percent for training units owning TF coded aircraft) of aircraft committed to the flying schedule, rounded up to the next whole aircraft. **Note:** During Planned Sortie Surges the MXG/CC determines the amount of spares that will be committed. However, leadership must consider health of the fleet when authorizing scheduled spares above 40 percent. **Note:** Units should be cognizant of their historical break rates and spare constraints when scheduling surges. Spares can be quickly used during surges and once spares are exhausted the capability to meet surge goals is severely limited.

A8.6.3.1. **(AFMC)** MMA computes annual spare aircraft requirements by month, using historical aircraft first sortie logistics losses and provides this information to the MO PS&D for use in computing spare aircraft requirements. Spare computation is based on 5 years of unit historical data from previous flying months. For example, when computing spares for Jan 06, use historical data for Jan 05, Jan 04, Jan 03, Jan 02, Jan 01, etc. Use a minimum of 5 years historical data to ensure seasonal variations are included to determine a basis. The formula for computing spare factors is Historical First Sortie Deletions/Cancellation divided by historical first sorties scheduled.

A8.6.3.2. **(AFMC)** A first sortie is defined as a sortie flown by an aircraft that has not previously flown for the day (0001-2400 flying period). For example, if 8 aircraft are committed to the schedule and there are 14 total sorties scheduled, the first 8 sortie line numbers (i.e., 101-108) should reflect all 8 committed aircraft tail numbers before they are re-scheduled (turned) against the last 6 (i.e., 109-114). This would be reflected as an 8 x 6 and will not be reflected as a 6 x 8 because of scheduled take-off times. Additionally lines are listed in sequential order with take-off times that reflect this order. Operations may define first sorties or turns by mission profile, take-off times, but for the purposes of this instruction, the sortie turn pattern is defined against initial aircraft flown and scheduled turns of the same or a portion of the same aircraft.

Table A8.8. (AFMC) Sample Application of Spare Factors.

1st Sortie Maintenance Cancellations	.10
1st Sortie Supply Cancellations	.03
1st Sortie Ground Aborts	.05
Spare factor	.18 or 18%
A sample figure of 12 first sorties is used in the following computation: Spare aircraft required equals 1st sorties scheduled times the spare factor and rounded up to the next whole number. 12 x .18 = 2.16 Spares Required is 3	

A8.6.3.3. **(AFMC)** The computed spare requirement may be adjusted to compensate for multiple configurations and syllabus constraints. When additional spares are added for multiple configurations, units will not exceed one spare per configuration.

A8.6.3.4. **(AFMC)** Additional spares are authorized to support higher headquarters taskings and special missions (if required by the tasking).

A8.6.3.5. **(AFMC)** At least one spare aircraft is authorized per MDS for each flying day.

A8.6.3.6. **(AFMC)** Unmanned Aerial Systems training missions are authorized an additional spare to support increased aircrew training requirements due to crew size ratio.

Attachment 9 (Added-AFMC)

SAMPLE AIRCRAFT AND EQUIPMENT IMPOUNDMENT CHECKLIST.

Table A9.1. (AFMC) Sample Aircraft and Equipment Impoundment Checklist.

	Impoundment Actions	Status
1	Impoundment authority directs impoundment and assigns an impoundment official.	
2	Enter a Red X in the applicable forms and MIS indicating the reason for impoundment and the name of individual assigned as impoundment official.	
3	Notify the MOC of impoundment decision.	
4	Select a team of highly qualified technicians to determine cause of problem that led to the impoundment.	
5	Control access to impounded aircraft or equipment and determine if an entry control point (ECP) is required. If ECP is established, use an access control log.	
6	Determine necessary controls required for aircraft and equipment records.	
7	Review aircraft or equipment forms and MIS for historical data related to the malfunction causing impoundment.	
8	Ensure maintenance is limited until the cause of impoundment is determined.	
9	Ensure parts removed are carefully controlled.	
10	Once the cause of the malfunction has been determined and corrected, determine if an OCF or FCF is necessary or required.	
11	Ensure QA is intimately involved in the impoundment process and has reviewed all actions taken to correct the malfunction.	
12	QA determines the need for cross-tell based on the potential effect to other aircraft and equipment.	
13	Brief release authority on findings and corrective actions, and request release from impoundment.	
14	Impoundment release authority clears or directs the impoundment be cleared in the applicable aircraft or equipment forms.	

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, DC

DAFI91-202_DAFGM2023-01

13 April 2023

MEMORANDUM FOR DISTRIBUTION C__
MAJCOMs/FLDCOMs/FOAs/DRUs

FROM: AF/SE
1400 Air Force Pentagon, Suite 5E1000
Washington, DC 20330-1400

SUBJECT: Department of the Air Force Guidance Memorandum to AFI 91-202, *The US Air Force Mishap Prevention Program*

By Order of the Secretary of the Air Force, this Department of the Air Force Guidance Memorandum immediately implements changes to AFI 91-202, *US Air Force Mishap Prevention Program.* Compliance with this memorandum is mandatory. To the extent its direction is inconsistent with other Department of the Air Force publications, the information herein prevails, in accordance with DAFI 90-160, *Publications and Forms Management.*

In advance of a rewrite of AFI 91-202, the Attachment to this Memorandum is updated to provide guidance changes that are effective immediately. This publication is applicable to the United States Space Force (USSF) and terminology should be interpreted to be inclusive of the USSF, as appropriate.

This memorandum becomes void after one-year has elapsed from the date of this memorandum, or upon incorporation of an Interim Change or rewrite of AFI 91-202, whichever is earlier.

JEANNIE M. LEAVITT
Major General, USAF
Chief of Safety

Attachment:
Guidance Changes

Attachment
Guidance Changes

The below changes to AFI 91-202, dated 12 March 2020, are effective immediately.

1.6.13.13.5. Coordinating and processing annual and recurring safety awards in accordance with AFMAN 36-2806, *Military Awards: Criteria and Procedures.* Air Force Safety Award Guide functional community awards criteria can be located online at **https://www.safety.af.mil/Home/Safety-Awards/**. The eligibility criteria and submission procedures for Air Force level awards, functional community awards, and awards sponsored by other Federal agencies and non-Federal entities are provided online at **https://access.afpc.af.mil/**.

1.6.22.18. Accomplishes explosives siting requirements according to the Defense Explosives Safety Regulation (DESR) 6055.09_AFMAN 91-201, *Explosives Safety Standards*. Conducts review of base comprehensive plan map in conjunction with Civil Engineering (CE). **(T-0)**

1.6.25.3. Coordinates siting and construction plans with the installation safety office and ensure explosives site plans have been approved before beginning construction as required in DESR 6055.09_AFMAN 91-201. **(T-0)**

1.6.27.7. Ensure request for equipment, products and services using purchase orders and/or Government Purchase Card are reviewed for potential safety and health impact in accordance with AFI 64-117, *Government Purchase Card Program,* and AFMAN 32-7002, *Environmental Compliance and Pollution Prevention.* **(T-2) Note:** Ensure government purchase card program addresses requirement to coordinate purchase of hazardous chemicals, munitions and industry equipment through the installation safety office. **(T-2)**

1.6.27.14. Will ensure their safety office, if authorized one, accomplishes an APMR in accordance with this instruction. **(T-1)**

1.6.28.6. Ensure employees exposed or potentially exposed to hazardous chemicals or materials are trained on the hazards of those chemicals and materials per AFI 90-821, *Hazard Communication (HAZCOM) Program,* including information from the Safety Data Sheet for each chemical or material used. **(T-0)** BE and installation occupational safety office shall be consulted for selection of PPE. **(T-1)** In addition, ensure work center/shop is authorized to be used in accordance with AFMAN 32-7002. **(T-0)**

1.7.1. Waivers to safety explosive requirements will be processed in accordance with DESR 6055.09_AFMAN 91-201. **(T-0)**

2.1.1. Chief of Safety (COS). The Chief of Safety (or Director in a civilian-led unit or MAJCOM/Field Command (FLDCOM)/FOA/DRU) reports directly to the commander and manages the mishap prevention program for the commander (e.g., installation, wing, deltas, center, and NAF/MAJCOM/FLDCOM/FOA/DRU commanders). The COS must be qualified in a primary mission weapons system of the unit, if one exists, or if the COS is a civilian position,

have a Safety Officer who is qualified in a primary mission weapon system. **(T-1)** Civilian COS must meet the qualification standards for Safety and Occupational Health professionals stated in the Office of Personnel Management (OPM) classification series (GS-0018 or GS-0803). **(T-0)** MAJCOM/FLDCOM/FOA/DRU Directors of Safety will have previous safety experience. **(T-1)** The AFRC equivalent to the above are Chiefs of Safety which are 2181-series (pilot)/2183-series (navigator) civilians.

2.1.2. Career Safety Professional. The Air Force/Space Force has an enlisted safety career field (Air Force Specialty Code (AFSC) 1S0X1) and a civilian safety career field (GS-0018, Safety and Occupational Health Manager or Specialist; GS-0019, Safety Technician; GS-0017, Weapons Safety Manager or Specialist; GS-1815, Air Safety Investigator; and GS-0803, Safety Engineer). These career safety personnel are assigned to positions authorized by the Unit Manning Document. The safety career field is addressed in AFMAN 36-2100, *Military Utilization and Classification*, and described in the Air Force Enlisted Classification Directory. The civilian safety career program is described in DAFMAN 36-142, *Civilian Career Field Management and Centrally-Managed Programs.*

2.1.2.4. Ensure safety and health personnel are properly trained. 29 CFR § 1960.56, *Training of Safety and Health Specialists*, DoDI 6055.01, 29 CFR § 1960.7, *Financial Management*, and DAFI 36-2670, *Total Force Development*, discuss responsibilities for funding and ensuring safety and health personnel are trained to function effectively as safety and health advisors to commanders and management officials.

2.1.3. Occupational Safety Manager (OSM). The OSM manages the occupational safety program for the Director/Chief of Safety and the commander (e.g., installation, center, NAF/MAJCOM/FLDCOM/FOA/DRU commanders). **(T-1)** The OSM must be fully qualified to advise and execute decisions on safety matters for the primary mission of the unit. **(T-1)** The OSM should complete the Safety Manager Course (AFSEC Course WCIP05D) prior to assuming an OSM position. If this is not possible, they will complete the course within one year of assuming the OSM position. **(T-1) Note:** Previous courses such as the Senior Safety Professional's Course or the Ground Safety Manager's Course meet this requirement.

2.1.5.1. Individuals will complete the Aviation Safety Program Manager (ASPM) course, or AFSEC certified MAJCOM equivalent course, and attend the AMIC (WCIP05A) within 120 days of appointment. **(T-1)**

Table 3.1. Safety Evaluations, Assessments and Inspections.

Level	Frequency	Type	By	Note
MAJCOM/FLDCOM/DRU/FOA	36 Months	Safety Evaluation	AFSEC	
NAF/Center/Wing/Delta	36 Months	Safety Program Evaluation	MAJCOM/FLDCOM/DRU/FOA	1
Squadron, Standalone Group, and DoD Schools	24/12 Months	Program Assessment &	Wing/Delta/Group SE	2, 3

		Safety Inspection		
Wing, Delta, and below	Monthly	Spot	Wing/Delta/Group / Squadron SE/Safety Representative/ Supervisor	
Wing, Delta, and below	Monthly	High Interest	Wing/Delta/Group SE	
Wing, Delta, and below	Varies	Special and Seasonal	Wing/Delta/Group SE	

Note 1: Conducted in accordance with this instruction, these Program Evaluations will be conducted for wing, delta, wing/delta-equivalent or higher with an assigned safety staff. **(T-1) Exception:** Air National Guard will complete this requirement not to exceed 48 month frequency. **(T-1)**

Note 2: Program Assessments are specified at a 24-month frequency, while safety inspections are at a 12-month frequency. Safety program assessments and inspections should be combined when conducted the same year to reduce the footprint within the affected organization.

Note 3: In accordance with DoD 1342.6-M, *Administrative and Logistic Responsibilities for DoD Dependents Schools* (August 1995), before the start of the school year, an inspection by qualified facility, physical security, safety, sanitation, bioenvironmental, and fire protection specialists to identify all facilities deficiencies and requirements and their relative priority for repair or maintenance. Additionally, in January, an inspection by qualified facility, physical security, safety, sanitation, bioenvironmental, and fire protection specialists to identify all facilities deficiencies and requirements and their relative priority for accomplishment. The second physical security inspection in January is not required for those schools located on military installations protected by positive entry control procedures.

3.2. Safety Evaluations. AFSEC will conduct safety evaluations of MAJCOMs/FLDCOMs/DRUs/FOAs with a Headquarters safety staff at 36 month intervals, not to exceed 48 months. **(T-0)** Waiver requests for deviation from the 48 month evaluation requirement from MAJCOMs/FLDCOMs/DRUs/FOAs will be processed through AFSEC, who, in turn, will process to SAF/IE to USD (P-R). These evaluations are conducted in accordance with DoDIs, AFIs, OSHA Standards and federal law. At the direction of the AF/SE, they will be rated with a two-tier (Satisfactory/Unsatisfactory) grading criteria. **(T-1)**

3.2.2. A written report will be prepared for each evaluation and sent to the commander and the safety staff of the MAJCOM/FLDCOM being evaluated. **(T-1)** This report will contain a statement to declare the mishap prevention program conformance and effectiveness under the systemic processes of the AFSMS was either Satisfactory or Unsatisfactory. **(T-1)**

3.4.4.1. Fall Protection. When performing safety inspections and assessments for fall protection, the following areas, as a minimum, will be looked at:

3.4.4.1.1. Equipment meets federal and Air Force standards. **(T-1)**

3.4.4.1.2. Personnel have the required fall protection equipment needed when working at height. **(T-1)**

3.4.4.1.3. Job hazard analyses are developed and used. **(T-1)**

3.4.4.1.4. Rescue plans are developed for units with active fall protection equipment. **(T-1)**

3.4.4.1.5. Fall protection training is accomplished. **(T-1)**

3.4.4.1.6. Job-specific safety training is performed. **(T-1)**

3.7. Spot Inspections. Work center/shop supervisors, USRs and safety personnel will perform spot inspections to check the day-to-day safety and health of an organization, work center, facility, etc. **(T-1)** Work center/shop supervisors, USRs, squadron assigned flight safety officers and Additional Duty Weapons Safety Representatives will conduct and document monthly spot inspections. **(T-2)** See discipline specific chapters for additional operations and areas that need to be inspected or monitored.

3.13.3.2. The requirements documents will specify compliance with appropriate provisions of DESR 6055.09_AFMAN 91-201 and this instruction. **(T-0)**

4.3.4. For all hazard report submissions, regardless of methodology (e.g. AF Form 457, ASAP and telephonic), the Chief of Safety, in consultation with their safety staff, will determine the appropriate safety, fire or health discipline to investigate the reported hazard. **(T-1)** The assigned investigator will investigate the reported hazard within one (1) duty day for critical/imminent danger situations, and three (3) work days for potentially serious situations and 10 work days for lesser conditions. The investigator discusses the reported hazard with the member who submitted the report (if known), the responsible supervisor or manager and other parties involved to validate the hazard and determine the best interim control and corrective action. **(T-1)**

4.13. Installation Master Hazard Abatement Plan (MHAP). All RACs assigned 1, 2 and 3 will be entered into the MHAP, even if corrected the same day. **(T-1)** This ensures full accountability for hazards of this severity. Fire and Occupational Health offices will ensure all identified RAC 1, 2 and 3 hazards are communicated to the installation safety office for entry into the formal installation MHAP. **(T-1)** RACs can be applied to hazards that are not necessarily considered occupational hazards, but where the RAC is appropriate to ensure CE prioritizes the work to abate the hazard(s), i.e., military working dogs kennels that pose a hazard to the animals and AF owned playgrounds where liability to the AF is possible in the case of injury or death. Commanders/Functional Managers will ensure AF Form 3s are initiated for any RAC 1, 2 or 3 hazard not abated within 30 days of identification. **(T-1)**

6.3.3.9.2. Deployed Weapons Safety Managers are responsible for initiating action for the explosives site planning of potential explosives sites at their base. Deployed Weapons Safety Managers will direct any problems involving explosives site planning to AFFOR/SEW. **(T-1)**

AFFOR/SEW will review all AOR explosives site plans and provide guidance/technical assistance to theater operating location Weapon Safety Managers. **(T-1)** Final approval must go through appropriate agencies as identified in DESR 6055.09_AFMAN 91-201. **(T-0)**

6.3.3.9.4. Radiation Hazard Zones. Ensure radiation hazard zones are established with the focus on personnel, electro-explosive devices and petroleum, oils and lubricants. Ensure interoperability with other systems deployed to the same location. **(T-0)** Refer to AFI 48-109, *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health Program*, AFI 48-139, *Laser and Optical Radiation Protection Program*, AFI 91-208, *Hazards of Electromagnetic Radiation to Ordnance (HERO) Certification and Management*, and DESR 6055.09_AFMAN 91-201 for additional information.

7.3.3. Midair Collision Avoidance (MACA) Program. Units with flying programs must establish a written MACA program. **(T-1)** The unit safety office is responsible for its creation, documentation and upkeep. **(T-2)** The FSO/Flight Safety Manager works closely with the Operations Group-determined OPR and other interested parties such as the Airfield Operations Flight Commander, the airspace manager, local Fixed Base Operators, Aircraft Owners and Pilots Association, and the local Flight Standards District Officer, to establish a comprehensive MACA program. Use the resources and services of the Federal Aviation Administration (FAA) Flight Standards District Office accident prevention specialists. Tailor the MACA program to meet local needs. As a minimum, the FSO/Flight Safety Manager will coordinate with appropriate agencies to accomplish these key objectives:

7.5.2. Maintenance units receive critical safety alerts, timely briefings on maintenance-related mishaps, and trends relevant to the unit's mission/MDS. **(T-2)**

8.3.6. Review and recommend for approval, as appropriate, the use of new hazardous materials in accordance with AFMAN 32-7002. **(T-1)** Coordinate on updates of the installation's hazardous materials Authorized User List when requested by the installation Environmental Management office under the installation Hazardous Materials Management Program. **(T-1)**

8.3.10. Work with contracting officials and unit purchasing personnel to ensure requests for equipment products and services using purchase orders and/or Government Purchase Card are reviewed for potential safety and health impact in accordance with DAFI 64-117, *Government Purchase Card Program,* AFMAN 32-7002 and **Chapter 12,** *Contract Safety.* **(T-1)**

9.2.4. Based on mission needs, Weapons Safety personnel are highly encouraged to attend the following courses: Mishap Investigation Non-Aviation (MINA), Introduction to Mishap Investigation, AMMO-47 Lightning Protection for Air Force Facilities, Explosives Safety Siting (ESS) Training and AMMO-65 DoD Contractor's Explosives Safety Standards.

9.4.7.12. Installation support (Continental United States only) for Department of Energy (DoE) shipments (SAFE HAVEN). **(T-2)** Refer to DESR 6055.09_AFMAN 91-201 for additional guidance.

9.4.8. Annually review installation explosives location map and provide changes and corrections to CE. **(T-2)** Review must be documented and maintained by the safety office. **(T-2)** CE published maps should be coordinated with logistics, operations and safety. The reviews can be

documented on separate logs and will include but not be limited to the following applicable areas:

9.4.8.1. Explosives safety "clear zones" required around each location based on approved site plans. **(T-2)**

9.4.8.2. Primary and alternate explosives movement routes through the installation. **(T-2)**

9.4.8.3. Authorized flight line locations for conducting explosives operations to include concurrent servicing operations activities, explosives aircraft cargo on or off loading, and combat aircraft explosives loading. **(T-2)**

9.4.8.4. Locations for handling hung ordnance and gun-clearing operations. **(T-2)**

9.4.8.5. Arm and de-arm areas. **(T-2)**

9.4.8.6. Explosives support workplaces, such as flightline munitions holding areas. **(T-2)**

9.4.8.7. Base explosives prohibited zones (see DESR 6055.09_AFMAN 91-201 and UFC 3-260-01). **(T-0)** **Note:** At OCONUS locations, consideration must be given to Status of Forces Agreements, Host Nation Funded Construction Agreements and Bilateral Infrastructure Agreements. **(T-0)**

9.4.8.8. Vehicle inspection points and suspect vehicle areas. **(T-2)**

9.4.8.9. Parking spots for aircraft loaded with munitions or explosives identified in DESR 6055.09_AFMAN 91-201. **(T-2)**

9.4.8.10. DEW operations, including potential electromagnetic radiation hazard zones, and maintenance location hazard zones that could affect munitions operations. **(T-2)** After 100 percent evaluation, plot only those zones that actually impact munitions operations to include primary and alternate explosive routes. **(T-2)** Identify hazardous DEW effects to potential explosive sites, including ordnance and fuel. **(T-2)** The review must be documented and maintained by Weapons Safety. **(T-2)** The reviews can be documented on separate logs.

9.4.8.11. Explosives Ordnance Disposal range(s). **(T-2)**

9.4.8.12. Base weapons range(s). **(T-2)**

9.4.8.13. Restrictive easement(s). **(T-2)**

9.5.1. With the assistance of the installation CE and Safety offices, submit explosives site plans in accordance with DESR 6055.09_AFMAN 91-201. **(T-0)** The installation safety office is the OPR for all explosives site plans and will maintain a current installation ESS dataset. **(T-2)**

9.5.2. Request a license for facilities that store small quantities of explosives according to DESR 6055.09_AFMAN 91-201. **(T-0)**

9.8.3. In coordination with base/wing safety personnel, operational units will evaluate and document unit radio frequency weapons, laser weapons and other directed energy systems for operational compatibility with ordnance, electronics and fuel storage likely to be in the operating and maintenance environment of the directed energy system in accordance with DoDI 3222.03, *DoD Electromagnetic Environmental Effects (E3) Program*, DESR 6055.09_AFMAN 91-201, and this instruction. **(T-0)**

9.11.3. Weapons safety, Additional Duty Weapons Safety Representative or designated representative conducts explosives safety training, which augments the job training provided by the supervisor. **(T-2)** The installation weapons safety staff evaluates and monitors this training, approves lesson plans and reviews them annually. **(T-2)** All personnel (supervisory and non-supervisory) who operate, handle, transport, maintain, load, activate or dispose of missiles, explosives or nuclear weapons must receive initial explosives safety training before performing any of these tasks. **(T-2)** All personnel tasked to work on aircraft configured with explosives or ordnance will receive training that includes how to identify an armed aircraft and a familiarization of the hazards involved when working on or around explosives loaded aircraft. **(T-2)** Ensure initial explosives safety training is provided before performing any of these tasks. **(T-2)** Recurring training must be provided not later than the end of the 15th month following initial training. **(T-2) Exception:** Personnel who store and/or handle only the following are exempt from initial and refresher explosives safety training.

9.11.3.1. Small arms ammunition, including cartridge-actuated tools in quantity-distance hazard class/division 1.4. This exception also includes the use of cartridge-actuated tools, small arms ammunition, blanks and paint ball rounds for training and weapons qualification.

10.1. Program Management.

10.1.1. This chapter contains requirements for space safety offices at all command levels. Units conducting space-related missions must have a comprehensive Space Safety Program designed to improve operational effectiveness by identifying, managing and mitigating hazards, reducing mishaps, supporting mission assurance, and incorporating mishap prevention guidance across the life cycle of space systems and their unique support equipment. **(T-1)**

10.1.2. Applicability. All United States Space Force and Air Force organizations that develop, test, or operate any space system, or who provide launch/range services for space systems shall comply with this instruction. **(T-1)** This includes space systems under development, research and development systems, experimental systems, systems undergoing testing, operational systems, systems at end-of-life, software safety, system safety, integration, pre-launch, launch operations, range operations, space nuclear systems, orbital operations, reentry operations, and ground-based space systems. This chapter is applicable to the entire segment of the Space mission (e.g., systems architecting and design, manufacturing, launching, and operations through disposal) under Department of Air Force (DAF) control. Organizations designing and operating DAF/Space Force hosted payloads on non-DAF/Space Force satellite vehicles shall comply with this chapter for portions within their control. **(T-3)**

10.8.3.3.2. Total object-time of debris in Low Earth Orbit. For missions leaving debris in orbits passing through Low Earth Orbit, the total object-time of debris larger than five millimeters (5mm) in any dimension shall not exceed 25 years per object and 100 object-years per mission.

(T-0) The object-time of debris is calculated as the sum of time spent in Low Earth Orbit for all mission debris objects (below 2000 km altitude). Refer to NASA-STD-8719.14C, *Process for Limiting Orbital Debris,* for calculation of total object time. **(T-3)**

10.8.3.4.1. The program office PM for each spacecraft or launch vehicle shall demonstrate via failure mode and effects analyses (or equivalent) that the integrated probability of explosion for all failure modes (excluding collisions) is less than 1×10^{-3} (one in one thousand). **(T-0)**

10.8.3.6.1.1. Program office PMs shall demonstrate that, during the orbital lifetime of each spacecraft or launch vehicle component, the probability of accidental collision with space objects larger than 10 cm in diameter does not exceed 1×10^{-3} (one in one thousand). **(T-0)** For the assessment of collision probability, the orbital lifetime is defined as the time from end of launch collision avoidance to atmospheric reentry. The maximum time-period for assessment is 100 years.

10.8.3.6.2. Collisions with Small Objects. Program office PMs shall demonstrate that, during the mission of the space system, the probability of accidental collision with objects (including space debris and meteoroids) sufficient to prevent post-mission disposal is less than 1×10^{-2} (one in one hundred). **(T-0)** Refer to NASA-STD-8719.14C for additional guidance.

10.8.5.4.1. The probability of successful disposal shall be no less than 0.90 at end of life for reentry within 25 years, orbital storage disposal, or for direct retrieval. **(T-0)**

11.2.2.1. Middle-Tiered-Acquisition (MTA) Risk Acceptance Authorities. The Decision Authority is the acceptance authority for High system safety risks, and the PM is the acceptance authority for Serious, Medium, and Low system safety risks.

11.3.1. For hazards determined to have a High or Serious level of System Safety risk, programs shall prepare a System Safety Risk Assessment in accordance with **paragraph 13.9.** **(T-1)**

11.3.3. System safety risk acceptance packages are only necessary for those risks that are inside the design/specification/requirement envelope. Those outside the envelope are handled by the user's/operator's risk management process.

11.3.4.1. CAE-PEO (TEO)-PM Structured Programs. High System Safety risk assessments shall be coordinated with lead Acquisition MAJCOM, FLDCOM, Center/SE, or Air Force Life Cycle Management Center Engineering Office (AFLCMC/EN), as applicable, the lead MAJCOM/CC or CD, PEO and AF/SE before submission for acceptance by the CAE. **(T-1)**

11.3.5.1. CAE-PEO(TEO)-PM structured programs: Serious System Safety risk assessments shall be coordinated with lead Acquisition MAJCOM, FLDCOM, Center/SE (for non-space programs), AFLCMC/EN (for airworthiness), the lead MAJCOM/FLDCOM/A3/A4/SE and HQ AFSEC before submission for acceptance by the PEO. **(T-1)**

11.4.2.5. Safety investigation recommendations affecting the system. A discussion of mishaps that have occurred since the last meeting. **(T-1)**

11.4.2.8. Unmitigated hazards. **(T-1)** Those hazards with either no mitigation plan or hazards where there is a planned mitigation that has not been completely implemented.

11.7.4. An SRA is the summary document for a package of materials that provides supporting details for the assessment and a decision. Do not rely upon information presented to the decision-maker separately. The SRA combined with supporting documents forms an SRA package that must sufficiently document all aspects pertinent to the decision regarding the mission or activity, involved systems, identified hazard(s), risk calculations, data sources and the mitigation options considered. **(T-2)**

13.1.4.4. Act. Request corrective actions on significant differences between actual and planned results. Analyze the differences to determine their root causes. Determine where to apply changes that will include improvement of the process or product. **(T-1)** At the conclusion of the reviews in this part of the cycle, there should be evidence of the future direction of the mishap prevention program and any needed changes to the policy, priorities, objectives, resources or other program elements.

13.1.5. Deleted.

13.3.5.3.2. Be used to contest violations and/or seek lesser classification, i.e., Serious to Other-Than-Serious. **(T-1) Note:** Installations may only pursue an appeal to an OSHA Notice with concurrence of their MAJCOM/FLDCOM safety office and AFSEC/SEG. **(T-1)**

Table 13.1. Safety and Fire Hazard Risk Assessment Code Matrix.

Figure 13.4. Sample Risk Assessment Layout and Guidance.

Risk Assessment Title
1. Background: Broadly describe the situation being evaluated. Provide sufficient detail so the remainder of the risk assessment may be easily understood.
2. Hazard Identification: Accurately and succinctly describe the hazard (e.g., deficiency with engineering design, material, quality, software, operations, maintenance) being analyzed.
3. Initial Risk: Using quantitative (preferred) and qualitative (alternate) means, identify the probability and severity of a mishap that could result from the hazard, based upon the exposure of personnel or assets to the identified hazard. Use the baseline or "as designed" state as the basis for determining the initial risk. Fully explain the methodology used, data considered (e.g., reported mishaps/events, deficiency reports, test results, etc.) and rationale for determining initial risk.
4. Interim Risk: Many times initial mitigation steps have already been taken prior to the completion of a written risk assessment. These steps may include permanent risk mitigation measures or temporary stop-gap risk mitigation measures. Describe these measures and explain how the initial risk is being mitigated, their effectiveness and the resulting interim risk until final risk mitigating options can be implemented.
5. Risk Mitigation Options: It is likely several options still exist to mitigate the risk of the identified hazard. Effective control measures reduce or eliminate one of the three components (i.e., probability, severity or exposure) of risk. Investigate specific strategies and tools that reduce, mitigate or eliminate risk. Address each risk mitigation option separately. One option

to always consider is "taking no further action" which is the equivalent of accepting the initial risk and acknowledging and accepting projected future losses.
6. For each option, including accepting the initial risk, address:
Description: Describe the option being evaluated.
Impact: Describe the impact of this option. What are its benefits; limitations?
Address its effectiveness and explain how it will eliminate or control future losses. Does it address other hazards/problems or introduce new ones?
Cost: Estimate the costs (i.e., financial, operational, maintenance) to implement this option.
Schedule: Estimated timeline needed to implement this option.
Target Risk: Great risk mitigation options eliminate hazards and their risk entirely; others only reduce the risk. Assuming this risk mitigation option is implemented; identify the probability and severity of a mishap that could result from the hazard based upon the exposure of personnel or assets to the identified hazard. Fully explain the methodology used (including analytical assumptions and limitations), data considered, and rationale for determining the target risk.
Projected Losses: Estimate the projected losses with implementation of this option. Projected losses quantifies the probability of occurrence for a given exposure. Express losses over a period of time, a number of events, number of flight hours, for a given population, etc. as appropriate. Fully explain the methodology used, data considered and rationale for determining these projected losses. Note: If qualitative means were used to determine the probability levels, a qualitative description of projected future losses may also be used. The projected future losses should not simply state the MIL-STD-882, or other applicable standard, qualitative probability levels. Instead, include the proposed exposure and effect of mitigations as appropriate (i.e. operating restrictions, remaining life of asset, limited period of test, etc.) to describe and substantiate the projected future losses.
7. Summary of Options: If the number of risk mitigation options is lengthy, a tabular summary may be appropriate. Include, as necessary.
8. Recommendation: State the recommended courses of action, including rationale.
9. Endorsements: Document the program office's preparation and review of the risk assessment by providing dates, signature blocks and signatures for the risk assessment's author, the System Safety Manager, the Chief Engineer, and the Program Manager.

14.1.2. Mandatory Items. The Job Safety Training Outline will be developed and used by supervisors to instruct all employees on work place specific hazards upon initial assignment and when work conditions or tasks change. **(T-1)** The items below are mandatory, minimum topics the supervisor must ensure their employees receive training on prior to performing tasks in the work center. Topics addressed by other sources can be directly referenced in the JSTO to prevent redundancy and still adequately cover the required topics. Document training as specified in **paragraph 1.6.28.7.1.** Deployed and installation commanders may dictate more stringent requirements.

Table 14.5. Aviation.

Course Name	AFCAT Number	Owning Organization
Security Assistance Training Program	WCIP05U	AFSEC
Safety Office Course (IFSO)		

Air Combat Command (ACC) Flight Safety Program Management Course	3J5ACC1XXXX 000	ACC
DCMA Aviation Safety Officer Course, ASO		DCMA
Air Reserve Component Chief of Safety Course ARCCOS		
Aviation Safety Program Manager's Course		

14.4.1.3. Establish and document an observation period for all applicants under consideration for retraining. The applicant must complete an assessment period of no less than three (3) duty days, but no more than seven (7) duty days with the local Occupational Safety office before the Evaluating Agent can make a recommendation. **(T-1)**

14.5.3.2. Safety staffs will use training rosters to update completion of SST in the Military Personnel Data System in accordance with PSDM 20-03, *MilPDS Access Control Policy,* Table 1. **(T-1)**

BY ORDER OF THE SECRETARY OF THE AIR FORCE

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12 MARCH 2020

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Safety

THE US AIR FORCE MISHAP PREVENTION PROGRAM

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This instruction implements Air Force Policy Directive (AFPD) 91-2, *Safety Programs*, relevant safety portions of Department of Defense Directive (DoDD) 3100.10, *Space Policy*, DoD Instruction (DoDI) 3100.12, *Space Support*, DoDI 3200.18, *Management and Operation of the Major Range and Test Facility Base*, and the *Memorandum of Agreement between the Department of the Air Force and the Federal Aviation Administration on Safety for Space Transportation and Range Activities.* This instruction implements North Atlantic Treaty Organization (NATO) Standardization Agreements (STANAGs) 3101, *Exchange of Flight Safety Information*, and 3102, *Flight Safety Cooperation in Common Ground/Air Space*. It establishes mishap prevention program requirements, assigns responsibilities for program elements and contains program management information. It applies to all Regular Air Force, Air Force Reserve and Air National Guard (ANG) military and civilian personnel. For the purposes of this instruction, ANG and Air Force Reserve Command (AFRC) are included in all references to Major Commands (MAJCOMs). At joint bases, Air Force units will follow the requirements in this instruction, along with guidance contained within inter-service and/or inter-agency agreements. At enduring and contingency locations outside the United States, follow the requirements in this instruction so long as they do not conflict with applicable requirements from any of the following: host nation requirements made applicable by international agreement, Overseas Environmental Baseline Guidance Document standards, country-specific Final Governing Standards, Geographic Combatant Command policy, environmental annex to operational order, operational plan (OPLAN) or other operational directive. This publication may be supplemented at any level, but all direct Supplements must be routed to the OPR of this publication for coordination prior to

certification and approval. Send major command, field operating agency and direct reporting unit (MAJCOM/FOA/DRU) supplements to Air Force Safety Center (AFSEC)/SE Org Box, 9700 G Avenue, Kirtland AFB NM 87117-5670, for coordination and approval before publication. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication;* route AF Forms 847 from the field through the appropriate functional's chain of command. All requests for changes, interpretations or clarifications concerning this publication must be forwarded through the MAJCOM/FOA/DRU safety organization, who, in turn, as applicable, will forward to AFSEC. The authorities to waive wing/unitlevel requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3) number following the compliance statement. See AFI 33-360, *Publications and Forms Management,* for a description of the authorities associated with Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the requestor's commander for non-tiered compliance items. Submit waiver requests for Secretary of the Air Force, Inspector General (SAF/IG) consideration through SAF/IGI. To meet the intent of AFI 33-360, e-mail finalized waivers (AF Form 679, *Air Force Publication Compliance Item Waiver Request/Approval*) to SAF/IGI (**usaf.pentagon.saf-ig.mbx.saf-igi-workflow@mail.mil**). Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with (IAW) Air Force Manual (AFMAN) 33-363, *Management of Records,* and disposed of IAW Air Force Records Disposition Schedule and disposed of IAW Air Force Records Information Management System. The use of the name or mark of any specific manufacturer, commercial product, commodity, and/or service in this publication does not imply endorsement by the Air Force. This Instruction requires the collection and/or maintenance of information protected by the Privacy Act of 1974 authorized by Title 29 United States Code (USC), Section 668, *Program of Federal Agencies;* Executive Order 12196, *Occupational Safety and Health Programs for Federal Employees;* Part 1960, Title 29, Code of Federal Regulations (CFR), *Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters;* Title 5 USC § 7902, *Safety Program,* and DoD Directive (DoDD) 5134.01, *Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L)).* All records created, collected and stored under the guidance of this instruction are subject to the provisions of the Freedom of Information Act, as authorized by Title 5 USC § 552, *Public Information; Agency Rules, Opinions, Orders, Records, and Proceedings,* and IAW DoDM 5400.07_AFMAN 33-302, *Freedom of Information Act Program.* The System of Records Notice F036 AF PC Q, Personnel Data System (PDS); F024 AF IL C Motor Vehicle Operator's Records, and F032 AF ILE, Enterprise Environmental, Safety and Occupational Health-Management Information System (EESOH-MIS) are available at: **https://dpcld.defense.gov/privacy/SORNS.aspx**.

SUMMARY OF CHANGES

This document is substantially revised and must be completely reviewed. This revision clarifies requirements of the mishap prevention program as framed within the Air Force Safety Management System. Chapter 12, *Hazard Abatement,* was consolidated with Chapter 4, *Hazard Identification and Reporting,* and renamed **Chapter 4,** *Hazard Identification, Reporting and Abatement.* **Chapter 12,** *Contract Safety, w*as added to give Air Force safety professionals more insight on the contract safety process. **Chapter 10,** *Space Safety,* incorporates substantial changes. **Chapter 1,** *Program Overview,* **Chapter 2,** *Safety Organization,* and **Chapter 11,** *System Safety*

and Safety Risk Assessments, have changes regarding space safety and/or space systems. Program management questions have been added at the end of each chapter to assist managers and supervisors in managing their programs. Attachments have been incorporated in the body of the instruction and now reside in **Chapter 13,** *Supporting Guidance,* **Chapter 14,** *Safety Training,* and **Chapter 15,** *Miscellaneous Safety Information.*

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Chapter 1

PROGRAM OVERVIEW AND RESPONSIBILITIES

1.1. Purpose. The purpose of the Air Force Mishap Prevention Program is to minimize the loss of Air Force resources and protect Air Force personnel from death, injuries or occupational illnesses by managing risks on and off-duty. This program is aligned with and framed using the Air Force Safety Management System as the core structure and applies to all Air Force organizations and personnel. The Air Force Safety Management System is a systematic approach to managing safety and includes the necessary organizational structures, accountabilities, policies, and procedures. The overarching mishap prevention program is system compliant with the tenants of the American National Standards Institute Z-10 and the Federal Aviation Administration, Aviation Safety Management Program, which were used as the foundational sources of the Air Force Mishap Prevention Program. The Occupational Safety and Health Administration's (OSHA) Voluntary Protection Program is recognized as a form of a Safety Management System, and is closely aligned with the Air Force Safety Management System. Units employing the Voluntary Protection Program will follow the USAF mishap prevention program guidance contained within this instruction. **(T-1)**

1.2. Vision. AFSEC's vision is to be a world leader in safety management and provide care for our Airmen, resources and our environment to meet our air, space and cyberspace missions. Accordingly, the Air Force is committed to the following three priorities:

1.2.1. Compliance. Comply with all safety and regulatory guidelines.

1.2.2. Risk Reduction. Protect our assets, personnel and material by effectively identifying and managing risks.

1.2.3. Continuous Improvement. Instill a culture that encourages and supports continuous improvement.

1.3. The Air Force Mishap Prevention Program. This instruction is the foundational guidance document for the implementation of the Air Force Mishap Prevention Program. Commanders at all levels will adhere to these requirements unless proper waivers, deviations or exemptions are approved as defined within this instruction. **(T-1)** Refer to paragraph **13.1,** *Air Force Safety Management System,* for additional guidance.

1.4. Mishap Prevention Program Disciplines (Aviation, Occupational, Weapons, Space, etc.). Each mishap prevention program discipline will direct more specific functional management responsibilities and risk management (RM) processes via AFIs, standards and manuals, as determined applicable at the various program discipline levels. **(T-1)** Air Force installation and tenant safety offices will implement these programs IAW this instruction. **(T-1)** Any inter-organization and inter-service agreements will be addressed in formal support documents. (**T-1)** Regardless of any support agreement or executive agency guidelines, requirements of this instruction must be satisfied. **(T-1)** The mishap prevention program will address:

1.4.1. Methods to target groups at increased risk for mishaps, injury or illness as directed by the commander or as indicated through hazard identification processes. **(T-1)**

1.4.2. Processes for tracking and trending hazards and incidents, as well as methods for determining program effectiveness. **(T-1)**

1.4.3. Funding for safety programs. **(T-1)**

1.4.4. Metrics for measuring effectiveness (See examples in **Chapter 5,** *Information and Data Analysis*). **(T-1)**

1.4.5. Safety goals, objectives and milestones that support Air Force established goals. **(T-1)**

1.4.6. Methods to identify and disseminate safety "best practices," "benchmarks," etc. **(T-1)**

1.5. Air Force Occupational Safety and Health (AFOSH) Guidance and Applying Standards. AFOSH guidance must be followed at all times and is the minimum guidance necessary to provide a safe and healthful work environment for all Airmen, other Department of Defense (DoD)/government personnel, and volunteers IAW Title 10 USC § 1588, *Authority to Accept Certain Voluntary Services,* working on Air Force installations. **(T-0)** Air Force activities must comply with OSHA requirements at all times unless the military-unique exemption applies according to DoDI 6055.01, *DoD Safety and Occupational Health (SOH) Program.* **(T-0)** See paragraph **1.8** for further guidance on military-unique and nonmilitary-unique policy. AFOSH requirements shall provide equal or greater protection than applicable federal regulatory standards. **(T-0)** All Air Force units must comply with applicable safety guidance during all Air Force operations. **(T-1)** The Air Force may develop supplementary or alternative guidance where inadequate or no federal regulatory standards are applicable. MAJCOMs, DRUs and FOAs may supplement AFOSH guidance when additional or more stringent safety, fire prevention or health criteria are required. When there is conflicting guidance, apply that guidance which provides the most protection. Safety offices will maintain (or have access to) a reference library to include national consensus standards and other mission-related technical and safety guidance. **(T-2)**

1.5.1. AFOSH guidance sources include:

1.5.1.1. Regulatory Federal Standards. The Air Force complies with applicable Department of Labor's (DoL) OSHA, Nuclear Regulatory Commission, the National Institute for Occupational Safety and Health (NIOSH), and Department of Transportation standards incorporating specific requirements by reference into AFOSH guidance or technical orders (TOs).

1.5.1.2. AFOSH Guidance. Air Force published guidance is located at **http://www.e-publishing.af.mil**. The Air Force publishes industrial and general occupational safety guidance as Air Force instructions and/or manuals, which implement applicable OSHA standards. When AFOSH guidance or safety criteria do not cover a situation, use non-Air Force standards including national consensus standards, professional safety and health standards, and other federal agency standards. When there is conflicting guidance, use the guidance that provides the most protection. Refer conflicts between OSHA, AFI, AFMAN, AFOSH guidelines and TOs to AF/SE through the appropriate MAJCOM/FOA/DRU safety office for resolution. **(T-1)**

1.5.1.3. TOs and manufacturers' guidance (e.g., Safety Data Sheets) for specific processes, aircraft, and equipment.

1.5.2. Joint-Use Workplaces. Personnel from different DoD Components or other federal agencies working in the same workplace shall be governed by OSHA standards and any applicable agency standards, host/tenant support agreements, joint base instructions, etc. **(T-0)**

1.5.3. Variances and Exemptions. The affected work center shall process a request for variance or exemption when it is impractical or impossible to meet code of federal regulations (CFR) or AFOSH requirements due to operational needs, mission impact or technical reasons. **(T-0)** Variances are temporary and are granted with the understanding that permanent control measures are planned and will be in place within a time period not to exceed five years. Exemptions grant permanent relief from a requirement and may be approved when the applicant can substantiate that their proposed methods, equipment or facilities protect the employee as well or better than the AFOSH requirements or applicable. AFSEC, Air Force Civil Engineering Center (AFCEC) and Air Force Medical Readiness Agency (AFMRA) may grant variances or exemptions to AFOSH and environmental requirements, and AFMAN 91-203, *Air Force Occupational Safety, Fire, and Health Standards*, guidance that are more stringent than applicable OSHA requirements. Only OSHA can grant waivers or exemptions to applicable Title 29 (OSHA) requirements, even if they are included in AFOSH guidance. AFSEC will serve as the liaison between OSHA and the Air Force when seeking OSHA safety-related waivers or exemptions. **Note:** A unit's inability to fund corrective actions does not constitute sufficient justification to request a waiver, variance or exemption. Request extensions for variances through MAJCOM/FOA/DRUs to AFSEC Occupational Safety Division (AFSEC/SEG) or AFMRA/SG3/5, as applicable, and appropriate. **(T-1)** Variance/Exemption process consists of the following steps:

1.5.3.1. Affected work center personnel shall implement interim control measures and notify the installation occupational safety (or tenant unit safety, if applicable), fire or health officials to validate the effectiveness of interim controls. **(T-0)** With effective controls in place, the work center will coordinate the variance/exemption package with installation occupational safety (or tenant unit safety, if applicable), fire and health officials. **(T-0)**

1.5.3.2. The installation safety office (or tenant unit safety, if applicable) will assemble a detailed staff package with the following attributes. **(T-1)**

1.5.3.2.1. Clearly define the safety-related variance or exemption being requested, i.e., a description of the situation identifying the AFOSH guidance/publication, paragraph and specific reason(s) compliance is not possible.

1.5.3.2.2. State the rationale why the AFOSH guidance/publication cannot be followed.

1.5.3.2.3. Provide a description and risk assessment of permanent control measures planned, implementation date, plus identify interim control measures used to protect personnel, equipment or property, or used to mitigate the risk or hazard.

1.5.3.2.4. Identify the number of personnel exposed and protected by interim control measures relative to the operation or condition on a regular basis, and any Air Force property involved.

1.5.3.2.5. A Job Hazard Analysis (JHA) will be conducted on all work processes, where appropriate, to identify potential hazards, preventative measures in procedures to mitigate the hazards and proper personal protective equipment (PPE), if required.

(T-0) Note: Prior to submitting a variance or exemption, a JHA should have been accomplished to address all potential hazards. If not accomplished, provide a reason in the variance or exemption, why a JHA was not accomplished.

1.5.3.2.6. In the case of a variance request, provide a proposed way ahead to resolve the problem, or a description of why it is believed the problem cannot be resolved.

1.5.3.2.7. In the case of an exemption request, provide the proposed methods, equipment or facilities to protect the employee as well as or better than the AFOSH guidance.

1.5.3.2.8. Propose a plan to remedy the problem.

1.5.3.2.9. Include drawings, photographs, maps, etc., to clearly and thoroughly document all of the above.

1.5.3.3. The installation safety office will forward the request to the appropriate MAJCOM safety office through appropriate command channels. **(T-1)**

1.5.3.4. Any tenant unit safety staff working a variance or exemption will coordinate the product with the installation safety office before sending it forward to the tenant unit's higher headquarters. **(T-0)**

1.5.3.5. The MAJCOM/FOA/DRU safety staff reviews and, if recommended for approval, forwards requests to AFSEC/SEG (safety-related issues), AFCEC/CC (fire prevention and facilities-related issues) or AFMRA/SG3/5 (health-related issues), as appropriate, for final approval. **Note:** Requests received without MAJCOM/FOA/DRU coordination will be returned to requestor without action.

1.5.3.6. The MAJCOM/FOA/DRU/installation occupational safety manager maintains a master file of approved variances or exemptions that apply to their MAJCOM/FOA/DRU/ installation as long as they are in effect and for one year thereafter. The safety manager distributes copies of variances and exemptions to fire protection, health and functional managers, as needed. Air Force level variances can be found at the AFSEC/SEG website: **https://cs2.eis.af.mil/sites/10178/segs/default.aspx**. Functional managers or supervisors, as appropriate, must train affected employees and employee representatives on approved variances, exemptions or any special procedures required; such training will be documented. Post copies of approved variances and exemptions in affected work areas until integrated into the Job Safety Training Outline (JSTO). **(T-0)**

1.5.4. Safety Changes to Technical Orders. Process recommended changes to TOs IAW TO 00-5-1, *Air Force Technical Order System*. Send a copy of recommended changes to Air Force Materiel Command Occupational Safety Division (AFMC/SEG) and AFSEC/SEG.

1.5.5. Changes to Directives. Submit requests for changes to occupational safety and health (OSH) guidelines in Air Force instructions through command channels to the directive OPR. Safety, fire and health reviews, as appropriate, shall be accomplished at each level of command between the requester and the directive OPR. **(T-1)** Send a copy of recommended changes to AFSEC/SEG, AFCEC/CXF, and/or AFMRA/SG3/5, as applicable. (**T-1)**

1.5.6. Occupational Health. Ensure commanders, supervisors, employees and occupational environmental health subject matter experts assess health risks in the workplace.

1.6. Roles and Responsibilities.

1.6.1. The Assistant Secretary of the Air Force for Installations, Environment, and Energy (SAF/IE).

1.6.1.1. The SAF/IE is the Department of the Air Force's Designated Agency Safety and Health Officer (DASHO). The SAF/IE delegates program responsibilities, except the DASHO duties (which are not delegable), to the Deputy Assistant Secretary for Environment, Safety, and Infrastructure (SAF/IEE).

1.6.1.2. Provides policy, guidance, direction and oversight of all matters pertaining to the formulation, review and execution of plans, policies, programs and budgets relative to the mishap prevention and Environment, Safety and Occupational Health (ESOH) programs.

1.6.1.3. Conducts Program Management Reviews of the Air Force ESOH programs, at least annually, with the Air Force Chief of Safety (AF/SE) and the Air Force Surgeon General (AF/SG). Reports the progress of the Air Force ESOH programs to the Deputy Undersecretary of Defense (Personnel and Readiness), as requested.

1.6.1.4. Establishes strategic goals and objectives, develops performance measures and assigns responsibilities in coordination with AF/SE.

1.6.1.5. Conducts Headquarters United States Air Force (HQ USAF) Environment, Safety and Occupational Health Council (ESOHC) meetings IAW AFI 90-801, *Environment, Safety, and Occupational Health Councils.*

1.6.1.6. Collects, analyzes and reports Air Force-wide performance information to Office of the Secretary of Defense IAW DoDI 6055.01, DoDI 6055.04, *DoD Traffic Safety Program,* and DoDI 6055.07, *Mishap Notification, Investigation, Reporting, and Record Keeping,* as applicable.

1.6.1.7. Establishes procedures for communication with interested external parties.

1.6.1.8. IAW Headquarters AF Mission Directive 1-18, *Assistant Secretary of the Air Force (Installations, Environment and Energy),* has authority over the Air Force Risk Management Process as described in DoDI 6055.01 and AFI 90-802, *Risk Management.*

1.6.2. The Assistant Secretary of the Air Force for Acquisition (SAF/AQ):

1.6.2.1. Establishes engineering and technical policy and procedures for SAF/AQ Programs (both acquisition and sustainment) to execute System Safety as an integrated part of the Systems Engineering efforts to manage environment, safety, and occupational health risks and requirements IAW DoDI 5000.02, *Operation of the Defense Acquisition System,* and AFI 63-101/20-101, *Integrated Life Cycle Management.*.

1.6.2.2. Coordinates guidance and federal acquisition regulations involving AFOSH matters with AF/SE, SAF/IE and AF/SG.

1.6.2.3. Ensures contracts include applicable Federal Acquisition Regulation/DoD Federal Acquisition Regulation Supplement/Air Force Federal Acquisition Regulation Supplement (FAR/DFARS/AFFARS) safety clauses.

1.6.2.4. Includes ESOH Risk Management concepts and responsibilities in the education and training of acquisition personnel.

1.6.2.5. Ensure appropriate risk acceptance authority for High-Risk system safety assessments.

1.6.2.6. Establishes engineering and technical policy and procedures for Air Force Acquisition and Sustainment, including policy and procedures for all programs to execute System Safety as an integrated part of Systems Engineering.

1.6.2.7. Performs periodic reviews of Acquisition and Sustainment programs. These include required reviews of the results of each program's ESOH Risk Management efforts. This ensures that System Safety is overseen within the context of other cost, schedule and performance issues.

1.6.2.8. Represents the Air Force in Acquisition and Sustainment Program System Safety matters with other DoD components and both Governmental and non-Governmental agencies.

1.6.2.9. Ensures program offices support and are included in system-related Class A and Class B mishap investigations to the extent necessary to analyze hazards that contributed to the accident, and provide recommendations for materiel risk mitigation measures, especially those that minimize potential human errors.

1.6.3. The Assistant Secretary of the Air Force for Financial Management and Comptroller (SAF/FM):

1.6.3.1. Determines process for Risk Assessment Code (RAC) funding visibility, priority and implementation procedures for funding the abatement of safety, fire and health hazards.

1.6.3.2. Encourages use of the RAC system on Resource Allocation Programming Information Decision System used during the corporate budgeting process.

1.6.3.3. Includes ESOH Risk Management concepts and responsibilities in the education and training of financial management/comptroller personnel.

1.6.3.4. Ensures scoring of ESOH risk data analysis for financial project management and programming.

1.6.4. The Air Force Surgeon General (AF/SG):

1.6.4.1. Establishes goals, objectives, policy and standards for occupational and environmental health.

1.6.4.2. Ensures Air Force occupational and environmental health policies meet or exceed federal regulations (CFRs) and other applicable requirements.

1.6.4.3. Develops health-related policies which support the Air Force mishap prevention program.

1.6.4.4. Develops and facilitates use of human factors standards in mishap prevention. Ensures use of tools that address human error identification and reduction related to fatigue, stress and other emotional, psychological or physiological factors.

1.6.4.5. Provides subject matter experts (SMEs) in human factors.

1.6.4.6. Through the Biomedical Sciences Corps (BSC) Associate Chief for Bioenvironmental Engineering (AFMRA/SG3PB), coordinates on installation-level proposed responses related to occupational safety and health events.

1.6.5. The Deputy Chief of Staff Logistics, Engineering, and Force Protection (AF/A4):

1.6.5.1. Ensures maintenance and logistics policy address and comply with all applicable safety and health standards.

1.6.5.2. Ensures Air Force procedures for storing, handling, using and transporting hazardous materials and disposing of wastes comply with transportation regulations, environmental statutes and occupational regulations.

1.6.5.3. Ensures civil engineering procedures, operations, technical publications and designs for new construction meet or exceed federal regulatory requirements and AFOSH guidance, as well as explosives and other safety criteria.

1.6.5.4. Ensures policy addresses and mitigates the potential for human error associated with logistics and engineering activities.

1.6.5.5. Integrates ESOH Risk Management and risk reduction into the sustainment decision-making process.

1.6.5.6. Incorporates ESOH principles in policies, procedures and training.

1.6.5.7. Determines process for RAC funding visibility, priority and implementation procedures within the Integrated Priority List corporate process for funding safety, fire and health hazards abatement.

1.6.6. The Deputy Chief of Staff, Manpower Personnel and Services (AF/A1):

1.6.6.1. Develops policy on personnel matters relating to AFOSH.

1.6.6.2. Provides guidance for commanders and supervisory personnel to meet accountability and performance requirements for the AFOSH program.

1.6.6.3. Serves as the OPR for Federal Employees' Compensation Act (FECA) at the Air Staff level.

1.6.6.4. Establishes a process through which Airmen are evaluated on Safety and Occupational Health (SOH) duties and responsibilities within the applicable appraisal system.

1.6.6.5. Provides guidance to ensure supervisory personnel appraisals address SOH conformance and reflect responsibility for the management of SOH programs in their area of responsibility. Such appraisals should specifically include an evaluation of their SOH program management performance.

1.6.6.6. Incorporates AFOSH program orientation into training programs for new civilian employees.

1.6.7. Headquarters, Air Force Directorate of Test and Evaluation (AF/TE). Provides direction and guidance to ensure test organizations assess safety standards and hazards prior to testing.

1.6.8. The Deputy Chief of Staff for Operations (AF/A3):

1.6.8.1. Develops policy and guidance for use and management of AF-operated operational ranges.

1.6.8.2. Ensures applicable environmental, safety and operation health programs and requirements are incorporated within operational range AFPDs, AFIs, and AFMANs.

1.6.9. The Air Force Chief of Safety (AF/SE):

1.6.9.1. Is the OPR for Air Force safety programs.

1.6.9.2. Directs implementation of Public Law, Executive Orders, and DoD Directives and Instructions on safety.

1.6.9.3. Directs implementation of the Air Force Mishap Prevention Program.

1.6.9.4. Emphasizes safety management strategies to drive mishap prevention program and safety management system requirements.

1.6.9.5. Provides direct liaison with MAJCOM/DRU/FOA Directors of Safety on mishap prevention program and safety management system implementation by providing training, SMEs and incorporating safety management system principles into existing training courses.

1.6.9.6. Serves as the lead agent for the overall cross-functional integration and sustainment effort of Air Force safety risk management processes and procedures IAW AFI 90-802 requirements.

1.6.9.7. Attends or delegates attendance to the Joint Service Safety Council.

1.6.9.8. Establishes and chairs or delegates chairmanship of the Air Force Senior Safety Advisory Council.

1.6.9.9. Assigns the Chief of Occupational Safety as the USAF OSHA Process Manager.

1.6.9.10. Ensures SAF/AQ program offices are included in system-related Class A and Class B mishap investigations to analyze hazards that contributed to the accident, and provides recommendations for materiel risk mitigation measures, especially those that minimize potential human errors.

1.6.10. The Air Force Safety Center, under the command of the AF/SE:

1.6.10.1. Develops, implements, oversees and funds, as appropriate, Air Force Mishap Prevention Programs within the framework of the Air Force safety management system. **(T-0)**

1.6.10.2. Develops safety programs, policies, goals and objectives, and establishes guidelines to support and assess effectiveness of the mishap prevention program. **(T-0)**

1.6.10.3. Acts as liaison for safety matters with DoD components, federal agencies and private sector groups. **(T-1)**

1.6.10.4. Prepares and publishes Air Force Instructions covering Air Force-unique operations and provides implementation guidance for applicable standards. **(T-1)**

1.6.10.5. In conjunction with AF/SG and AFCEC, develops special guidance for Air Force operations where federal regulations, AFI and AFOSH guidance is not available or is inadequate. **(T-1)**

1.6.10.6. Serves as the approving authority and repository for all safety-related variances and exemptions within the Air Force. **(T-1)**

1.6.10.7. Coordinates testing to ensure Air Force compliance with DoD Explosives Safety standards. **(T-1)**

1.6.10.8. Develops procedural rules to ensure compliance with DoD and Department of Energy (DoE) rules related to nuclear systems. **(T-1)**

1.6.10.9. Coordinates, facilitates, develops and provides safety education and training where appropriate. **(T-1)**

1.6.10.10. In coordination with MAJCOMs/DRUs/FOAs, ensures identified safety hazards and deficiencies are managed within the hazard abatement program (**Chapter 4,** *Hazard Identification, Reporting and Abatement*).

1.6.10.11. Performs safety evaluations of MAJCOMs, DRUs, and FOAs with a safety staff at least every 48 months. **(T-1)**

1.6.10.12. Collects annual OSHA 300, *Log of Work-Related Injuries and Illness,* and OSHA Form 300A, *Summary of Work-Related Injuries and Illness,* for submission to the Bureau of Labor and Statistics by 30 May each year. **(T-0)**

1.6.10.13. Manages the Air Force Combined Mishap Reduction System (AFCMRS) survey process and conducts Organizational Safety Assessments (OSA) of organizations or wings, as requested by commanders. **(T-1)**

1.6.10.14. Reviews records disposition for functional records IAW AFMAN 33-363, *Management of Records,* and 29 CFR Part 1904, *Recording and Reporting Occupational Injuries and Illnesses.* **(T-0)**

1.6.10.15. Provides and maintains a centralized suite of mishap reporting, data collection and analytical tools or resources for use at all levels of the Air Force Safety enterprise. **(T-1)**

1.6.10.16. Conducts specialized analyses and studies at the request of the Congress, Chief of Staff of the Air Force, Air Force Chief of Safety, Headquarters Air Force, and MAJCOM/DRU/FOA Commanders. **(T-0)**

1.6.10.17. Provides discipline specific subject matter experts in safety. **(T-1)**

1.6.10.18. Coordinates with applicable agencies to ensure safety requirements and issues (e.g., safety related FAR clauses) are addressed in guidance and directives. **(T-0)**

1.6.10.19. Serves as consultants on assessments, evaluations and mitigation of human factors and human performance hazards.

1.6.10.20. Performs Air Force-level trend analysis of mishaps, incidents, risk, hazards and errors, and publishes results. **(T-1)**

1.6.10.21. Serves as safety consultants for safety related investigations.

1.6.10.22. Maintains and upgrades the Air Force Safety Automated System (AFSAS) program, database and all associated information technology tools necessary for AFSAS operation and maintenance.

1.6.10.23. Serves as the lead agent for the overall cross-functional integration and sustainment effort of Air Force Risk Management processes and procedures IAW AFI 90-802.

1.6.10.24. Conducts the Air Force Senior Safety Advisory Council. **(T-1)**

1.6.10.25. Conducts the Air Force Occupational Safety Corporate Committee. **(T-1)**

1.6.10.26. Conducts the Air Force Space Safety Council. **(T-1)**

1.6.10.27. Conducts the Air Force Aviation Safety Council. **(T-1)**

1.6.10.28. Develops, implements and oversees the Air Force OSHA Process Management system for the cross-functional integration and execution of occupational safety and health events and procedures for Federal or State programs. **(T-0)** Coordinates on installation-level proposed responses related to occupational safety and health events. **(T-0)**

1.6.10.29. Develops and publishes yearly high-interest spot inspection areas (Occupational Safety Emphasis items), using five years of on-duty ground mishap data analysis as part of the Occupational Safety Annual Program Management Review. **(T-1)**

1.6.10.30. Publishes OSHA Cross-tells for each notice of violation received by an installation to share data across the Air Force and DoD to support mishap prevention and reduction efforts. **(T-1)** Cross-tells may be published to reinforce effective safety programs identified during occupational safety and health events.

1.6.10.31. Develops and coordinates System Safety policy and guidance. **(T-0)**

1.6.10.32. Evaluates safety risk assessment portions of High-Risk and Serious-Risk acceptance packages for systems safety analysis. Reviews and coordinates on the High-Risk acceptance packages before submission to SAF/AQ. **(T-1)**

1.6.10.33. Provides independent assessments and advice on overall Acquisition and Sustainment Program safety (residual hazards and associated risks) to Headquarters Air Force senior leadership, as appropriate. **(T-1)**

1.6.10.34. Participates in Headquarters Air Force (HAF)-level reviews for Acquisition and Sustainment Programs. These reviews are one of the key opportunities to influence System Safety in Acquisition and Sustainment Programs.

1.6.10.35. Represents the Air Force in system safety policy and guidance matters with other DoD components and other government and non-government agencies. **(T-1)**

1.6.10.36. Develops and implements System Safety training programs. **(T-1)**

1.6.10.37. Provides advisors and consultants to System Safety Groups. **(T-1)**

1.6.10.38. Reviews Air Force technical and management documents (capabilities management documents, program management directives, System Safety Group charters) for inclusion of appropriate safety requirements. **(T-1)**

1.6.10.39. Reviews and comments on mishap reports for technical content and lessons learned. **(T-1)**

1.6.10.40. Provides members, advisors and consultants to the Non-nuclear Munitions Safety Boards, Laser System Safety Review Board and safety study groups for terrestrial

nuclear reactors. **(T-1)** Provides a senior advisor to the chair of the US Air Force Nuclear Weapons System Safety Group. **(T-1).** Refer to AFI 91-205, *Nonnuclear Munitions Safety Board,* and AFI 91-102, *Nuclear Weapon System Safety Studies, Operational Safety Reviews, and Safety Rules.*

1.6.10.41. Evaluates the System Safety of Directed Energy Weapons needed for Air Force operations via the Directed Energy Weapons Safety Board. **(T-1)** This safety consideration is a System Safety effort which considers the Directed Energy Weapons hazard posed to Airmen and all pertinent Air Force equipment. Safety of a Directed Energy Weapon device shall be considered before purchase or during design, using AFI 91-401, *Directed Energy System Safety,* for safety design criteria.

1.6.10.42. For system-related mishaps, determines whether the Program Manager previously identified the hazards that played a role in the mishap sequence and had included those hazards in its Systems Engineering ESOH Risk Management efforts.

1.6.11. Program Executive Officers (PEOs) ensure that programs within their portfolios are integrating ESOH concerns into the overall systems engineering process using the system safety methodology in Military Standard (MIL-STD)-882E, *DoD Standard Practice for System Safety,* as required by DoDI 5000.02, *Operation of the Defense Acquisition System,* and AFI 63-101/20-101, *Integrated Life Cycle Management.* They perform periodic program and technical reviews of programs within their portfolios. These required reviews include the results of each program's System Safety and safety Risk Management efforts. This ensures that System Safety is overseen alongside other cost, schedule and performance issues. PEOs are the acceptance authorities for "Serious" program safety risks and coordinate on "High" program safety risks.

1.6.12. MAJCOM/DRU/FOA/Numbered Air Force (NAF)/Center Commanders/Directors:

1.6.12.1. Direct implementation and provide resources for the mishap prevention program. **(T-1)**

1.6.12.2. Establish and maintain a safety program that provides a safe and healthful workplace. **(T-1)** Ensure command guidelines meet or exceed applicable safety program requirements. **(T-1)**

1.6.12.3. Ensure subordinate commanders enforce compliance with occupational safety and health requirements. **(T-1)**

1.6.12.4. Ensure a process is in place for new commanders to receive training on their safety responsibilities. **(T-1)**

1.6.12.5. Ensure procedures are developed to identify command mishap trends and direct actions and resources in order to establish goals and objectives to reverse identified adverse mishap or safety program trends. **(T-1)**

1.6.12.6. Ensure safety program performance is included in rating of subordinate commanders, and senior civilian supervisory personnel's performance using guidance provided by AF/A1 as called for in paragraph **1.6.6.2** **(T-1)**

1.6.12.7. Advocate with applicable organizations for funding priorities for hazard abatement projects during the MAJCOM corporate planning, programming and budgeting process.

1.6.12.8. Coordinate safety directives, instructions and supplements with the AF Safety Center. **(T-1).** Subordinate unit supplements will be approved by their parent command. MAJCOM programming plans, safety annexes, Concept of Operations, etc., should be shared with the Safety Center and MAJCOM safety staffs as cross-feed items. When such documents impact other commands, coordination with the Safety Center is required.

1.6.12.9. Ensure command personnel are aware of commander's goals and related expectations for safety.

1.6.12.10. Ensure contracts include provisions requiring contractors to maintain an effective safety and health program on Air Force-owned sites that complies with applicable DoL, DoD, and Air Force safety standards. **(T-1)**

1.6.12.11. Ensure all personnel are provided requisite formal and informal training courses, educational programs and other activities to enable them to meet their respective mishap prevention responsibilities. **(T-1)**

1.6.12.12. Ensure conduct of the MAJCOM Environment, Safety and Occupational Health Council adhere to requirements of AFI 90-801.

1.6.12.13. Support and ensure installations execute cooperative efforts to reduce injuries and illnesses across the Air Force by implementing safety and occupational health management systems throughout their command.

1.6.12.14. Convene Safety Investigation Boards and receive out briefs IAW AFI 91-204, *Safety Investigations and Hazard Reporting.*

1.6.13. MAJCOM/DRU/FOA/NAF/Center Safety Staffs:

1.6.13.1. Oversee implementation of the mishap prevention program within their organization.

1.6.13.2. Evaluate management, implementation and effectiveness of the Air Force Mishap Prevention Program within the command IAW this instruction. **(T-1)**

1.6.13.2.1. Ensure the evaluation criteria includes a qualitative rating system with written criteria, to measure compliance, adequacy and effectiveness of the safety program and safety management system. **(T-1)**

1.6.13.2.2. Report results directly to MAJCOM/DRU/FOA/NAF/Center Commander/Directors. **(T-1).** Based on assessment/evaluation results, identify opportunities for continuous improvement.

1.6.13.2.3. Track program evaluation deficiencies and monitor corrective actions until closure.

1.6.13.2.4. Review and analyze applicable mishap reports from other organizations for lessons learned. **(T-1)** Distribute mishap prevention data and other safety related communications to subordinate units. **Note:** Lessons learned can be viewed via the AFSEC SharePoint®.

1.6.13.3. Assist and advise commanders and supervisors at all levels to understand their responsibility to ensure plans, procedures, facilities, equipment modifications/acquisitions,

hardware, software, and operations receive a safety review and incorporate effective risk management, hazard elimination/mitigation and mishap reduction features.

1.6.13.4. Represent the cross-functional interest of their command during applicable councils, committees, and meetings, e.g., Senior Safety Advisory Council, Occupational Safety Corporate Committee, Non-Nuclear Munitions Safety Board, Explosives Safety Committee, Flight Safety Corporate Committee, and Space Safety Council. **(T-2)**

1.6.13.5. Coordinate with appropriate staff agencies to ensure explosives site plans comply with explosives and other safety criteria. **(T-1)**

1.6.13.6. Advocate for funding of safety training for command safety personnel. Maintain a current list of safety training courses required/completed by each career safety professional, as defined by paragraph **2.1.2,** to include name of course(s), date courses completed and courses required. **(T-1)** MAJCOMs/FOAs/DRUs can delegate tracking of training.

1.6.13.7. Coordinate, facilitate, develop and provide safety education and training and required funding to assist command safety personnel in meeting their continuing education unit (CEU) requirements through various funding sources available, i.e., civilian personnel, base level civilian training, Air Force Personnel Center (AFPC), Federal Safety and Health councils, as well as organizational funding.

1.6.13.8. Evaluate local On-the-Job Training (OJT) and continuation training of safety personnel during safety program evaluations. **(T-1)**

1.6.13.9. Review all Class A and B mishap investigation reports for thoroughness and accuracy. **(T-1)** Class C and below reports may be released at the convening authority level without MAJCOM review. Ensure the findings, causes and recommendations of reports comply with the direction in AFI 91-204 and the applicable manuals: AFMAN 91-221, *Weapons Safety Investigations and Reports,* AFMAN 91-222, *Space Safety Investigations and Reports,* AFMAN 91-223, *Aviation Safety Investigations and Reports,* and AFMAN 91-224, *Ground Safety Investigations and Reports.*

1.6.13.10. Ensure a process is in place to identify, train and track training of potential safety investigation board members within the MAJCOM staff.

1.6.13.11. Ensure all personnel with access to privileged safety information receive annual training on the proper handling procedures and document the training. **(T-1) Note:** For those with AFSAS accounts, training may be recorded in their AFSAS Training Module.

1.6.13.12. Assist commanders and functional managers on implementation and integration of risk management language into command operations and instructions to include risk assessment processes.

1.6.13.13. Develop and submit supplements for organization unique AFI and AFOSH guidance to AFSEC for approval prior to publication. **(T-1)** Supplements must delineate methods for accomplishing safety program management responsibilities and should consider guidance on:

1.6.13.13.1. The process for scheduling and conducting commander-requested Staff Assistance Visits (SAVs) for subordinate units.

1.6.13.13.2. Conduct analysis at the installation level and below. Safety staffs should use available resources to identify and analyze mishap trends and guidance and present to subordinate units and commanders for mishap prevention.

1.6.13.13.3. Command mishap tracking and recommendation procedures IAW AFI 91-204.

1.6.13.13.4. Review of safety alert messages (which could come from a number of sources, e.g., manufacturers, users, Program Managers) and verify subordinate units take appropriate actions.

1.6.13.13.5. Coordinating and processing annual and recurring safety awards IAW AFMAN 36-2806, *Awards and Memorialization Program.* **(T-1)**

1.6.13.13.6. Providing command unique training to subordinate units' safety staff.

1.6.13.13.7. Responsibilities and/or expectations of the NAFs in regards to the management and implementation of the Air Force Mishap Prevention Program.

1.6.13.14. Providing MAJCOM-unique requirements to subordinate units for implementation into local Air Force Supervisor Safety Training (SST) classes.

1.6.13.15. Coordinates the cross-functional integration and execution of occupational safety and health events, responses and procedures as prescribed within this instruction. **(T-1)**

1.6.13.16. Consider designating high interest areas for spot inspections using their MAJCOM-specific mishap trends and the AFSEC Occupational Safety Emphasis Items.

1.6.13.17. Provide direction and guidance identifying documentation, by discipline, which must be uploaded in the unit's Management Internal Control Toolset (MICT). Refer to AFI 90-201, *The Air Force Inspection System,* and AFI 33-360 for additional guidance.

1.6.13.18. Review and supplement, as needed, the Occupational Safety Emphasis Items based on MAJCOM-specific mishap trends. Prescribe these emphasis items to subordinate installations for inclusion in their High Interest Spot Inspection program.

1.6.13.19. Each MAJCOM with acquisitions not accomplished by SAF/AQ programs must appoint a trained System Safety Manager to act as the point of contact to facilitate System Safety matters.

1.6.13.19.1. Specify any requirements for safety features that could reduce risk, hazards or their effects. **(T-1)** Safety personnel must identify particular safety constraints as early as possible to the Program Office, preferably as a part of a formal requirements document, endorsed by the Lead Command's proponent office for the system. **(T-1)** These System Safety constraints could affect the command mission, base locations, unique operational use, support concepts or meteorological operating environments dealing with the weapons system.

1.6.13.19.2. Participate as System Safety Group (SSG) members and System Safety Working Group (SSWG) members, as appropriate. Ensure the Programmatic Environment, Safety and Occupational Health Evaluation (PESHE) includes adequate operational safety criteria and meets the DoDI 5000.02 requirements. Ensure material

mishap recommendations are included in the Lead MAJCOM cycle and efforts/results are addressed by program offices.

1.6.13.19.3. Designate a trained focal point in the MAJCOM Safety Office responsible for System Safety advocacy for the Command. Provide AFSEC Flight Safety Division (AFSEC/SEF), AFSEC/SEG, AFMC System Safety Branch (AFMC/SES) and Air Force Space Command System Safety Branch (AFSPC/SEK) (space programs only) with the name of the focal point. **Note:** Trained focal point is someone who has completed a formal System Safety course.

1.6.13.19.4. Work closely with non-SAF/AQ program managers to facilitate the Lead Command's coordination role in the System Safety risk acceptance process. Jointly determine the overall level of risk and document the acceptance of this risk level with the appropriate authorities.

1.6.13.19.5. Use the principles of system safety to discover previously unidentified hazards and/or changes in the level of risks in fielded systems. Provide relevant information to the program manager for risk mitigation efforts.

1.6.13.20. Lead Commands will consolidate Using Command's requirements and represent these needs to program offices.

1.6.14. Air Force Materiel Command and Air Force Space Command:

1.6.14.1. Develop policy and provide guidance on applying System Safety management and engineering.

1.6.14.2. Identify and correct product safety deficiencies, give technical assistance to mishap investigation boards, and implement corrective action involving materiel safety aspects of mishap reports as required by AFI 91-204. Manage budgets provided for mishap investigation support.

1.6.14.3. Ensure system, aviation, space, occupational, directed energy, and weapons/explosives safety experts are consulted early in the life cycle of acquisition programs.

1.6.14.4. Maintain a master hazard abatement program for centrally procured systems and equipment applied to end products.

1.6.14.5. Ensure design criteria complies with commercial standards, military requirements and joint standards, as well as applicable AFOSH and/or OSHA requirements.

1.6.14.6. Periodically review design handbooks, TOs, military specifications, military standards, and Allowance Standards (AS) to ensure safety and health criteria and procedures in those documents comply with safety guidance. Ensure human factors and reduction of human error potential are factored into the system design, through the use of System Safety Groups, Human Factors review, etc., and based upon inputs from System Safety and Human Systems Integration activities.

1.6.14.7. Monitor the Government Industry Data Exchange Program, distributes information and corrective action to eliminate or reduce use of hazardous products.

1.6.14.8. Develop and encourage use of human factors standards in mishap prevention.

1.6.14.9. Ensure use of tools that address human error identification and reduction related to fatigue, stress, and other emotional, psychological or physiological factors.

1.6.14.10. Establish and maintain the Air Force's capability to support system safety efforts on major weapon system acquisitions.

1.6.14.10.1. Develop and coordinate MAJCOM centric guidance and policy for system safety.

1.6.14.10.2. Ensure program offices and the lead and using commands coordinate when modifications or changes in system use affect safety.

1.6.14.10.3. Evaluate mishaps and mishap trends to identify deficiencies that engineers and managers may have overlooked or incorrectly analyzed during system development.

1.6.14.10.4. Specifically, notify AFSEC of Program Lead System Safety Manager assignment and location.

1.6.14.10.5. Ensure level of support, training and experience of System Safety staff is appropriate for each Program.

1.6.14.10.6. Ensure all Center system safety managers annually report RM policies conforming to paragraph **11.1.3**, along with a current list of all Component Acquisition Executive (CAE)- or Program Executive Officer (PEO)-accepted risks for their programs. Provide a consolidated annual report for all programs to AF/SE and SAF/AQ.

1.6.14.10.7. Appoint a trained System Safety manager to act as the point of contact to facilitate system safety matters.

1.6.14.10.8. Air Force Materiel Command:

1.6.14.10.8.1. Ensures Centers document safety criteria and hazards identified during their efforts throughout the program life cycle. Provides support as required to ensure the responsible organizations include a safety hazard analysis with any development or modification to be evaluated, assessed or tested within AFMC and the using command.

1.6.14.10.8.2. Facilitates information exchange between AFMC Centers, HQ AFSEC and the user to maintain operational safety of AFMC managed weapon systems and end items.

1.6.14.10.8.3. Ensures AFMC/SES forwards to AFSEC/SEFE not later than 1 November in every even-numbered year, an update to the USAF Aviation Safety Equipment Database in the format described in paragraph **13.4,** *USAF Aviation Safety Equipment Database Reporting,* reflecting fleet status on the last day of the preceding fiscal year.

1.6.14.10.8.4. AFMC/SES is responsible for System Safety Engineering Analysis efforts but may delegate these as required.

1.6.14.10.8.5. AFMC/SES shall ensure each Center has a designated Center System Safety Manager (CSSM).

1.6.14.10.9. Air Force Space Command. Ensures launch and on-orbit hazards are identified. Provides input to the acquisition framework to ensure system safety is considered throughout the space system life cycle.

1.6.15. Air Education and Training Command (AETC):

1.6.15.1. Reviews new and revised technical training course specialty and job qualification training objectives and outlines to ensure safety requirements are being met.

1.6.15.2. Ensures mishap prevention programs and risk management concepts are embedded in technical training and Professional Military Education.

1.6.15.3. Incorporates AFOSH program orientation into training programs for officer and enlisted accessions and new civilian employees.

1.6.15.4. Develops and oversees safety training guidance for the development and management of formal technical training (non-flying), OJT, ancillary and additional duty training, automated training record and learning management systems, and Mission Readiness Training.

1.6.16. Program Managers organize their offices, based on system acquisition program size and complexity, to execute the system safety requirements elaborated by the DoD and Air Force in DoDI 5000.02, AFI 63-101/20-101, and MIL-STD-882E. Acquisition Category (ACAT) I Acquisition and Sustainment Program Managers integrate system safety into their program's overall Systems Engineering effort at the same level where day-to-day engineering decisions are being made. This allows System Safety professionals to most effectively influence system design.

1.6.16.1. Ensure that ESOH concerns are integrated into the overall systems engineering process using the system safety methodology in MIL-STD-882E, as required by DoDI 5000.02 and AFI 63-101/20-101. **(T-0)** The Program Manager appoints a System Safety Manager (SSM) to serve as the program focal point for the System Safety Program. **(T-0)**

1.6.16.2. Program offices must document and report status of all High-Risks and Serious-Risks as part of their risk management. **(T-1)** This information is also required to be documented in the PESHE (if a PESHE is required for the program). Applicable current High- and Serious-Risks must be presented at each Program and Technical Review. For High- and Serious-Risks, program managers must prepare a written risk decision package IAW paragraph **13.9,** *Preparation of Risk Assessments.* **(T-1)** Paragraph **13.9** is also recommended for all other risk assessments.

1.6.16.3. The Program Manager (PM) shall provide safety releases containing all identified hazards, implemented mitigation measures and accepted risks to developmental and operational testers as part of testing and fielding new or modified systems or end items prior to any test involving personnel. **(T-1).** As a minimum, the safety release will contain the information in paragraph **13.10,** *Safety Release.* **(T-1)**

1.6.17. System Safety Managers (SSMs) and System Safety Engineers (SSEs) will monitor operational experience, mission changes, environmental effects or system modifications to identify and correct hazards throughout the life cycle of a system or facility. **(T-1)** When a program (e.g., an aircraft or a space vehicle) has an embedded sub-program (e.g., an aircraft engine or hosted payload), which could create inter-related safety risk at the higher system

level, both program managers will ensure their Systems Engineering Plans include processes to identify inter-related safety risks and to integrate RM and mitigation efforts for safety risks. **(T-1)** When assigned to Program Offices, SSMs and SSEs:

1.6.17.1. Will have direct lines of communication to PMs to advise them on system safety matters. **(T-1)**

1.6.17.2. Must have introductory space safety course training when assigned to a program involved in the acquisition of a space system. **(T-1)**

1.6.17.3. Work within the Program Manager's organizational structure to perform system safety functions IAW the methodology in MIL-STD-882E. **(T-1)**

1.6.17.4. Integrate System Safety efforts with systems engineering and other functional areas within the program. **(T-1)**

1.6.17.5. Identify and assess safety hazards and risks throughout the program life.

1.6.17.6. Annually report safety RM policies, accepted risks and those that require PEO or higher action for their program to the Center System Safety Manager.

1.6.17.7. Incorporate safety requirements and design criteria into appropriate program documents. **(T-1)**

1.6.17.8. Work with Systems Engineering staff to provide System Safety risk assessments for program and technical reviews. **(T-1)**

1.6.17.9. Develop, recommend and oversee efforts to verify effectiveness of mitigation measures. **(T-1)**

1.6.17.10. Develop and implement tracking procedures for all identified hazards and mitigation measures. Document management decisions for acceptance of risks. **(T-1)**

1.6.17.11. Conduct SSGs/SSWGs meetings, when required, for their program. **(T-1)**

1.6.17.12. Prepare formal risk assessment packages for acceptance at the appropriate level IAW paragraph **13.9,** DoDI 5000.02, AFI 63-101/20-101 and MIL-STD-882E. **(T-0)**

1.6.17.13. Ensure System Safety requirements are clearly defined and presented to the appropriate decision authorities for integration into the Systems Engineering process for their program. **(T-1)**

1.6.17.14. As part of the preparations for fielding new or modified systems, ensure Air Force Operational Test Evaluation Center (AFOTEC), using commands and Air Force Sustainment Center Chief of Safety (AFSC/SE), as well as other validated stakeholders, are provided with a listing of all High- and Serious-Risks (and Low- and Medium-Risk on specific request), their mitigation measures, as well as risk assessment and acceptance documentation. **(T-1)**

1.6.17.15. SSMs shall participate in Configuration Control Boards (CCBs), deficiency review boards, Integrated Test Team, and other meetings where system safety concerns may be addressed. **(T-1)**

1.6.18. When assigned as a Center System Safety Manager (CSSM):

1.6.18.1. AFMC and AFSPC Centers will have a trained full-time CSSM in the center safety office, unless waived by MAJCOM System Safety Functional. **(T-1)** The CSSM should be level II acquisition certified.

1.6.18.2. If a center has a full-time system safety staff, the chief of this staff will be the CSSM. **(T-1)**

1.6.18.3. CSSMs should be members of applicable center senior engineering venues such as Acquisition Strategy Panel, to remain informed of top-level issues and provide cross-tell.

1.6.18.4. CSSMs or their designated staff members will be members or advisors of SSGs and Mishap Review Panels and CCBs. **(T-1) Note:** Full-time SSMs may represent system safety in lieu of the CSSM on program-unique CCBs, Mishap Review Panels and SSGs.

1.6.18.5. CSSMs will conduct annual meetings with all center system safety personnel to cover refresher training, cross-tell items, and new developments in system safety. **(T-1)**

1.6.18.6. The CSSM will coordinate on the safety portion of the PESHE for programs managed at the Center. **(T-1)**

1.6.18.7. CSSMs must provide annual overviews to the MAJCOM/SE and AF/SE on the safety RM policies and status of all risks requiring PEO or CAE action for all programs managed at their Center. **(T-1)**

1.6.18.8. Promote standardization through the cross-flow of best practices.

1.6.19. When assigned to Lead/Using Command, System Safety Officers, Managers and engineers:

1.6.19.1. Must be familiar with System Safety policy and guidance. **(T-1)**

1.6.19.2. Support the Initial Capabilities Document, Capability Development Document and Capability Production Document development effort IAW AFPD 90-8, *Environment, Safety, and Occupational Health Management and Risk Management.* Safety personnel must work with the Environmental and Bioenvironmental Engineering (BE) staffs to identify ESOH constraints as early as possible to prevent adverse impacts on command mission, base locations, operational use, support concepts or meteorological operating environments associated with systems.

1.6.19.3. Assist in coordinating user concurrence for safety risk acceptance decisions.

1.6.19.4. Interpret hazard data provided by the program manager for the system users.

1.6.20. Test Organizations. During both development and operational test and evaluation, test organizations will review and validate program office risk assessments for hazards that were not eliminated through redesign. **(T-1)** The test organizations will provide the using commands with their recommendations on program office risk assessments. **(T-1)** The test organizations and AFOTEC will provide to the program office a summary of the test hazards and the mitigating actions for all serious and high test hazards. **(T-1)**

1.6.21. Installation Commander:

1.6.21.1. Directs implementation and provides resources for the mishap prevention program. **(T-1)**

1.6.21.2. Provides safe and healthful workplaces for all installation personnel. **(T-0)**

1.6.21.3. Ensures leadership at all levels enforces safety and occupational health standards. **(T-1)** Based on assessment/evaluation results, identifies continuous improvement opportunities, goals and objectives via the Annual Program Management Review (APMR).

1.6.21.4. Promotes safety and occupational health awareness (e.g., culture, environment and atmosphere) and enforce personal accountability. **(T-2)**

1.6.21.5. Promotes and supports Airmen participation in safety and health program activities.

1.6.21.6. Provides incentives to Airmen for participation in Airmen-led safety and health program activities. **(T-3)** Refer to AFI 65-601V1, *Budget Guidance and Procedures,* for guidance regarding promotional or incentive gifts and awards, including exceptions.

1.6.21.7. Develops and implements safety and health programs and risk management processes that integrate hazard reduction and safety policy into on and off-duty operations and activities. **(T-1)**

1.6.21.8. Serves as chairperson of the ESOHC. **(T-1)** Refer to AFI 90-801 for additional information and guidance.

1.6.21.9. Reviews interim control measures and establishes funding priorities for master hazard abatement projects. **(T-2)**

1.6.21.10. Ensures safety and occupational health program requirements and mishap prevention are part of the measurement of group/squadron commanders and senior civilian supervisory personnel's performance appraisals using guidance provided by AF/A1. **(T-0)**

1.6.21.11. Minimizes assigning full-time safety personnel additional duties not directly associated with duties described in 91-series directives and their supplements. **Note:** This expectation should be applied to all safety offices, installation or tenant.

1.6.21.12. Ensures functional managers and supervisors (rather than the safety staff) take actions to mitigate hazards and reduce risk. **(T-2)**

1.6.21.13. Integrates safety and occupational health into all operations and missions of the installation's organizations. **(T-1)**

1.6.21.14. Emphasizes risk management and personal accountability. **(T-2)**

1.6.21.15. Ensures the installation safety office has established written procedures to define how to support OSHA representative(s) during official installation visits or inquiries. These procedures will be approved by the installation commander. **(T-1)**

1.6.21.16. Publishes guidance informing command personnel of expectations for safety and occupational health. **(T-1)**

1.6.21.17. Ensures commanders, functional managers, and requirements generators work with their responsible contracting and safety office to ensure all contracts require contractors and subcontractors (e.g., contract aircraft maintenance and grounds maintenance) to provide a contractor safety and health plan (as required) to the contracting office. **(T-1)** Additionally, promptly reports pertinent facts regarding mishaps involving

government personnel or property incidental to work performed as part of the Statement of Work that occur on or off an Air Force installation IAW AFI 91-204. **(T-1)**

1.6.21.18. Provides adequate funding and support for safety and occupational health program (e.g., funding for required safety training). **(T-1)** See 29 CFR § 1960.7, *Financial Management.*

1.6.21.19. Ensures an APMR is accomplished by the safety office IAW this instruction to determine Air Force Safety Management System (AFSMS) effectiveness and to make necessary changes to the future program elements as a means of continual improvement. **(T-1)**

1.6.21.20. Ensures safety personnel are properly trained to the appropriate level for deployment prior to being deployed.

1.6.21.21. Will review the annual calendar year (CY) OSHA 300 and sign the OSHA Form 300A for the OSHA establishment code related to their organization and delineated in AFSAS, no later than 31 January each year for posting by 1 February. **(T-0)** This task may be delegated to the vice commander or executive director. **Note:** Tenant units on Air Force installations with full-time qualified safety personnel except those defined in paragraph **1.6.22.5** will be responsible for producing their own OSHA 300 and 300A to include posting of the form. Codify this responsibility in the related host/tenant support agreement. **(T-1)** At all joint bases, this responsibility will be codified in the formal Inter-Service Memorandum of Agreement (MOA). **(T-1)** Any tenant unit safety staff generating their own OSHA 300 and 300A will send a courtesy copy to the installation safety office**. (T-1)**

1.6.21.22. Serves as chairperson for OSHA visit meetings to the installation. **(T-2)** This may be delegated to the vice commander or Chief of Safety. Ensures proper coordination and is the final signature on official responses from the installation to OSHA. **(T-1)** The final signature may be delegated no lower than the vice commander.

1.6.21.23. Convenes safety investigations IAW AFI 91-204. **(T-1)** The commander may appoint all personnel in their safety office as Investigating Officers for Class C – E events, to be detailed to specific investigations by the Chief of Safety. Commander appointments should be in writing when possible.

1.6.21.24. Promotes a Just Culture which provides Airmen an environment where they can report hazards, near misses, work-related injuries, and illnesses without fear of reprisal. **(T-1)**

1.6.22. Installation Safety Office:

1.6.22.1. Oversees implementation of the mishap prevention program. **(T-2)**

1.6.22.2. Advises commanders, functional managers, supervisors, and employees on safety matters. **(T-1)**

1.6.22.3. Provides safety office member as an active participant of the FECA working group, if one is held at the installation. **(T-2)** Lends support to specific issues and assists with problem solving at other base meetings, e.g., Aerospace Medicine Council, Occupational and Environmental Health Working Group, Sports Council, etc.

1.6.22.4. Manages proactive on and off-duty safety programs, focusing on identifying and mitigating latent conditions, which are deficiencies within the organization or supervision negatively affecting job performance, hazards or mishap outcome. **(T-2)**

1.6.22.5. Conducts safety program assessments and inspections of their command subordinate units, both local and geographically separated. **(T-1)** Conducts the annual safety inspection of tenant units without a full time safety staff or as otherwise specified IAW Support Agreements. **(T-1)** The tenant unit inspection will include a validation of job safety training and documentation at least every two years. Tracks open findings and discrepancies until closure. **(T-1) Note:** Installation will not perform safety program assessments or inspections of tenant organizations with full-time safety staff, unless otherwise specified in host/tenant support agreement. **(T-1).** HAF, MAJCOM, AFOTEC, NAF and Center safety offices are not configured as a traditional safety office IAW the latest version of the Air Force Manpower Standard (AFMS) and are, therefore, treated as a tenant unit without an assigned safety staff. They will follow the installation program unless otherwise specified in a host/tenant support agreement. **(T-1)** Special consideration may be needed for Guard or Reserve safety offices with only traditional Guardsmen or Reservists.

1.6.22.6. Ensures appropriate assignment of OPRs or Offices of Collateral Responsibility for mishap recommendations and that they are notified and actively manage the recommendations through closure, providing status updates as outlined in AFI 91-204. **(T-1)**

1.6.22.7. Manages installation master hazard abatement program. Assigns RACs to safety hazards and coordinates with health and fire protection officials when required. **(T-1)**

1.6.22.8. Processes hazard reports and manages the hazard reporting process. **(T-1)**

1.6.22.9. Conducts safety education programs and provides assistance to supervisors in developing Job Safety Training Outlines (JSTOs) and Job Hazard Analyses (JHAs). Completes Part 4 of AF Form 1754, *Job Capability and Safety Analysis*, when submitted by Medical Treatment Facility (MTF). **(T-1)**

1.6.22.10. Reviews airfield waiver packages, to include airfield construction phasing/safety plans. **(T-2)**

1.6.22.11. Oversees Bird/Wildlife Aircraft Strike Hazard (BASH) programs in coordination with Airfield Manager, flying operations and civil engineering. **(T-1)**

1.6.22.12. Ensures mishaps are properly investigated and reported IAW AFI 91-204 and discipline specific manuals (e.g., AFMANs 91-221, 222, 223, 224). **Exception:** Tenant units with full-time safety staff will investigate and report mishaps for their unit. **(T-1)** Assigns safety office personnel to specific Class C-E mishap investigations when the commander has appointed those personnel as the investigating officer.

1.6.22.13. Ensures all personnel with access to privileged safety information receive annual training on the proper handling procedures and documents the training. **(T-1)** For those with AFSAS accounts, training may be recorded in their AFSAS Training Module.

1.6.22.14. Maintains a list of potential Safety Investigation Board (SIB) members who have completed the formal training requirements according to AFI 91-204 and discipline

specific manuals (e.g., AFMANs 91-221, 222, 223, 224), and provides a copy to MAJCOM/SE when requested, through the NAF or Center safety office, as applicable. In addition, maintains a list of potential medical consultants for SIBs such as Psychologists, Flight Surgeons, and Aerospace and Operational Physiologists (AOP)/Aerospace and Operational Physiology Technicians who have completed Aircraft Mishap Investigation and Prevention (AMIP), Aircraft Mishap Investigation Course (AMIC) or the Mishap Investigation Non-Aviation (MINA) course. **(T-2)**

1.6.22.15. Provides identified potential Interim Safety Board (ISB) and SIB members training annually on the basics of mishap investigation. **(T-1) Note:** This requirement is applicable to AFRC units who have identified individuals as potential ISB members or have established ISB support responsibilities through MOA/Memorandum of Understanding (MOU). This annual training is also required for Psychologists, Flight Surgeons, and Aerospace and Operational Physiologists/Aerospace and Operational Physiology Technicians, who have completed at least one of the following courses: AMIP, AMIC or MINA. **(T-1)**

1.6.22.16. Develops and coordinates the Mishap Response Plan, addressing all disciplines, in conjunction with Installation Emergency Manager for integration with the overall Installation Emergency Management Plan. **(T-1)** The plan will define roles, responsibilities and notification requirements for leadership and all involved agencies. **(T-1)** Reviews other emergency plans and procedures to include, but not limited to: SAFE HAVEN, SAFE PARKING, Hazardous Material (HAZMAT) and disaster response required by AFI 10-2501, *Air Force Emergency Management Program.* Ensures safety concerns, procedures, notification, etc., are addressed. The Installation Emergency Management Plan should include elements of and reference existing plans concerning the following (paragraph **13.5,** *Mishap Response*):

1.6.22.16.1. Disaster response required by AFI 10-2501.

1.6.22.16.2. HAZMAT response required by AFI 10-2501.

1.6.22.16.3. Response to aircraft in-flight and ground emergencies.

1.6.22.16.4. Response to severe weather watches and warnings.

1.6.22.16.5. Crash recovery plans.

1.6.22.16.6. Notifying and convening investigation boards.

1.6.22.16.7. Procedures for missing aircraft.

1.6.22.16.8. Procedures and training for extracting crewmembers from local and common transient aircraft.

1.6.22.17. Provides mishap prevention and education material to subordinate and tenant units. **(T-1)**

1.6.22.18. Accomplishes explosives siting requirements according to AFMAN 91-201, *Explosives Safety Standards*. Conducts review of base comprehensive plan map in conjunction with Civil Engineering (CE). **(T-1)**

1.6.22.19. Assists responsible commanders and supervisors to ensure plans, procedures, facility and equipment modifications/acquisitions, hardware, software and operations

receive a safety review based on RM and hazard elimination/mitigation. **Note:** Safety staff qualifications may preclude hardware and software safety reviews. **(T-2)**

1.6.22.20. Functions as the primary point of contact and process manager for all OSHA related activities. **(T-2)** This includes cross-functional management of all federal and state OSHA visits to the installation, OSHA requests for self-investigations/inspections, and recordkeeping responsibilities, to include Employees' Compensation Operations and Management Portal. Assigns roles to OSHA cross-functional representatives as needed, including tenant unit safety office when the OSHA event involves the tenant unit. **(T-2)** Upon request from OSHA, provide copies of AF Forms 978, *Supervisor's Preliminary Mishap/Incident Report*, and/or OSHA Rapid Response Reports. **(T-0)** Refer to paragraph **13.3,** *Federal/State Inspections of DoD Working Conditions and Mishap Investigations,* for additional information.

1.6.22.21. In collaboration with Bioenvironmental Engineering (BE), assists the contracting officer through the Multi-Functional Team (MFT) as needed to ensure that the contractor safety and health plan includes all required elements identified in the Performance-Based Work Statement. The contractor is directly responsible for complying with federal and state OSHA standards for its employees. **(T-1)**

1.6.22.22. Administers the Safety Awards Program IAW AFMAN 36-2806 to ensure proper recognition of personnel. **(T-2)**

1.6.22.23. Create annual program management review report. See paragraph **3.5** and paragraph **13.2,** *Annual Program Management Review,* of this instruction. **(T-1)**

1.6.22.24. Documents duties delegated among installation and tenants in a MOA or similar formal document, with tenant/joint base organizations' responsibilities spelled out. **(T-2)**

1.6.22.25. Employs the Occupational Safety Manager to act as initial Evaluating Agent during the 1S0X1 retraining evaluation process. Refer to paragraph **14.4**, 1*S0X1 Retrainee Evaluation Process.*

1.6.22.26. Supports installation planning and execution of Air Force Open Houses as described in AFI 10-1004, *Conducting Air Force Open Houses.* **(T-2)**

1.6.22.27. Installation safety offices may not impose installation command-unique requirements on tenant units unless specified in the applicable support agreement. Tenant USAF units without full-time safety authorizations receive the same safety services as installation subordinate units. (**Note:** HAF, MAJCOM, AFOTEC and NAF safety offices are not configured as a traditional safety office IAW latest AFMS and are, therefore, treated as a tenant unit without an assigned safety staff. They will follow the installation program unless otherwise specified in a host/tenant support agreement.) **(T-1)** Support Agreements will identify and delineate responsibilities. Non-USAF tenant units may be provided safety services based on support agreements IAW DoDI 4000.19, *Support Agreements,* and AFI 25-201, *Intra-Service, Intra-Agency, and Inter- Agency Support Agreements Procedures.* **Note:** Installations may require reimbursement for services provided.

1.6.23. Installation Contracting Office:

1.6.23.1. Directs implementation and provides resources to support the installation contracting role within the mishap prevention program. **(T-2)**

1.6.23.2. Ensures provisions for safety clauses are included in the contract solicitation IAW FAR/DFARS/AFFARS, including the Air Force Federal Acquisition Regulation Supplement Clause 5352.223-9001, *Health and Safety on Government Installations.* **(T-0)**

1.6.23.3. Ensures contractor's past performance in safety is a consideration during the selection process for those contractors whose employees are expected to work on a government installation(s) more than 1,000 hours per quarter (this may include a comparison of the contractor's three year total recordable incident rate and three year days away, restricted and/or transfer case incident rate to the most recently published Bureau of Labor Statistics national average for the specific National American Industry Classification System or other similar information). **(T-2)**

1.6.24. Installation Medical Wing/Group Commanders:

1.6.24.1. Direct implementation and provide resources to support the installation medical role within the mishap prevention program. **(T-1)**

1.6.24.2. Ensure comprehensive and coordinated occupational and environmental health surveillance and education programs are established and implemented. **(T-1)**

1.6.24.3. Ensure patient safety programs are developed and fully implemented in compliance with DoDM 6025.13-R, *Medical Quality Assurance (MQA) and Clinical Quality Management in the Military Health System (MHS)*, AFI 44-119, *Medical Quality Operations*, and appropriate civilian standards. **(T-0)**

1.6.24.4. Ensure timely notification to the installation safety office, or other safety office(s) per support agreements, for any injury producing events that occurred to military members (on-duty and off-duty), and DoD civilians on-duty IAW AFI 44-102, *Medical Care Management*. At a minimum, the following medical information will be released to fulfill requirements for OSHA injury reporting as defined in 29 CFR Part 1904:

1.6.24.4.1. Name of the injured individual. **(T-0)**

1.6.24.4.2. Organization. **(T-0)**

1.6.24.4.3. Date of injury. **(T-0)**

1.6.24.4.4. Date of treatment. **(T-0)**

1.6.24.4.5. Diagnosis of injury, a brief description of the nature of the injury. (Use latest version of International Classification of Disease codes). **(T-0)**

1.6.24.4.6. Severity of injury, whether the treatment given was greater than first aid (as defined by 29 CFR 1904.7 (b) (5) (i)), if the individual was placed on quarters (and how long) and if the individual was hospitalized and the estimated hospital duration **(T-0)**

1.6.24.5. Consistent with AFI 41-200, *Health Insurance Portability and Accountability Act (HIPAA)*, medical information will be released to safety personnel for military members treated in the MTF for on-duty or off-duty injuries, and for civilian members treated in the MTF for on-duty injuries. **(T-0)**

1.6.24.6. When the MTF discovers that injured individuals (military on-duty or off-duty and civilian on-duty) are seen at a civilian hospital or clinic, as much injury information

listed above that is obtained will be reported to safety. **(T-0)** IAW DoDM 6025.18, *Implementation of the Health Insurance Portability and Accountability Act (HIPAA) Privacy Rule in DoD Health Care Programs*, all disclosures to the safety office must be documented by the MTF and kept by the MTF for a period of six years. **(T-0)**

1.6.24.7. MTF Covered Entities should develop local policy in coordination with their assigned Medical Law Consultant.

1.6.24.8. Ensure occupational illnesses are thoroughly investigated and reported using the Occupational Illness Module and AFSAS. **(T-1)**

1.6.24.9. As applicable, ensures the Bioenvironmental Engineer or Public Health officer, attends all federal/state official in-briefs and out-briefs, accompanies officials during all health-related inspections/investigations.

1.6.24.10. The Chief of Aerospace Medicine (SGP) or Occupational Medicine physician:

1.6.24.10.1. Provides oversight for the occupational health program and ensures medically appropriate risk assessment and medical surveillance activities are conducted IAW AFI 48-101, *Aerospace Medicine Enterprise*, AFI 48-145, *Occupational and Environmental Health Program*, DoD 6055.05-M, *Occupational Medical Examinations and Surveillance Manual*, and 5 CFR Part 339, *Medical Qualification Determinations.* **(T-0)**

1.6.24.10.2. Provides consultative services on occupational and environmental health and safety issues that affect the framework of the AFSMS. **(T-2)**

1.6.24.10.3. Provides urgent clinical services for occupational injuries and occupational illnesses in DoD civilian employees. Performs routine surveillance, periodic evaluation, fitness for duty evaluations, pre-placement evaluations and disability evaluations IAW AFI 48-101, AFI 48-145, DoD 6055.05-M and 5 CFR Part 339. **(T-0)**

1.6.24.10.4. Maintains a list of Flight Surgeons who are potential medical officers on ISBs or SIBs and track the dates of the AMIP training and previous SIB experience. **(T-1)** In addition, tracks Psychologists, and Aerospace and Operational Physiologists/Aerospace and Operational Physiology Technicians, who have completed AMIP, AMIC, MINA or Aviation Safety Program Management (ASPM) courses. Provides a list to installation Chief of Safety, MAJCOM/SGP, and appropriate agencies. **(T-1)** Ensures Flight Surgeons, trained Psychologists, Aerospace and Operational Physiologists, and Aerospace and Operational Physiology Technicians are trained annually on the basics of mishap investigation and privilege by the installation safety staff or flight safety officer (FSO). **(T-2)**

1.6.24.10.5. Attends the FECA Working Group, if one is held at the installation. Medical participation in FECA program will be IAW DoDI 1400.25-V810, *DoD Civilian Personnel Management System: Injury Compensation.* Participates in military and civilian lost work/duty time initiatives. **(T-1)**

1.6.24.10.6. Accomplishes additional occupational health and safety responsibilities as delineated in AFI 48-101. **(T-2)**

1.6.24.11. Flight Surgeons/Aerospace and Operational Physiologists (AOP)/ Aerospace and Operational Physiologists Technicians.

1.6.24.11.1. Direct implementation and provide resources to support the installation medical role within the mishap prevention program. **(T-2)**

1.6.24.11.2. Provide human performance and human factors analysis on identified hazards and evaluate controls to reduce or mitigate risks. **(T-2)**

1.6.24.11.3. Support the wing's aircrew flight equipment and flying safety programs. **(T-2)**

1.6.24.11.4. Assist in targeted occupational safety improvements, training of safety staff and unit safety representatives in human factors and human factors hazard mitigation strategies. **(T-1)** Provide consultant services for safety activities and investigations. **(T-1)**

1.6.24.11.5. Support wing RM, crew resource management, and maintenance resource management programs to optimize war fighter performance and safety in the operational environment. **(T-2)**

1.6.24.11.6. Act as Human Systems Integration consultants for aircraft, space, weapons and Warfare Centers at the wing level. **(T-2)**

1.6.24.11.7. Provide ISB/SIB members for military mishaps IAW AFI 91-204 and its related AF Manuals. **(T-1)**

1.6.24.12. Bioenvironmental Engineering (BE):

1.6.24.12.1. Manages the occupational and environmental health surveillance programs IAW AFI 48-145 and AFMAN 48-146, *Occupational and Environmental Health Program Management*. Identify health-related deficiencies and assign health-related RACs. **(T-1)**

1.6.24.12.2. Conducts occupational and environmental health evaluations and health risk assessments of workplaces, maintains survey reports, as required (IAW DoDI 6055.05, *Occupational and Environmental Health*), and provides access to all documents at request by the employee, supervisor or union representative as permitted by governance such as the Privacy Act, Freedom of Information Act, etc. **(T-0)**

1.6.24.12.3. Performs health risk assessments and notifies the applicable safety office of assigned health RACs 1-3. **(T-1)**

1.6.24.12.4. Maintains access to pertinent health-related OSHA standards/ guidelines, Air Force requirements, and other OSHA guidelines pertaining to occupational health. **(T-0)**

1.6.24.12.5. Attends all federal/state official (Federal OSHA, State OSHA, NIOSH, Environmental Protection Agency, etc.) in-briefs and out-briefs, accompanies inspectors during all health-related inspections/investigations. As applicable, the Bioenvironmental Engineer, provides occupational health subject matter expertise consultation to a unit receiving a OSHA Notice of Unsafe or Unhealthful Working Conditions. **(T-2)**

1.6.24.12.6. Determines the need for and adequacy of occupational health-related personal protective equipment (PPE), engineering controls, substitution and administrative controls to reduce exposures. **(T-1)**

1.6.24.12.7. Maintains the ability to provide Safety Data Sheets upon request for all hazardous materials used in the industrial workplaces on the installation. **(T-1)**

1.6.24.12.8. Provides radiological protection program management as the installation radiation safety officer, when appointed, IAW AFI 48-148, *Ionizing Radiation Protection.* **(T-1)**

1.6.24.12.9. As needed, provides a representative to the FECA Working Group to offer BE-rated expertise. **(T-2) Note:** At non-collocated AFRC installations BE is the full-time BE/Public Health Office that is aligned under the Mission Support Group. At collocated AFRC Wings/Groups, where regular Air Force is host and AFRC units are tenant, BE is aligned under the regular Air Force Military Treatment Facility (MTF). A Host/Tenant Support Agreement between the regular Air Force installation and AFRC tenant shall outline support provided by the regular Air Force BE Flight to AFRC units.

1.6.24.12.10. Identifies and manages health-related RACs using the Defense Occupational and Environmental Health Readiness System while also meeting the requirements of the installation master hazard abatement plan process procedures. **(T-1)**

1.6.24.13. Public Health:

1.6.24.13.1. Communicates occupational health education requirements and available resources to supervisors. Responsible as the initial point of contact for occupational medical monitoring. **(T-1)**

1.6.24.13.2. Reports cases of occupational illness to the installation occupational safety office through AFSAS. **(T-1)**

1.6.24.13.3. Investigates and reports occupational illness IAW AFI 91-204. **(T-1)**

1.6.24.13.4. Provides a representative to actively participate in the FECA working group (if one exists) and the ESOHC to provide consultation on epidemiology, occupational illnesses, and other occupational health program areas. **(T-1)**

1.6.24.13.5. Attends all federal/state official in-briefs and out-briefs, accompanies officials during all health-related inspections/investigations. As applicable, the Public Health officer provides occupational health subject matter expertise consultation to a unit receiving a OSHA Notice of Unsafe or Unhealthful Working Conditions. **(T-2)**

1.6.24.14. Psychologists who are AMIP, AMIC or ASPM trained or have completed a post-doctoral fellowship in operational psychology will work in conjunction with Flight Surgeons to provide consultant services on human factors investigations and analysis of military aircraft mishaps. **(T-2)**

1.6.25. Installation Civil Engineer:

1.6.25.1. Directs implementation and provides resources in support of the civil engineering role within the mishap prevention program. **(T-1)**

1.6.25.2. Provides cost data and status information on hazard abatement actions associated with real property facilities and real property installed equipment. **(T-2)** Coordinates corrective actions with the applicable installation and/or tenant unit safety office. **(T-2)**

1.6.25.3. Coordinates siting and construction plans with the installation safety office and ensure explosives site plans have been approved before beginning construction as required in AFMAN 91-201. **(T-1)**

1.6.25.4. Ensures an environmental review and coordinates new construction, facility modification projects or work request documents with installation safety, fire protection, environmental management, and BE offices. **(T-2)** Also, ensures they are included in associated project approval, design review meetings and acceptance inspections. **(T-2)**

1.6.25.5. Notifies safety, environmental management, BE and fire protection offices of major base maintenance projects, e.g., digging permits, road markings, welding projects outside the CE shops. **(T-2)**

1.6.25.6. Ensures RACs are incorporated into project prioritization for corrective actions. **(T-2)**

1.6.25.7. Coordinates airfield waiver packages with airfield manager, installation or applicable safety office, and installation commander. **(T-2)**

1.6.25.8. Performs fire investigations IAW DoDI 6055.07 and AFI 91-204. **(T-0)**

1.6.25.9. Provides traffic engineering expertise. **(T-2)**

1.6.25.10. Teams with the MFT to ensure contractor operations are compliant with safety and health requirements of the contract. **(T-2)**

1.6.25.11. Provides a foundation informational map and facility data (common installation picture and real property inventory) for safety offices to apply and publish their unique map(s). Any changes to common installation picture or real property inventory data must be coordinated with the installation safety office. **(T-1)**

1.6.25.12. Attends all federal/state official in-briefs and out-briefs, accompanies officials during all fire-related inspections/investigations. As applicable, the Fire Department provides subject matter expertise consultation to a unit receiving a OSHA Notice of Unsafe or Unhealthful Working Conditions. **(T-2)**

1.6.26. Installation Security Forces Commander.

1.6.26.1. Directs implementation and provides resources to support the security forces role within mishap prevention program. **(T-1)**

1.6.26.2. Provides the Chief of Safety and/or Occupational Safety Manager (OSM) a copy of Security Forces (SF) blotter entries involving injury or death resulting from a mishap, motor vehicle mishaps (government or private motor vehicle), property damage as a result of a mishap, and any others as deemed appropriate by the SF commander. **(T-1)** Provides completed investigation reports when requested by the Chief of Safety or OSM. Blotter entries may be retrieved electronically or through the appropriate SF office after they have been processed.

1.6.26.3. Notifies command post of all safety related issues as determined in a locally devised installation notification matrix. **(T-1)**

1.6.26.4. Upon request from Chief of Safety or occupational safety (installation or tenant unit), coordinates with local or state law enforcement to obtain off-base traffic accident reports and/or data. **(T-1)**

1.6.26.4.1. Traffic accident reports may include vehicle accident involving death or serious injury to a military member, DoD civilian or dependent of regular Air Force member.

1.6.26.4.2. Traffic accident data may include areas which are identified as high traffic incident areas or areas which travel is deemed unsafe (as deemed by the installation commander) under certain conditions.

1.6.27. Commanders other than the installation commander:

1.6.27.1. Direct implementation and provide resources for the mishap prevention program. **(T-1)**

1.6.27.2. Implement a safety and health program in their unit or area of responsibility. Where commanders are not authorized full-time safety personnel, they will appoint a primary and alternate Unit Safety Representative (USR) to assist them in implementing their safety program. **(T-1)** Notify the installation safety office, in writing, of the appointment of USRs in order to schedule USRs for training. **(T-1)**

1.6.27.3. Ensure safety and health training, to include risk management, is provided to all personnel based on requirements from regulatory guidance, and the specific needs of the organization. **(T-1)**

1.6.27.4. Implement and use RM principles at all levels within the unit. **(T-2)**

1.6.27.5. Ensure a proactive mishap prevention program is implemented to include procurement and proper use of PPE, and facility compliance with AFOSH guidance and OSHA standards. **Note:** Overseas installations will also need to consider host nation standards. **(T-0)**

1.6.27.6. Ensure hazard abatement actions needed to control identified hazards are implemented and follow-up actions are complete. Update fire, safety and BE offices, as appropriate, on abatement actions every 180 days until the hazard(s) is abated. **(T-1)**

1.6.27.7. Ensure request for equipment, products and services using purchase orders and/or Government Purchase Card are reviewed for potential safety and health impact IAW AFI 64-117, *Air Force Government-Wide Purchase Card (GPC) Program*, and AFI 32-7086, *Hazardous Materials Management*. **Note:** Ensure government purchase card program addresses requirement to coordinate purchase of hazardous chemicals, munitions and industry equipment through the installation safety office. **(T-2)**

1.6.27.8. Establish a management strategy integrating safety and health into all operations and missions and ensure functional managers and supervisors take actions to mitigate hazards and reduce risk. **(T-1)**

1.6.27.9. Ensure all personnel are briefed on the findings and recommendations contained in occupational and environmental health risk assessments and reports. **(T-0)** A copy of the

survey report will be posted in a conspicuous location in the workplace for a period of 10 days after receipt to allow all employees free access to the findings. **(T-0)** These reports will be maintained on file in the workplace for a minimum of two years. **(T-0)**

1.6.27.10. Provide the opportunity for Airmen to participate in safety and health program activities and/or committees. **(T-1)**

1.6.27.11. Communicate safety and health expectations to personnel in their command and hold them accountable for compliance with applicable standards. **(T-1)**

1.6.27.12. Encouraged to establish an off-duty High Risk Activities Program to ensure personnel participating or planning to participate in high-risk activities take appropriate safety measures to reduce the likelihood of their involvement in a mishap. High risk activities are defined in **Attachment 1,** while paragraph **15.4,** *Air Force Off-Duty High Risk Activities Program,* contains sample guidance for those units that may adopt the optional program. **Note:** MAJCOMs can define their own list of high risk activities. Briefings may be documented on AF Form 4391, *High Risk Activities Worksheet.* If commanders or supervisors at any level choose to make this program mandatory it will apply only to regular Air Force personnel.

1.6.27.13. Appoint Motorcycle Safety Representatives IAW AFI 91-207, *The US Air Force Traffic Safety Program*. **(T-1)**

1.6.27.14. Should ensure their safety office, if authorized one, accomplishes an APMR IAW this instruction.

1.6.27.15. Ensure applicable OSH guidance for the workplace and operations are available to personnel. **(T-2)**

1.6.27.16. Ensure their unit complies with the installation safety office procedures for OSHA related events on the installation. **(T-2)**

1.6.27.17. Ensure representation at all unit/organization related federal/state official in-briefs and out-briefs, during all inspections/investigations. Ensure a unit receiving an OSHA Notice of Unsafe or Unhealthful Working Conditions consults with the applicable subject matter expert and crafts any related correspondence to OSHA in preparation for the Installation Commander's endorsement and release.

1.6.27.18. Commanders of Operational Units.

1.6.27.18.1. Support, as appropriate, participation in SSGs and SSWG meetings to identify risks and hazards.

1.6.27.18.2. Coordinate issues affection System Safety with the MAJCOM Representatives, the Program Office, the System Safety Group, and AFSEC as appropriate.

1.6.27.18.3. Ensure the unit risk management effort uses Program Manager's System Safety hazard information in its risk assessments, as appropriate.

1.6.28. Work Center/Shop Supervisors:

1.6.28.1. Direct implementation and provide resources for the mishap prevention program **(T-0)**

1.6.28.2. Understand and enforce the safety and health standards that apply to their areas, operations and operations involving their subordinates. **(T-0)** Demonstrate knowledge of their roles and responsibilities with relation to risk management and mishap prevention. **(T-0)**

1.6.28.3. Shall not require personnel to work in environments and conditions hazardous to their safety or health without first providing adequate elimination, substitution, engineering controls, administrative controls, and/or PPE. **(T-0)**

1.6.28.4. Shall provide safe working conditions by:

1.6.28.4.1. Ensuring required guards, interlocks, enclosures, other protective equipment and tools are provided, used, properly maintained, and inspected daily prior to use. **(T-0)**

1.6.28.4.2. Providing required safety related training. **(T-0)**

1.6.28.4.3. Providing proper required PPE. **(T-0)**

1.6.28.4.4. Exercising control over job tasks to ensure personnel follow all precautions and safety measures, including the proper use of PPE. **(T-0)**

1.6.28.4.5. Taking immediate action to correct any violation of safety rules observed or reported to them. **(T-0)**

1.6.28.4.6. Ensuring actions are taken to promptly eliminate hazards and correct deficiencies, and ensure any hazards identified by an AF Form 1118, *Notice of Hazard*, are added to the JSTO and employees are trained on the interim control measures and documented IAW paragraph **14.1,** *Job Safety Training Outline (JSTO).* **(T-1)**

1.6.28.5. Use risk management techniques to analyze work environment and job tasks for hazards. Conduct a Deliberate Risk Assessment or JHA of job tasks as required to determine potential hazards for each work task. It shall be accomplished when new equipment is installed, equipment is modified/relocated or new procedures are implemented in critical or hazardous operations **(T-1)** Refer to paragraph **13.6,** *Job Hazard Analysis (JHA)*, for additional guidance.

1.6.28.6. Ensure employees exposed or potentially exposed to hazardous chemicals or materials are trained on the hazards of those chemicals and materials per AFI 90-821, *Hazard Communication*, including information from the Safety Data Sheet for each chemical or material used. **(T-0)** BE and installation occupational safety office shall be consulted for selection of PPE. In addition, ensure work center/shop is authorized to be used IAW AFI 32-7086. **(T-0)**

1.6.28.7. Develop a work center-specific JSTO based on paragraph **14.1** on safety, fire protection/prevention and health requirements. **(T-0)** Documents will be maintained and centrally located, readily available to supervisor and individual. **(T-0)** The mandatory items can be documented as one item, i.e., course code for JSTO mandatory training. Job specific items and any additional training identified in a BE survey will be documented individually, as appropriate. **(T-0)**

1.6.28.7.1. Methods of documentation may include, but are not limited to, the AF Form 55, *Employee Safety and Health Record*, electronic mediums such as AFFORMs/MAF

LOG C2/G081 or locally developed products. If the AF Form 55 is mandated for use as the training documentation device, the entity that mandated the form usage will prescribe the requirement in writing to include entries that require signatures, e.g., HAZCOM, respirator, powered industrial trucks, lockout/tagout, fall protection, confined spaces, radiation safety, laser safety, etc. **(T-0) Note:** Training requirements vary, i.e., some documents may require the signature of the supervisor or the person who conducted the training, while other documents may require the initials of the individual (trainee) and trainer/supervisor.

1.6.28.7.2. Documentation will contain the following minimum data: trainee name (last, first, middle initial), type of training and date of training. **(T-1)** Neither the trainer nor trainee signature is required unless specified in writing by the applicable chain of authority. **Note:** If the Maintenance Information System cannot support minimum documentation requirements, then it is not suitable as a documentation product.

1.6.28.8. Provide and document work area specific safety, fire protection and health OJT to all DoD employees and volunteers before assigning them duty tasks requiring this training. **(T-0)** This includes OSHA, AFOSH directives, AFPDs, AFIs, AFMANs, etc. Review JSTO annually, update and retrain employees when new tasks or equipment are added, or when existing tasks change, whichever comes first. **(T-0)**

1.6.28.8.1. The home station supervisor shall ensure a copy of the documented training is sent with the deploying personnel and the deployed supervisor shall collect the documentation from the deployed individual. **(T-1)**

1.6.28.8.2. Ensure subordinates receive a safety briefing from the temporary duty (TDY) locations safety staff on known hazards associated with TDY locations. **(T-1)** Provide and document job safety training at the TDY locations as specified in paragraph **1.6.28.13** **(T-1)** The TDY supervisor will ensure the individual is provided a copy of the documented training to return to the home station supervisor. **(T-1)**

1.6.28.9. Planned workloads will be assigned to qualified employees ensuring they understand the work to be completed along with the potential hazards and abatement for those hazards. **(T-0)**

1.6.28.10. Report all mishaps that occur on-duty and all off-duty mishaps involving assigned military personnel, and related subsequent Airmen absences to the supporting safety office IAW AFI 91-204**. (T-0)** The AF Form 978 will be used to document Ground, Motor Vehicle and Afloat mishaps to the Unit Commander and the Installation Safety Office. **(T-1)** Use of the AF Form 978 for mishap reporting within the Aviation, Weapons, and Space disciplines is optional. For appropriated and Non-Appropriated Fund Air Force employee occupational injuries and illnesses, supervisors will complete the required Compensation Act/Longshore (CA/LS) forms IAW the servicing civilian personnel office or Non-Appropriated Fund Human Resources Office processes. **(T-0)**

1.6.28.11. Ensure AF Form 1118 issued by qualified safety, fire protection or BE officials is posted to alert personnel to the hazardous conditions and interim control measures. **(T-1)**

1.6.28.12. Accomplish Air Force Supervisor Safety Training. **(T-1)**

1.6.28.12.1. Attend Supervisor Safety Training course as scheduled by applicable safety office. **(T-1)**

1.6.28.12.2. Prior to attending, supervisors will complete the Supervisor Safety Training computer-based training located on Air Force Distributed Learning Service (ADLS) and bring their completion certificate to the classroom portion of the course. **(T-1)**

1.6.28.13. Consider providing an interactive pre-departure safety briefing to all active duty regular Air Force military personnel, reserve component personnel in a duty status and civilian personnel performing official duties scheduled for travel outside the local area. Refer to paragraph **15.3,** *Pre-Departure Travel Safety (Examples Only)*, for recommended guidance.

1.6.28.14. Conduct and document monthly spot inspections of their work areas IAW paragraph **3.7** of this instruction. **(T-1)**

1.6.28.15. Upon notification that a military employee is pregnant, direct the employee to report to Public Health immediately in order to ensure they receive appropriate education. **(T-1)**

1.6.28.15.1. Ensure a workplace evaluation is scheduled and completed. **(T-1)**

1.6.28.15.2. Advise pregnant civilian employees of the same opportunities so they may choose to take advantage of the program, if desired. **(T-1)**

1.6.28.16. Provide employees an environment where they can report work-related injuries and illnesses without fear of reprisal. **(T-0)**

1.6.28.17. Will encourage and support employee participation in safety and health program activities and/or committees. **(T-1).**

1.6.28.18. Ensure personnel requiring occupational health medical examinations attend scheduled medical appointments. **(T-0)**

1.6.28.19. Ensure safety program requirements are part of measurement of non-supervisory personnel's performance appraisals using guidance provided by AF/A1. **(T-1)**

1.6.28.20. Ensure applicable OSH guidance for the workplace and operations are available to personnel. **(T-1)** Supervisors at Outside Continental United States locations shall ensure applicable host-nation safety guidance is available. **(T-1) Note:** Electronic or paper products are acceptable.

1.6.28.21. Complete an OSHA Rapid Response Report when requested by safety staff and return to safety office by their suspense date. **(T-1)** See paragraph **13.3**

1.6.28.22. When delegated by unit commander, attends all work center related federal/state official in-briefs and out-briefs, accompanies officials during all inspections/investigations and ensures a work center receiving a OSHA Notice of Unsafe or Unhealthful Working Conditions crafts any related correspondence to OSHA in preparation for the installation Commander's endorsement and release. **(T-1) Note:** Also, when delegated by unit commander, ensures a work center receiving a OSHA Notice of Unsafe or Unhealthful Working Conditions consults with applicable subject matter expert(s). **(T-1)**

1.6.29. Airmen. An all-encompassing term used to indicate all Department of the Air Force members, both uniformed military and DoD civilian employees working for the Air Force. Airmen shall:

1.6.29.1. Comply with all occupational safety and health instructions, guidance, technical orders, job guides and operating procedures. **(T-0)**

1.6.29.2. Apply RM principles in both on-duty and off-duty activities to enhance the safety and well-being of themselves and other personnel. **(T-1)**

1.6.29.3. Assess personal safety and the safety of surrounding employees while performing assigned tasks as well as off-duty activities. **(T-0)**

1.6.29.4. Identify and report hazardous conditions that place personnel or property at risk to supervision, facility manager, USR, or safety office, without fear of coercion, discrimination or reprisal. **(T-0)** Use the AF Form 457, *USAF Hazard Report*, or Airman Safety Action Program, as appropriate. **(T-1)**

1.6.29.5. Promptly report personal injury, property damage, near misses and any suspected exposure to biological, chemical or nuclear hazardous materials to their supervisor without fear of coercion, discrimination or reprisal, i.e., occupational illness and on-duty injury to DoD military and civilian personnel, and off-duty injury to DoD military personnel. **(T-1)**

1.6.29.6. Immediately report to their supervisor if they believe that they have a physical or mental condition that they feel may impact safe job performance. **(T-1)**

1.6.29.7. Use prescribed PPE for job tasks to include inspecting and maintaining it IAW applicable guidance. **(T-0)**

1.6.29.8. Ensure required guards, interlocks, and enclosures are in place and properly used. **(T-1)**

1.6.29.9. Comply with required medical surveillance examinations. **(T-1)**

1.6.29.10. Military members will immediately notify their primary care managers of a known pregnancy and make an appointment with Public Health to initiate a workplace evaluation for exposures that may be hazardous to the fetus and determination of work restrictions. **(T-1)**

1.6.29.10.1. Government civilian employees are encouraged to notify their supervisor of a known pregnancy and to make an appointment with Public Health for a workplace evaluation, but are not required to do so.

1.6.29.10.2. Any employee with questions regarding how their worksite exposures can affect immediate family members (e.g., spouse, children) should contact Public Health.

1.6.29.11. DoD personnel must be protected from coercion, discrimination, or reprisals for participation in the safety and occupational health program IAW DoDI 6055.01. **(T-0)**

1.6.29.12. Use official on-duty time to take part in safety activities. **(T-1)**

1.6.29.13. Hand-carry or electronically transfer safety training documentation, provided by their supervisor, to the new supervisor when deploying or transferring to another government position/location. **(T-1) Note:** Upon separation or retirement from

government service the employee is entitled to copies of their safety training documentation.

1.6.29.14. Refer to this chapter and **Chapters 2,** *Safety Organization,* **3,** *Safety Assurance,* **4,** *Hazard Identification, Reporting and Abatement,* **5,** *Information and Data Analysis,* **13,** *Supporting Guidance,* **14,** *Safety Training,* and **15,** *Miscellaneous Safety Information,* for additional guidance.

1.6.30. The Air Force Civil Engineering Center (AFCEC):

1.6.30.1. Ensures agency/center support for occupational safety and health-related events. **(T-1)**

1.6.30.2. Ensures Air Force fire, and safety policies meet, exceed or receive proper waiver, deviation, or exemption authority, as applicable, to federal regulatory standards, MIL-STD 3007G, *Standard Practice Unified Facilities Criteria, Facilities Criteria and Unified Facilities Guide Specifications,* DoD Unified Facility Criteria (**www.wbdg.org**), National Fire Protection Association, and/or other applicable agency requirements. **(T-0)**

1.6.30.3. Coordinates on installation-level proposed responses related to occupational safety and health events. **(T-1)**

1.6.30.4. Adopts national consensus standards and develops impending guidance for standards developed by consensus code/standard bodies such as the International Code Council and the National Fire Protection Association.

1.6.31. Headquarters, United States Air Force, The Air Force Judge Advocate (AF/JA), primarily through the Air Force Safety Center Legal Office (AFSEC/JA) and the Air Force Legal Operations Agency Environmental Law and Litigation Division (AFLOA/JACE):

1.6.31.1. Ensures Air Force guidance meets or exceeds OSHA and other applicable agency requirements.

1.6.31.2. Ensures Air Force correspondence to agencies such as OSHA are in compliance with established legal and regulatory requirements.

1.6.32. Installation Legal Office. Ensure a legal representative attends all federal/state official out-briefs, and reviews all correspondence to OSHA for installation Commander's endorsement and release after full coordination as specified within this instruction. **(T-1)** The installation safety office may request a legal representative to attend in-briefs, as needed.

1.6.33. Acquisition and Sustainment Program Managers. The designated acquisition individual (per DoDD 5000.01, *The Defense Acquisition System*) with responsibility for and authority to accomplish program objectives for development, production, and sustainment to meet the user's operational needs. This term is used interchangeably with Program Manager. Refer to this chapter and **Chapter 11,** *System Safety and Safety Risk Assessments,* for additional guidance.

1.6.34. Additional Duty Flight Safety Officer. Additional duty flight safety officers are assigned to the AEW/AEG safety offices. They are responsible for managing the flight safety program for the expeditionary wing. Refer to this chapter and **Chapters 2,** *Safety Organization,* **3,** *Safety Assurance,* **6,** *Deployment and Contingency Safety,* and **7,** *Aviation Safety,* for additional guidance.

1.6.35. Additional Duty Weapons Safety Representative (ADWSR). A person assigned to a unit who is responsible for the additional duties that may include explosives safety, missile safety, nuclear surety and directed energy safety. The ADWSR coordinates with the installation safety office on these matters. Refer to this **Chapters 2**, **3**, **6** and **9,** *Weapons Safety,* for additional guidance.

1.6.36. Career Field Manager. The chief master sergeant at Headquarters, Air Force Safety Center, is responsible for organizing and managing the Safety career field. They will use the Enlisted Development Team (EDT) to execute the progression, succession planning to ensure there are sufficient personnel, and skill sets available to accomplish the mission. Refer to **Chapter 2** for additional guidance.

1.6.37. Career Safety Professional. Career safety professionals include all Air Force enlisted safety career field personnel holding the Air Force Specialty Code (AFSC) of 1S0 and those civilians in the safety career field GS-0018, Occupational Safety and Health Manager or Specialist; GS-0019, Safety Technician; GS-0017, Weapons Safety Manager or Specialist; GS-1815, Air Safety Investigator; and GS-0803, Safety Engineer. Refer to this chapter and **Chapters 2**, **3**, **5**, **7**, **8,** *Occupational Safety,* and **14.**

1.6.38. Chief of Safety (COS). The COS (or Director in a civilian-led unit or MAJCOM/FOA/DRU) manages the commander's safety program, which may include flight, occupational, space, system and weapons safety disciplines. Refer to this chapter and **Chapters 2** – **4**, **6** – **9**, **10,** *Space Safety,* **11, 12,** *Contract Safety,* and **14** for additional guidance.

1.6.39. Commander. Commanders hold the authority and responsibility to act and to lead their units to accomplish the mission. They can hold positions at the MAJCOM/DRU/FOA/NAF/Center/Directors, wing, group and squadron levels. Commanders must apply good risk management, accept risk and manage resources to adjust the timing, quality and quantity of their support to meet the requirements of the supported commander. They provide leadership emphasis to all safety disciplines. Refer to this chapter and **Chapters 2** – **15** for additional guidance.

1.6.40. Component Acquisition Executive. A Component Acquisition Executive (CAE) is a single official within a DoD component that is responsible for all acquisition functions within that component. This individual serves as the risk decision authority for high risks. This term is interchangeable with Service Acquisition Executive. Refer to this chapter and **Chapter 11** for additional guidance.

1.6.41. Employee. The term Employee applies to all DoD civilian and military personnel, and Department of the Air Force military personnel. This may also include Personal Services Contractors (defined in **Attachment 1,** Terms. Refer to this chapter and **Chapters 1**, **3**, **4**, **8**, **12**, **14** and **15** for additional guidance.

1.6.42. Enlisted Development Team (EDT). This team will vector the 1S0 career field. They will provide recommendations for training, education and experience requirements for the most critical safety duty positions. Refer to **Chapter 2** for additional guidance.

1.6.43. Flight Safety Manager (FSM). FSMs are civilians assigned to perform flight safety officer duties. They manage flight safety programs for the Director/Chief of Safety and the commander. Refer to this chapter and **Chapters 2**, **3** and **7** for additional guidance.

1.6.44. Flight Safety Non-Commissioned Officer (FSNCO). Full-time FSNCOs are assigned to positions authorized by the Unit Manning Document. Their primary duty will focus on aviation maintenance safety. Refer to **Chapters 2**, **3** and **7** for additional guidance.

1.6.45. Flight Safety Officer (FSO). Full-time FSOs are assigned to positions authorized by the Unit Manning Document at the wing level or above. They are responsible for managing the flight safety program for the Chief of Safety and the commander. Refer to this chapter and **Chapters 2**, **3**, **7** and **13** for additional guidance.

1.6.46. Milestone Decision Authority. - The designated individual (per DODD 5000.01) with overall responsibility for a program. The MDA has the authority to approve entry of an acquisition program into the next phase of the acquisition process and is accountable for cost, schedule, and performance reporting to higher authority, including Congressional reporting. Refer to **Chapter 11** for additional guidance.

1.6.47. Non-typical Safety Staffs. Since their duties and responsibilities are those of the senior safety advisor within their organization, they will report to their commander/director as they manage the commander's mishap prevention program. Refer to **Chapter 2** for additional guidance.

1.6.48. Occupational Safety Manager (OSM). The OSM manages the occupational safety program for the Director/Chief of Safety and the commander (e.g., installation, center, NAF/MAJCOM/FOA/DRU commanders). Refer to this chapter and **Chapters 2** – **6**, **8** and **12** – **14.**

1.6.49. Program Manager. - The designated acquisition individual with responsibility for and authority to accomplish program objectives for development, production, and sustainment to meet the user's operational needs. This term is used interchangeably with Acquisition and Sustainment Program Manager. Refer to this chapter, and **Chapters 11** and **13** for additional guidance.

1.6.50. Safety Staff. Assigned safety professionals that are qualified to perform safety discipline duties. Qualified safety professional's work in the safety office and manage the commander's safety program. They ensure Air Force units understand and comply with all safety requirements and standards. All safety disciplines will oversee the implementation of the mishap prevention program. Refer to this chapter and **Chapters 2** – **14** for additional guidance.

1.6.51. Satellite Anomaly Resolution Team. Group established to resolve a spacecraft anomaly with the primary purpose of returning an on-orbit satellite to operations. Refer to **Chapter 10** for additional guidance.

1.6.52. Service Acquisition Executive. Service Acquisition Executive (SAE) is a single official within a DoD service that is responsible for all acquisition functions within that service. This individual serves as the risk decision authority for high risks. This term is interchangeable with Component Acquisition Executive. Refer to this chapter and **Chapter 11** for additional guidance.

1.6.53. Space Safety Manager. Personnel assigned to a space mishap prevention or mishap investigation role. Refer to **Chapters 2** and **10** for additional guidance.

1.6.54. Squadron Assigned Flight Safety Officer. Squadron assigned FSOs are assigned to flying squadrons that do not have full-time positions by the Unit Manning Document. The primary duty of the squadron-level FSO is to manage the squadron's internal flight safety program as directed by the squadron commander. Refer to this chapter and **Chapters 2**, **3** and **7** for additional guidance.

1.6.55. Supervisor. Supervisors whether officer, civilian or enlisted have a specific responsibility to ensure assigned members comply with safety guidance and standards in this instruction and correct them when they deviate. Refer to this chapter and **Chapters 1** – **9** and **12** – **15** for additional guidance.

1.6.56. System Safety Manager. The assigned individual responsible for the application of engineering and management principles, criteria and techniques throughout all phases of the system life-cycle to optimize safety within the constraints of operational effectiveness, time and cost. Refer to this chapter and **Chapters 2**, **10**, **11**, **13** and **14** for additional guidance.

1.6.57. System Safety Officer. This is a general term for a person (military or civilian) working at a Lead MAJCOM (as defined in AFPD 10-9, *Lead Command Designation and Responsibilities for Weapon Systems*) or operational command who represents the operational community in system safety matters. Refer to this chapter and **Chapters 2**, **11** and **13** for additional guidance.

1.6.58. Technology Executive Officer (TEO). The individual dedicated to executive management and supervision of the Air Force Science and Technology portfolio, analogous to a Program Executive Officer. The TEO shall be appointed and assigned by, and is accountable to, the Air Force Service Acquisition Executive. Refer to **Chapter 11** for additional guidance.

1.6.59. Unit Motorcycle Safety Representative. Unit motorcycle safety representative responsibilities are defined in AFI 91-207.

1.6.60. Unit Safety Representative (USR). A person assigned to a unit who is responsible for the additional duty safety responsibilities. May be a representative of flight, occupational or weapons safety, and may include a more specific title such as additional duty weapons safety representative or squadron assigned flight safety officer, etc. Refer to **Chapters 2**, **3**, **6** – **9**, **13** and **14** for additional guidance.

1.6.61. Weapons Safety Manager (WSM). The WSM manages explosives safety programs to ensure Air Force and tenant units understand and comply with explosives safety, missile safety, nuclear surety and directed energy safety standards. Refer to this chapter and **Chapters 2**, **3**, **6**, **9**, **13** and **14** for additional guidance.

1.7. Waivers.

1.7.1. Waivers to safety explosive requirements will be processed IAW AFMAN 91-201. **(T-1)**

1.7.2. Each commander/director will keep, at a minimum, the previous commander's/director's waivers/deviation/exemption on file. **(T-1)**

1.7.3. Each commander/director will reevaluate risk throughout the waiver/deviation/exemption period and adjust risk controls as necessary. **(T-1)**

1.7.4. Each applicable Safety Office shall brief previously approved and active safety waivers, deviations or exemptions to incoming commanders, system program managers, and Chiefs of Safety within 90 days of assignment. **(T-1)**

1.8. Military-Unique and Nonmilitary-Unique Policy. The Air Force policy is to comply with AFOSH, OSHA, DoD and other non-DoD regulatory safety and health standards and guidance as provided under federal law and IAW DoD policy with respect to military-unique and nonmilitary-unique workplaces, operations, equipment and systems.

1.8.1. Military-Unique. 29 CFR Part 1960, *Basic Program Elements for Federal Employee OSHA*, DoDI 6055.01 and **Attachment 1** for additional guidance and information regarding military-unique.

1.8.1.1. The Air Force shall apply AFOSH, OSHA, DoD and other non-DoD regulatory safety and health standards and guidance to military-unique workplaces, operations, equipment and systems in whole or in part, insofar as practicable. These standards shall apply unless AFSEC or Air Force Medical Readiness Agency/SG3P (AFMRA/SG3P) coordinates on a variance or exemption with a recommendation of an approval/disapproval for the risk acceptance authority.

1.8.1.2. Air Force commanders who oversee workplaces, operations, equipment or systems in question, will employ the guidance in 29 CFR Part 1960, DoDI 6055.01, and this instruction when making military-unique determinations. **(T-0)** These process procedures will be codified via technical orders, job guides, operations orders, a Job Hazard Analysis or some other means to address residual hazards and alternative protective measures. **(T-0)**

1.8.2. Nonmilitary-Unique. Air Force personnel and units shall comply with OSHA, DoD, AFOSH, and other non-DoD regulatory safety and health standards and guidance with respect to nonmilitary-unique workplaces, operations, equipment and systems, regardless of whether work is performed by military or civilian personnel. **(T-0)** Refer to DoDI 6055.01 and **Attachment 1** for additional guidance and information regarding nonmilitary-unique.

Chapter 2

SAFETY ORGANIZATION

2.1. Safety Staff. All safety disciplines will be consolidated under a single Director or Chief of Safety, as applicable. Full-time safety personnel must be trained and qualified to manage safety programs. **(T-0)** Use the Air Force Manpower Standard (AFMS) 11H100 (**https://cs2.eis.af.mil/sites/11190/AFMDandAFMS/AFMS/Forms/FAC1stFAC2nd.aspx**) to determine the size of the safety staff. ARC units use applicable Command Manpower Standards or Guides to determine safety staff size. All safety manpower requests or changes will be coordinated with the MAJCOM/SE and (for Regular AF requests/changes only) AFSEC Career Field Manager (AFSEC/CFM) before submission to the local management engineering team. **(T-1)** Manpower variances can be submitted for safety staffs that conduct special programs IAW AFMS 11H100. **Note:** The unit involved, the MAJCOM safety office and the applicable manpower staffs collaboratively determine the size of safety staffs for Joint Bases and other non-host units excluded by AFMS 11H100. **(T-2)**

2.1.1. Chief of Safety (COS). The Chief of Safety (or Director in a civilian-led unit or MAJCOM/FOA/DRU) reports directly to the commander and manages the mishap prevention program for the commander (e.g., installation, center, NAF/MAJCOM/FOA/DRU commanders). The COS must be qualified in a primary mission weapons system of the unit, if one exists, or if the COS is a civilian position, have a Safety Officer who is qualified in a primary mission weapon system (except AFSPC). **(T-1)** Civilian COS must meet the qualification standards for Occupational and Health professional stated in the Office of Personnel Management (OPM) classification series (GS-0018 or GS-0803). **(T-0).** MAJCOM/FOA/DRU Directors of Safety will have previous safety experience (except AFSPC). **(T-1)** The AFRC equivalent to the above are Chiefs of Safety which are 2181-series (pilot)/2183-series (navigator) civilians.

2.1.1.1. When the COS is either Regular Air Force or Air Force Reserve (not applicable to Air National Guard wing), he/she will be appointed on a memorandum signed by the unit commander and be selected from a current or previous Squadron Commander/Director of Operations/Chief of Safety list, or be a former Squadron Commander. **(T-2)**

2.1.1.2. Assigned individuals must complete the Chief of Safety Course (WCIP05B) within 90 days of assuming the Chief of Safety position. **(T-1)** Air Force Reserve and ANG Chief of Safety may substitute the Air Reserve Component Chief of Safety course (ARCCOS101) and should make every effort to complete the requirement within 90 days of assuming the Chief of Safety position. **Note:** In no case will Air Force Reserve and ANG components exceed a 180 day limit. Waiver authority for this requirement will be AFSEC. **(T-1)**

2.1.1.3. Assigned individuals must be available to serve as COS for a minimum of one year after completion of training. **(T-1)**

2.1.2. Career Safety Professional. The Air Force has an enlisted safety career field (Air Force Specialty Code (AFSC) 1S0X1) and a civilian safety career field (GS-0018, Occupational Safety and Health Manager or Specialist; GS-0019, Safety Technician; GS-0017, Weapons Safety Manager or Specialist; GS-1815, Air Safety Investigator; and GS-0803, Safety

Engineer). These career safety personnel are assigned to positions authorized by the Unit Manning Document. The safety career field is addressed in AFI 36-2101, *Classifying Military Personnel (Officer and Enlisted),* and described in the Air Force Enlisted Classification Directory. The civilian safety career program is described in AFMAN 36-606, *Civilian Career Management and Development.*

2.1.2.1. Professional Continuing Education and Training. Full-time safety professionals working in authorized occupational safety positions as depicted in the Unit Manning Document, must complete at least three safety-related CEUs per year. **(T-2)** For courses with no assigned CEU value, one CEU is the equivalent of ten hours of course participation. **Note:** This also applies to persons such as over-hires, career-broadeners, interns or similar positions working within occupational safety. Other full-time safety professionals in weapons, space and flight safety disciplines should consider similar continuing education to remain up to date in their specialty. MAJCOM/SEs or their designee may grant waivers for this requirement for reasons to include personnel on extended deployments, manning shortfalls and funding limitations. The wing or below chief of safety will document specific circumstances and conditions when this training requirement cannot be met and is not covered under a MAJCOM level waiver. **(T-2)**

2.1.2.1.1. Professional continuing education and training is not the same as qualification training where an individual could be decertified, downgraded or unable to deploy, etc., if not trained to a specific level. The purpose of continuing education and training is to help safety professionals expand their knowledge base and stay informed on the latest technical and behavioral developments in the field of safety.

2.1.2.1.2. College, OPM and other safety professional development courses that do not award CEUs, e.g., on-line training, seminars, webinars may be used to satisfy this requirement, if approved by the MAJCOM/SEs or their designee.

2.1.2.2. **Chapter 14** contains a partial list of recommended safety courses that safety professionals should consider when meeting CEU requirements. Additionally, **Table 14.2** contains a list of AFSEC courses that will satisfy CEU requirements. Safety managers will plan, program and budget for safety resources (e.g., to include sufficient safety training to meet CEU requirements).

2.1.2.3. The award of Special Experience Identifier (SEI) 430 “Master Safety Professional” requires the following requirements to be met:

2.1.2.3.1. Completion of an Associate’s Degree or higher in Safety.

2.1.2.3.2. Mishap Investigation Non-Aviation (MINA) course (Course Code: WCIP 059). **Note:** MINA is the preferred course; however, Introduction to Mishap Investigation is a suitable substitute if personnel are unable to attend the MINA course.

2.1.2.3.3. Complete the Safety Managers Course.

2.1.2.3.4. Five (5) years in the Safety career field.

2.1.2.3.5. One or more certifications from recognized and accredited national/international organizations.

2.1.2.3.6. Supervisor and MAJCOM Functional Manager recommendation.

2.1.2.4. Ensure safety and health personnel are properly trained. 29 CFR § 1960.56, *Training of Safety and Health Specialists*, DoDI 6055.01, 29 CFR § 1960.7, *Financial Management*, AFI 36-401, *Civilian Training, Education, and Professional Development*, and AFI 36-2651, *Air Force Training Program*, discuss responsibilities for funding and ensuring safety and health personnel are trained to function effectively as safety and health advisors to commanders and management officials. **(T-0)**

2.1.2.5. The 1S0 AFSC vectors Senior Non-Commissioned Officers (SNCOs) through the Enlisted Development Team (EDT) construct. The 1S0 EDT outlines the training, education and experience requirements for the most critical Safety duty positions, and provides recommendations for the best qualified SNCOs into key developmental and key leadership positions at the unit, MAJCOM and HQ AF level. SNCOs are vectored on a periodic basis according to the most current EDT Charter is on the Career Field Manager page located on the AFSEC/SEG SharePoint® site (**https://cs2.eis.af.mil/sites/10178/Pages/SEGHomeV2.aspx**). The EDT Charter and vectored position list are reviewed annually and available at the above link. All eligible SNCOs will route a worksheet to the EDT as directed by the EDT Chair. **(T-1)** MAJCOM Functional Managers determine vectored positions with the concurrence of the EDT Chair. Out-of-cycle EDTs will be conducted at the discretion of the EDT Chair to provide opportunity to eligible candidates during supplemental promotion boards or when individual's records change. **(T-1)**

2.1.3. Occupational Safety Manager (OSM). The OSM manages the occupational safety program for the Director/Chief of Safety and the commander (e.g., installation, center, NAF/MAJCOM/FOA/DRU commanders). **(T-1)** The OSM must be fully qualified to advise and execute decisions on safety matters for the primary mission of the unit. **(T-1)** The OSM should complete the Safety Manager Course (AFSEC Course WCIP05D) prior to assuming an OSM position. If this is not possible they will complete the course within one year of assuming the OSM position. **(T-1) Note:** Previous courses such as the Senior Safety Professional's Course or the Occupational Safety Manager's Course meet this requirement.

2.1.4. Flight Safety Officer (FSO). FSOs in higher headquarters positions will be rated officers or prior rated officers with experience in headquarters managed mission aircraft (not applicable [N/A] for Flight Safety Managers). FSOs/Flight Safety Managers manage flight safety programs for Director/Chief of Safety and the commander, e.g., installation, Center, NAF/MAJCOM/FOA/DRU commanders. **(T-1)** FSOs at squadron and installation-level must be current in a unit mission aircraft (N/A for Flight Safety Managers). Once trained, individuals will fill the position for a minimum of 12 months unless waived by the MAJCOM/FOA/DRU SE. **(T-1)** Flight Safety Managers will not be assigned to fill FSO billets on bases where there are primary active flying missions and only one FSO billet. **(T-1) Note:** This requirement does not apply to deployed operations. **(T-2)**

2.1.4.1. Full-time FSOs (squadron level, wing level and above) must complete the Aircraft Mishap Investigation Course (AMIC, WCIP05A) and Aviation Safety Program Management course (ASPM, WCIP09B), AFSEC-certified MAJCOM equivalent courses have completed the legacy FSO course. This training should be completed within 90 days of appointment, but must be completed no later than 180 days from appointment. **(T-2).** AFRC and ANG FSOs may fulfill this requirement by attending AMIC (WCIP05A) and

the Air National Guard Chief of Safety/Air Reserve Component Chief of Safety course (ARCCOS101).

2.1.4.2. Commanders of flying squadrons without an authorized FSO will appoint a Squadron Assigned Flight Safety Officer as an additional duty. **(T-3)**

2.1.4.3. Squadron Assigned Flight Safety Officers should attend the ASPM course and/or AMIC course in conjunction with MAJCOM/FOA/DRU supplemental training.

2.1.5. Flight Safety Noncommissioned Officer (FSNCO). The FSNCO is an integral part of the flight safety program. Their primary duties will focus on aviation maintenance safety. **(T-3)** Individuals selected to fill the position will be, as a minimum, a technical sergeant or civilian equivalent, GS-0018 or GS-0803, with maintenance experience on a unit-assigned aircraft type but no less than a 7-level with two years' experience as a 7-level. **(T-2)** Primary consideration will be to select individuals in the 2A37X (tactical aircraft maintenance) or 2A57X (aircraft maintenance) career fields. Selecting from other 2A – AFSCs is acceptable with a minimum of two years flightline experience in the unit assigned aircraft. Refer to AFRC and ANG supplements to this AFI for Air Reserve Component (ARC) FSNCO and Flight Safety Manager manning descriptions.

2.1.5.1. Individuals will complete the FSNCO course (L3AZR1S071-0S5A), or AFSEC-certified MAJCOM equivalent course, and attend the AMIC (WCIP05A) within 120 days of appointment. **(T-1).**

2.1.5.2. The FSNCO will be assigned the Special Experience Identifier (SEI) code of 307 and AFPC personnel records will assign a code 39 to ensure they serve in this capacity for a minimum of two years. **(T-1)** Designated individuals must meet criteria IAW AFI 36-2101. **(T-1)**

2.1.6. Weapons Safety Managers. Full-time Weapon Safety Managers are assigned to positions authorized by the Unit Manning Document.

2.1.6.1. Weapons Safety Managers must be qualified in their AFSC 2WXXX, 2MXXX, or OPM 017/018 or 803 standards and should have experience in the maintenance or operation of nuclear weapons, missiles or non-nuclear munitions. Airmen selected as Weapon Safety Managers will be at least a 7-level in their Air Force Specialty Code. **(T-2)**

2.1.6.2. Full-time Weapon Safety Managers and Air Reserve Component Weapons Safety Managers in UTC positions must complete the Weapons Safety Course (L3AZR2W071-0C2A) within six months of appointment. **(T-2)**

2.1.6.3. Upon completion of training course L3AZR2W071-0C2A and six months in the Weapons Safety position, the COS will ensure the individual is awarded special experience identifier (SEI) 375 and a two-year assignment deferment is initiated if the individual is satisfactorily accomplishing Weapons Safety tasks (Assignment deferment is not applicable for Air Reserve Component personnel). **(T-3)** It is desirable that individuals not deploy in Weapons Safety Manager positions prior to six months satisfactory experience in Weapons Safety tasks (Chiefs of Safety will make final deployment determinations based on proven duty performance). **(T-3)**

2.1.7. System Safety Officers, Managers and Engineers. According to their particular job requirements, individuals in System Safety positions will complete a MAJCOM-approved System Safety Course within 120 days of assignment. **(T-1)** Safety offices must document reasons for assigned individuals who have not completed training within 120 days of assignment. **(T-1)**

2.1.8. Space Safety Manager. These positions can be filled by a System Safety Manager, Mission Safety Manager, Mission Flight Control Manager, Launch Safety Manager, Orbital Safety Manager and/or Ground Based Space System Manager, as applicable to the program's mission. These individuals will be trained in space mishap prevention and/or investigations, as applicable to their assigned duties, within 120 days (or at the first available course). **(T-1)** Assigned Space Safety personnel (military and government civilians) shall receive initial and annual training in all applicable aspects of Space Safety according to the unit's specific operations (e.g., risk analysis and management, system safety, space environment hazards, testing, and conjunction assessment), tailored to the person's assigned tasks and positions. **(T-1)** Space Safety personnel will complete the Air Force Space Safety Fundamentals located on the AFSEC/SES SharePoint® at **https://cs2.eis.af.mil/sites/11007/ses/default.aspx**. **(T-1)** Any AFSEC or National Aeronautics and Space Administration (NASA) provided mishap investigation course is suitable.

2.1.8.1. As appropriate for the assigned mission, each wing (or equivalent) will have at least one Space Safety Manager for each program. **(T-2)** These individuals may be assigned to subordinate units. With approval from the MAJCOM/NAF/Center Safety Office, these positions may be assigned as an additional duty or multiple programs may be covered by the same Space Safety Manager.

2.1.8.2. Safety Offices must document reasons for assigned individuals who have not completed training within 120 days (or first available course) of assignment. **(T-1)**

2.1.8.3. Organizations acquiring, testing and/or operating space systems must have the following, as applicable:

2.1.8.3.1. At a minimum, wing-level organization conducting operational space or space test missions shall have a Chief of Safety. **(T-3)**

2.1.8.3.2. Each wing-level space organization shall assign a Space Safety Manager for each subordinate unit. **(T-3)** In addition, each space system program office must have a Space Safety Manager. **(T-3)**

2.1.9. Non-Typical Safety Staffs. Throughout the Air Force there are an assorted number of one-deep safety positions and other small atypical safety staffs which are centric in nature to a specific safety function – occupational safety, lab safety, hospital safety, etc. These may exist at FOAs, Groups (CE, Medical, etc.) or other organizational levels outside of or below a standard wing organization. They may reside as an installation or tenant unit function on an installation. Individuals assigned to these positions, or those similar in nature, fulfill the role and responsibility of keeping their respective Commanders/Directors informed of safety issues and executing the mishap prevention program for their Commander. Since their duties and responsibilities are those of the senior safety advisor within their organization, they will report to their Commander/Director as they manage the commander's mishap prevention program.

(T-1) This is consistent with the principles set forth in AFI 38-101, *Manpower and Organization.*

2.2. Unit Safety Representative (USR). Each unit will have a primary and alternate USR. **(T-1)** Additionally each unit will have a primary and alternate Additional Duty Weapons Safety Representative and Squadron Assigned Flight Safety Officer, as applicable. **(T-2)** When possible, these individuals will have one-year retainability in the assigned additional duty position. Each installation safety discipline or assigned safety staff (if different than the installation safety office) will train their respective USRs within 30 working days after receipt of appointment letter. **(T-2)** Air Reserve Component primary and alternate USR will complete initial training within two unit training assemblies of appointment. **(T-2) Note:** Units with full-time safety personnel are not required to have a USR.

2.2.1. Organizations may augment the primary and alternate safety representatives using a "team concept" by adding representatives at the flight level (or equivalent organizational levels). However, the primary and alternate representation will serve as the primary points of contact for all unit safety issues. **(T-2)** If the team concept is used, each member, beyond the primary and alternate, will be trained by the organization for their responsibilities. **(T-2)**

2.2.2. For specific USR responsibilities, see the discipline-specific chapters. USRs will, as a minimum:

2.2.2.1. Advise the commander on safety matters, including latent conditions, which are deficiencies within the organization or supervision negatively affecting job performance, hazards or mishap outcome. **(T-2)**

2.2.2.2. Conduct and document spot inspections in conjunction with facility managers when possible and IAW paragraph **3.7** **(T-2)**

2.2.2.3. Assist unit personnel with mishap reporting requirements. **(T-1)** Assist unit commander and supervisors in mishap investigation when required to include OSHA's Rapid Response Report. **(T-2)**

2.2.2.4. Assist supervisors who develop Job Safety Training Outlines and Job Hazard Analysis. **(T-2)**

2.2.2.5. Conduct and document safety briefings and provide unit personnel with educational safety materials. **(T-2)**

2.2.2.6. Assist the unit commander and supervisors with hazard abatement processes. **(T-2)**

2.2.2.7. Facilitate the inspection and assessment process for their unit and accompany safety office personnel on the formal inspection and assessment. **(T-2)**

2.3. Safety Education/Training. Education and training prepares Airmen to meet their safety and health responsibilities. Each installation shall develop, implement and integrate safety guidelines and standards into existing local level training programs. **(T-1)** Commanders will promote safety awareness at all appropriate venues such as commander calls, holiday safety briefings and other events or functions. **(T-2)**

2.3.1. Commander Orientation/Immersion. The Chief of Safety will provide face-to-face training on the safety and health of the organization to new commanders within their

organizational chain within 60 days of their arrival or appointment. **(T-1)** It is recommended the Chief of Safety include their safety discipline managers, as applicable, for these training events. Air Reserve Components will complete this requirement within 90 days (3 Unit Training Assemblies). **(T-1)** Telephonic training is satisfactory for units that support commanders at operating locations away from the Chief of Safety's home base. In the absence of the Chief of Safety, their deputy will fulfill this requirement. **(T-2)** The training will be documented and include, but is not limited to the following items:

2.3.1.1. Launch vehicle operations and concerns (if applicable). **(T-1)**

2.3.1.2. Safety responsibilities. **(T-1)**

2.3.1.3. Last annual inspection/assessment/evaluation results and open recommendations, unabated hazards and master hazard abatement plan. **(T-1)**

2.3.1.4. Unit specific mishap rates, trends and open mishap recommendations. **(T-1)**

2.3.1.5. Special interest issues (e.g., motorcycle safety/motorcycle unit tracking tool, high risk activities, Annual Program Management Review). **(T-1)**

2.3.1.6. Hazards posed by explosives activities. Refer to paragraph **9.4** for additional information. **(T-1)**

2.3.1.7. Airfield operations and concerns. **(T-1)**

2.3.1.8. Safety Awards Program. (AFMAN 36-2806). **(T-1)**

2.3.1.9. Air Force Combined Mishap Reduction System (AFCMRS). **(T-1)** Website: **https://www.afcmrs.org**.

2.3.1.10. OSHA activities to include Voluntary Protection Program participation, if applicable, and expectations required in response to OSHA visits. **(T-0)** Ensure MAJCOM and AFSEC coordination in the process. **(T-1)**

2.3.1.11. Proactive safety programs (Airman Safety Action Program, Military Flight Operations Quality Assurance, Line Operations Safety Audit, and Organizational Safety Assessments). **(T-1)**

2.3.1.12. Approved and active safety waivers, deviations or exemptions. **(T-1)**

2.3.2. Supervisor Safety Training. For requirements, refer to paragraph **14.5**

2.3.3. Safety, Fire Protection and Health Training. Supervisors will develop a Job Safety Training Outline specifically tailored to address safety, fire protection and health concerns of the work environment. **(T-0)** The outline will encompass both safety awareness and job specific safety training topics. **(T-0)** See mandatory training requirements in paragraph **14.1**

2.4. Safety Office Vehicles and Equipment. The following information should be used when establishing equipment requirements.

2.4.1. Vehicles and Communication. Safety disciplines must be mobile to accomplish their program responsibilities on and off the installation to include mishap response. **(T-1)** In units with flying, missile, and range operations and units with installation base responsibilities who support these activities or as designated by the installation commander, the safety staff must have the immediate use of a two-way radio (ultra-high frequency/very high frequency)-

equipped 4-wheel drive vehicle capable of transporting a minimum of four people and their associated mishap investigation equipment. **(T-1)** Any radio net, appropriate to the mission, that allows the vehicle to move freely around the airfield or missile complex is acceptable.

2.4.2. Allowance Standards (AS). The following AS prescribe the equipment items and quantities required to perform safety missions, functions, and duties. The standards can be found at **https://dpassupport.golearnportal.org/**.

2.4.3. Mishap Investigation Kits. Each MAJCOM/FOA/DRU determines the minimum contents of investigation kits for their safety offices to maintain and have available to meet initial response and ISB requirements for flight, ground, weapons, and space mishaps. **(T-2)** Safety offices will have available all items required to conduct a safety investigation IAW AFI 91-204 to include interview forms with appropriate disclaimers. **(T-2)** Coordinate the medical member investigation content requirements of the kit with the medical treatment facility. Mishap investigation kits are optional for AFRC units.

2.5. Safety Library. Air Force safety offices will establish a library with publications that specifically apply to the safety program. **(T-1)** Electronic access through the internet meets the intent of this requirement; maintain hard copies of publications that are not available electronically. The library will include as a minimum:

2.5.1. DoD Safety standards and handbooks and applicable host country's governing safety standards, rules and regulations. **(T-1)**

2.5.2. Air Force policy directives, instructions, pamphlets, manuals and appropriate technical orders. **(T-1)**

2.5.3. Applicable (based on organizational mission) OSHA, Air Force Safety and Health guidance/standards, National Fire Protection Association, American National Standard Institute standards and other national consensus standards, e.g., Compressed Gas Association, Pressure Vessel and Boilermaker, etc. **(T-1)**

2.5.4. MAJCOMs/FOAs/DRUs will provide a means to disseminate command-specific safety information to subordinate units. **(T-1)**

2.6. Environment, Safety and Occupational Health Councils (ESOHC). For council requirements see AFI 90-801. **Note:** Aviation Safety trends and analysis may instead be addressed through more appropriate forums, i.e., Airfield Operations Board, Bird Hazard Working Group, Quarterly Flight Safety Meeting, Foreign Object Damage Prevention Committee, etc.

2.6.1. While AFI 90-801 governs the rules regarding the conduct of ESOHCs, the ESOHC Chair may charter an ESOHC Safety Sub-Group to ensure full review and oversight of all safety related matters.

2.6.1.1. If established, Safety Sub-Groups will be chaired by the commander or commander's designee and will convene at the commander's discretion. **(T-2)** The Safety Sub-Group will be represented at a minimum by group and squadron commanders from the installation base, representatives from each 2-letter office and commanders (or their designee) from tenant organizations, unless exempted by the installation. **(T-3)** Union representatives will be invited to participate. **(T-1)**

2.6.1.2. The safety staff will make all Safety Sub-Group arrangements; develop the agenda and distribute it in advance; and record and publish council meeting minutes. **(T-1)** The

Safety Sub-Group agenda and minutes will consider safety-related items addressed in the previous ESOHC and the meeting outcomes will be added to the agenda and proceedings of the following ESOHC. **(T-1)** The chief of safety will ensure the minutes are prepared within 30 days following a Safety Sub-Group meeting. **(T-1)** The Sub-Group chair will approve the minutes and all Sub-Group members will be furnished a copy. **(T-1)** OPRs will be identified for items requiring action. **(T-1)**

2.6.2. AFI 90-801 identifies topics that can be addressed, as appropriate, at the ESOHC. Hazard report analysis will include AF Forms 457, AFSAS-generated Hazard reports and Hazardous Air Traffic Reports. **(T-1)**

2.7. Non-USAF Councils and Committees. Air Force safety staffs should support federal, state, and local safety councils and committees through attendance and participation at scheduled meetings.

2.8. Major Range and Test Facility Base (MRTFB) Safety Programs. MAJCOMs will establish safety policy for MRTFB and other range activities. The overall goal of the range safety program is to ensure safety consistent with operational requirements, which includes preventing test objects, space launch vehicles or their hazardous effects from violating established limits. Units operating any range facility or conducting "range activities" as defined by AFMAN 13-212V1, *Range Planning and Operations*, shall establish a range safety program to ensure public safety and protection of government resources and personnel. **(T-1)** The installation commander of the unit operating the range is considered the Range Operating Authority. Under the direction of the MAJCOM concerned, the Range Operating Authority will:

2.8.1. Appoint a Range Safety Officer. Range Safety Officers appointed to the Range Operating Authority typically monitor daily activity and implement the safety program. Range safety duties vary from installation-level program management (Range Safety Officer assigned to the installation/wing) to on-site safety oversight performed by the Range Safety Officer, Range Control Officer or activity manager during execution.

2.8.2. Institute a Risk Management program that quantifies risk and sets requirements for risk acceptance. High residual risk range events are typically accepted by the installation commander or Range Operating Authority. MAJCOM/A3 and SE will establish guidance regarding high risk activities. Approval authorities in coordination with the installation safety office may issue local operating instructions for select or repetitious activities.

2.8.3. Determine safety requirements and ensure all range users are in compliance.

2.8.4. Establish allowable occupational and flight safety conditions and take appropriate action to ensure that test articles do not violate the conditions. Where reliability of the test object is not established, appropriate measures should be taken to ensure it will not endanger the public or their property.

2.8.5. Ensure weapon, non-ionizing and ionizing radiation safety footprints exist for all aircraft, weapons, radars, telemetry, radioactive material and tactics (including those from other services and countries) authorized for a given target and event on the range.

2.8.6. The installation safety office assists the Range Operating Authority with the development and publication of a standardized safety and Risk Management program. An installation-level Range Safety Officer may be appointed within the safety office.

Chapter 3

SAFETY ASSURANCE

3.1. General. Under the AFSMS, safety assurance is largely achieved through safety program evaluations, assessments and inspections that measure program compliance, conformance, and effectiveness of Department of Labor, Department of Defense, and Air Force Mishap Prevention Program requirements. See **Table 3.1** for a summary of minimum evaluation, assessment and inspection requirements.

Table 3.1. Safety Evaluations, Assessments and Inspections.

Level	Frequency	Type	By	Note
MAJCOM/DRU/FOA	48 Months	Safety Evaluation	AFSEC	
NAF/Center/Wing	36 Months	Safety Program Evaluation	MAJCOM/DRU/ FOA	1
Squadron, Standalone Group, and DoD Schools	24/12 Months	Program Assessment & Safety Inspection	Wing/Group SE	2, 3
Wing and below	Monthly	Spot	Wing/Group/ Squadron SE/Safety Representative/ Supervisor	
Wing and below	Monthly	High Interest	Wing/Group SE	
Wing and below	Varies	Special and Seasonal	Wing/Group SE	

Note 1: Conducted IAW this instruction, these Program Evaluations will be conducted for wing, wing-equivalent or higher with an assigned safety staff. **(T-1) Exception:** Air National Guard will complete this requirement not to exceed 48 month frequency. **(T-1)**

Note 2: Program Assessments are specified at a 24-month frequency, while safety inspections are at a 12-month frequency. Safety program assessments and inspections should be combined when conducted the same year to reduce the footprint within the affected organization.

Note 3: IAW DoD 1342.6-M, *Administrative and Logistic Responsibilities for DoD Dependents Schools*, (August 1995) before the start of the school year, an inspection by qualified facility, physical security, safety, sanitation, bioenvironmental, and fire protection specialists to identify all facilities deficiencies and requirements and their relative priority for repair or maintenance. Additionally, In January, an inspection by qualified facility, physical security, safety, sanitation, bioenvironmental, and fire protection specialists to identify all facilities deficiencies and requirements and their relative priority for accomplishment. The second physical security inspection in January

is not required for those schools located on military installations protected by positive entry control procedures.

3.2. Safety Evaluations. AFSEC will conduct safety evaluations of MAJCOM/DRUs/FOAs with a Headquarters safety staff at intervals not to exceed 48 months. **(T-0)** Waiver requests for deviation from the 48 month evaluation requirement from MAJCOMs/DRUs/FOAs will be processed through AFSEC, who, in turn, will process to SAF/IE to USD (P-R). **(T-0)** These evaluations are conducted IAW DoDIs, AFIs, OSHA Standards and federal law. At the direction of the AF/SE, they will be rated with a two-tier (Satisfactory/Unsatisfactory) grading criteria.

3.2.1. The focus of these evaluations is to ensure MAJCOM/SE program management compliance and oversight of subordinate organizations' safety programs are effective. The evaluation provides the MAJCOM/CC/CV an independent perspective of the effectiveness and efficiency of the evaluated organization's safety program.

3.2.2. A written report will be prepared for each evaluation and sent to the commander and the safety staff of the MAJCOM being evaluated. **(T-1)** This report will contain a statement to declare the mishap prevention program conformance and effectiveness under the systemic processes of the AFSMS was either Satisfactory or Unsatisfactory.

3.3. Safety Program Evaluation (SPE). Either independently, or in conjunction with a Unit Effectiveness Inspection, qualified safety personnel from MAJCOMs/FOAs/DRUs must evaluate the safety program of each organization at wing (or wing-equivalent level), as appropriate, and higher. **(T-1)** The evaluations will be accomplished every 36 months. **(T-1)** Safety staffs will develop evaluation checklists to assess compliance and performance of core program elements. **(T-1)** Safety staffs-developed checklists will be reviewed at least annually for accuracy and relevancy. **(T-1)** The SPE checklist items include, but are not limited to the Annual Program Management Review, trends in MICT, mishap trends, results of OSHA inspections, local training of safety personnel during program evaluations, to include OJT master training plan for assigned 1S0s, and results of any commander-requested safety staff assistance visits that were conducted since the last safety program evaluation. Safety will prepare a comprehensive report on the status of the Commander's safety program, inclusive of all safety disciplines evaluated and will attach this report as an addendum to the IG report or an independent report as called for by MAJCOM/FOA/DRU procedures. **(T-1)** The report will contain a statement to declare the mishap prevention program conformance and effectiveness under the systemic processes of the AFSMS was either met and effective, met but needs minor improvement(s), met but needs significant improvement(s), or was not effective. **(T-1)**

3.4. Safety Program Assessments. Qualified safety personnel assess the safety program of each standalone group and squadron on the installation every 24 months as a minimum. **(T-1)**

3.4.1. The assessment will cover all applicable safety disciplines. **(T-1)** Safety staffs will conduct multi-discipline (e.g., Aviation, Occupational, etc.) assessments, when feasible. **(T-1)** Safety assessments address the areas of commander and supervisory support, compliance with program directives and the effectiveness of mishap prevention programs (performance). Assessments may be conducted in conjunction with the annual safety inspection. Assessments may include safety related data found in the Commander's Inspection Program IAW AFI 90-

201, *The Air Force Inspection System*. **Exception:** For subordinate Geographically Separated Units, Detachments or Operating Locations, recommend on-site safety program management assessment be accomplished at intervals not to exceed 24 months. MAJCOM/SEs may allow a virtual assessment in lieu of on-site visits.

3.4.2. The Safety Program Assessment is not an IG-led process, but is core to the safety program and authorized in AFI 90-201. Commanders and Chiefs of Safety are encouraged to use information from the Commander's Inspection Program as part of the assessment. Details of the Commander's Inspection Program are in AFI 90-201. Results of the most recent Safety Program Assessments should be summarized and included as part of the APMR.

3.4.3. Provide an out-brief to the commander within three work days and a formal written report to the squadron/unit commander within 15 work days after completion of assessment. **(T-2)** When either of these timeframes cannot be met, the safety staff will create a memorandum for record justifying the delay. **(T-2)** The assessment report may be combined with the annual inspection report. This report must contain:

3.4.3.1. A statement declaring the mishap prevention program conformance and effectiveness under the systemic processes of the AFSMS was either met and effective, met but needs minor improvement(s), met but needs significant improvement(s), or was not effective. **(T-1)**

3.4.3.2. Unit assessed. **(T-1)**

3.4.3.3. Date of assessment. **(T-1)**

3.4.3.4. Management and supervisory support for safety. **(T-1)**

3.4.3.5. Mishap experience and trends. **(T-1)**

3.4.3.6. Compliance with safety program directives. **(T-1)**

3.4.3.7. Description of any program deficiencies or policy shortfalls and references. **(T-1)**

3.4.3.8. Recommendations for improvement/compliance. **(T-1)**

3.4.4. Safety staffs will develop assessment checklists to assess compliance and performance of core program elements. **(T-1)** Safety office-developed checklists will be reviewed at least annually for accuracy and relevancy, and dated accordingly. **(T-1)** Conduct assessments with prior notice. **(T-1)** Existing MICT self-assessment communicators may be used in the assessment process. As a minimum, assessments will include the following program elements as applicable:

3.4.4.1. Fall Protection. **(T-1)**

3.4.4.2. Hazardous Energy Control Program. **(T-1)**

3.4.4.3. Confined Space Program. **(T-1)**

3.4.4.4. USR compliance with roles and responsibilities. **(T-1)**

3.4.4.5. Motorcycle Safety Representative compliance with roles and responsibilities. **(T-1)**

3.4.4.6. Completion of SST by new supervisors. **(T-1)**

3.4.4.7. Traffic safety training IAW AFI 91-207. **(T-1)**

3.4.4.8. Hazard reporting procedures. **(T-1)**

3.4.4.9. Mishap response and reporting procedures. **(T-1)**

3.4.4.10. Safety promotion support. **(T-1)**

3.4.4.11. Use of Risk Management/Training. **(T-1)**

3.4.4.12. Training, care and use of PPE. **(T-1)**

3.4.4.13. Currency of JSTO content, to include but not limited to JHAs and hazards (AF Forms 1118, *Notice of Hazard*, AF Form 3, *Hazard Abatement Plan*, etc.). **(T-1)**

3.4.5. When prescribed by MAJCOM safety guidance, subordinate safety staffs will upload documentation in unit MICT (or hyperlink to suitable electronic medium, such as SharePoint®) to permit oversight of assessments by the MAJCOM. **(T-2)**

3.4.6. Follow-up Procedures and Actions. The assessed unit will submit to the safety staff corrective actions taken/planned. **(T-1)** The safety staff ensures these reports along with the unit's corrective actions are staffed through the installation commander as their policy prescribes. Safety personnel will track and monitor the status of all open assessment findings until closed. Procedures shall be established to document and follow-up on the correction of hazards/deficiencies identified during assessments not to exceed 180 days (see spot inspection follow-up and/or hazard abatement program). **(T-1)**

3.5. Annual Program Management Review (APMR). Refer to paragraph **13.2** for APMR content. The management review provides leadership and applicable process owners a strategic and critical evaluation of the conformance and effectiveness of the Mishap Prevention Program and an opportunity to recommend improvements. Each safety office at the HAF/MAJCOM/Wing is responsible for completing an APMR. **(T-1)** The APMR will include appropriate data from all safety disciplines. **(T-1)** Results of the annual APMR inform the commander on the health and effectiveness of the organization's safety program and will contain a statement declaring the mishap prevention program conformance and effectiveness under the systemic processes of the AFSMS was either, met and effective, met but needs minor improvement(s), met but needs significant improvement(s), or was not effective. **(T-1)** Results and action items from this review shall be documented, prioritized, communicated to affected organizations and tracked to completion. **(T-1)** The Director/Chief of Safety will brief their commander on the results of the APMR. **(T-1)** Each Wing safety office below the MAJCOM/FOA/DRU level will forward their report to the next higher level safety office by 15 November. **(T-1**) MAJCOM/FOA/DRU SE offices will submit their APMR to AF/SE via email to **usaf.pentagon.af-se.mbx.af-se-workflow@mail.mil** by 15 January. **(T-1)** AF/SE will consolidate MAJCOM/FOA/DRU APMRs into an AF-level APMR for submission to SAF/IEE. **(T-1)**

3.6. Annual Safety Inspections. Safety inspections as required by public law (29 CFR Part 1960, *Occupational Safety and Health Administration*), DoDI 6055.01 and this instruction help identify hazards and measure compliance with applicable safety guidance and standards. The annual safety inspection is not an IG-led inspection, but part of core safety duties and can only be accomplished by a qualified safety professional.

3.6.1. Scope. At least annually (12 month cycle), qualified safety personnel shall inspect every installation workplace/facility where Airmen are regularly employed at fixed installations. **(T-0)** Workplace/facility inspections shall include reviews of inspection documentation for

equipment and real property, i.e., Air Force Technical Order (AFTO) Form 244, *Industrial/Support Equipment Record,* hoist weight testing, etc. **(T-1)** Inspections are to be conducted more frequently based on factors such as the exposure to and potential severity of hazards, actual accident experience, special emphasis programs, changes in the organization's staffing or workplaces or other events that increase risk in the workplace. Procedures shall be established to document and follow-up on the correction of hazards/deficiencies identified during inspections. **(T-1)** Follow-ups will be completed within 30, 60, 90 days or other specified timeframe(s) not to exceed 180 days (see spot inspection follow-up and/or hazard abatement program). **(T-1)**

Note 1: Inspections of workplaces and operations in contractor facilities (Government-Owned Contractor Operated or contractor owned/operated) where fewer than 25 AF personnel are employed shall be at the discretion of the Chief of Safety, based on existing conditions and potential risks. **(T-1)** Assist the contract management multi-functional team, upon request, to resolve any issues related to the safety of the contractor's facilities. **Note 2:** Use of CE's Facility Listing can provide a baseline for identification of workplace/facilities on an installation however, their listing may include areas such as unoccupied/condemned buildings, slated for demolition, flagpoles, and foundation slabs, which may not be considered facilities for safety purposes. OSMs may adjust their listing of facilities accordingly.

3.6.1.1. Facility, workplace and operational inspections. The safety manager will ensure safety personnel are properly qualified and/or have been task certified to perform all aspects of the inspection, and all facilities assigned to the unit are inspected/documented. **(T-0)** The inspection report will identify all workplaces and facilities inspected regardless of whether there were findings or not. **(T-1)**

3.6.1.2. All hazards identified during the inspections will be assigned a RAC. **(T-1)** The safety staff conducting the inspection will assist the responsible supervisor in developing hazard mitigation and abatement actions. **(T-1)** Program management deficiencies identified during the inspections will be assigned a deficiency designator of Critical, Significant or Minor instead of assigning a RAC. **(T-1)** Inspection findings will be recorded and tracked through closure. **(T-1)**

3.6.1.3. Checklists will be used to help identify hazards, deficiencies and other work-related violations. **(T-1)** The safety staff will ensure checklists are available to all applicable organizations. **(T-1)** Safety office-developed checklists will be reviewed at least annually for accuracy and relevancy. **(T-1)** Method of documentation of the review is determined by the safety staff.

3.6.1.4. The installation safety staff inspects units that do not have an authorized full-time safety position in a particular discipline. **Exception:** The installation safety staff inspects HAF, MAJCOM, NAF and AFOTEC safety offices as specified in paragraph **1.6.22.5** Host/tenant/associate support agreements will define who will conduct inspections.

3.6.1.5. Geographically separated units with full-time safety personnel will inspect workplaces annually and keep a copy of the report on file until the next annual inspection. **(T-1)** For geographically separated units without a full-time safety staff, the installation safety office will conduct the annual workplace's inspection (unless a support agreement specifies otherwise) and forwards a copy of the report to the geographically separated unit and the geographically separated units parent organization. **(T-1)**

3.6.1.6. Tenant/Associate units with a full-time safety staff (by discipline) will conduct annual inspections/assessments and will provide a copy of their inspection report to the installation safety office except as exempted in paragraph **1.6.22.5** **(T-1)**

3.6.1.7. Inspect at least 20 percent of unmanned missile and space launch facilities once a year. **(T-1)** Select these launch work areas to ensure that a representative segment of the unit's assets are inspected annually. Inspections must be scheduled to ensure all launch work areas will be inspected over a 5-year cycle. **(T-1)**

3.6.2. Procedures. Safety staffs will conduct multi-discipline (e.g., Aviation, Occupational, etc.) inspections when feasible. **(T-1)** The safety staff will develop and publish an annual fiscal year inspection schedule and distribute to units, to include local union(s) and Wing IG gatekeepers, no later than 15 September for the upcoming fiscal year. **(T-1)** When possible, these may be conducted as part of the Wing's Commander's Inspection Program.

3.6.2.1. Inspectors must consult with workplace personnel and their union representatives on matters affecting their safety and health and give them the opportunity to identify unsafe and unhealthful working conditions, equipment and practices. **(T-0)** Upon request, conduct such consultations privately and do not identify employees who want to remain anonymous.

3.6.2.2. Provide an out-brief to the commander within three work days and a formal written report to the squadron/unit commander within 15 work days after completion of inspection. **(T-1)** When either of these timeframes cannot be met, the safety staff will create a memorandum for record justifying the delay. **(T-1)** Ensure these reports along with the unit's corrective actions are staffed through the installation commander as their policy prescribes. When the installation base safety office conducts inspections of tenant units, the installation base safety office will send a copy of the report to the parent safety office. **(T-1)** Formal inspection reports must contain:

3.6.2.2.1. The unit, activity or work areas inspected. **(T-1)**

3.6.2.2.2. The date of the inspection. **(T-1)**

3.6.2.2.3. Facilities and/or work areas inspected. **(T-1)**

3.6.2.2.4. Description of any hazards, deficiencies or unsafe work practices with risk assessment code and deficiency designator (as applicable) and references. **(T-1) Note:** When there is an OSHA reference for the non-compliance, that reference will be used. Safety staffs may also use AFI references to further support non-compliance.

3.6.2.2.5. Causes of deficiencies and hazards noted, if known. **(T-1)**

3.6.2.2.6. Recommendations for improvement/compliance. **(T-1)**

3.6.2.2.7. Instructions for follow-up actions such as requiring units to provide monthly updates on open items until closure. **(T-1)**

3.6.2.3. Follow-up procedures and actions. The inspected unit will submit to the safety staff corrective actions taken. **(T-1)** Safety personnel will track and monitor the status of all open inspection findings until closed. **(T-1)** Use spot inspections and follow-up reporting to ensure corrective action(s) are taken and hazards are mitigated/abated. **(T-1)** All hazards identified during inspections will be managed IAW **Chapter 4**. **(T-1)**

3.7. Spot Inspections. Work center/shop supervisors, USRs and safety personnel will perform spot inspections to check the day-to-day safety and health of an organization, work center, facility, etc. **(T-2)** Work center/shop supervisors, USRs, squadron assigned flight safety officers and Additional Duty Weapons Safety Representatives will conduct and document monthly spot inspections. **(T-2)** See discipline specific chapters for additional operations and areas that need to be inspected or monitored.

3.7.1. The Chief of Safety will ensure coverage of on-duty and off-duty activities that occur on, or are controlled by the installation. **(T-2)**

3.7.2. Ensure appropriate follow-up actions (not to exceed 180 days) are conducted and documented until findings are closed. **(T-2)** Documentation of spot inspections by safety staffs will include the following:

3.7.2.1. The organization, unit, activity or work area inspected. **(T-2)**

3.7.2.2. The date and time of the inspection. **(T-2)**

3.7.2.3. The inspector's name and their organization or office symbol. **(T-2)**

3.7.2.4. A brief description of the areas, equipment or processes/procedures reviewed as well as observations (may also include positive findings), hazards or unsafe work practices. **(T-2)** When qualified safety personnel identify hazards or deficiencies, assign RACs or deficiency codes, as prescribed by this instruction. **(T-2)**

3.7.2.5. Causes of deficiencies and hazards, as noted. **(T-2)**

3.7.2.6. Recommendations for corrective action. **(T-2)**

3.7.2.7. Name and phone number and/or e-mail address of responsible person. **(T-2)**

3.7.2.8. Ensure appropriate follow-up actions (not to exceed 180 days) are conducted and documented until findings are closed. **(T-2)**

3.7.3. Work center/shop supervisors and USRs will ensure appropriate follow-up actions (every 30 days) are conducted and documented until findings are closed. **(T-1).** Documentation of spot inspections will include the following as a minimum. Local safety staffs may prescribe additional items.

3.7.3.1. The activity or work area inspected. **(T-2)**

3.7.3.2. The date and time of the inspection. **(T-2)**

3.7.3.3. The name of the person conducting the spot inspection. **(T-2)**

3.7.3.4. A brief description of the area, equipment or process/procedure reviewed as well as observations of hazards, deficiencies or unsafe work practices. **(T-2)** The description may also include positive findings.

3.7.3.5. The applicable RAC or deficiency code, if assigned by a qualified fire, safety or health person after contact by the USR or supervisor. **(T-2)**

3.7.3.6. Corrective action taken or planned. **(T-2)**

3.8. High Interest Areas. High interest areas are those areas having the greatest risk to life or property, have experienced repeated mishaps or in the judgment of the wing commander and/or safety office require added monitoring. While designation should usually be based on trends,

analysis or command interest, they can also be work areas or operations that need additional attention or inspections because of increased mishap potential due to the nature of the work performed, physical conditions or type of materials handled. High interest areas, if identified, will be designated by the Chief of Safety in writing. **(T-1)** Identified High Interest Inspections will be accomplished and documented at least monthly. **(T-1)** In addition to local and MAJCOM identified High Interest Areas, consider incorporating the AFSEC designated Occupational Safety Emphasis Items. Documentation of High Interest Area inspections will be IAW paragraph **3.7.2** **(T-1)**

3.9. Administrative Areas. A task-qualified USR may conduct inspections of administrative work areas (not permissible for entire facility inspections, which include dock areas, mechanical rooms, storage, etc.) when the safety staff determines the mishap potential is minimal. The applicable occupational safety staff develops specific provisions to ensure the USR has sufficient documented training and/or experience in the safety hazards of the administrative area to recognize and evaluate those particular hazards and to suggest general abatement procedures, as required by 29 CFR § 1960.25, *Qualifications of Safety and Health Inspectors and Agency Inspections*. **(T-0)** Any specific provisions beyond what may already be addressed in the required USR training may be added to that training process. Periodic over-the-shoulder assessments of these USR responsibilities will be accomplished and documented. **(T-1)**

3.10. Special and Seasonal Inspections. Inspections are conducted to ensure work and recreational environments are safe and healthy.

3.10.1. Special inspections include seasonal, targeted mishap preventive activities, special events and mission readiness operations/exercises. Special inspections will be conducted of installation child development centers and playgrounds that are part of real property. **(T-1)** Playground inspections, special or seasonal, conducted by the safety office, Family Support Squadron (FSS) personnel or CES personnel will be accomplished using the most current version Consumer Product Safety Commission Public Playground Safety Handbook. **(T-1)**

3.10.1.1. Installation safety offices will conduct the annual unannounced comprehensive safety inspections of all child and youth facilities, Family Child Care (FCC) Administration and at least 10 percent or no fewer than three FCC homes located in government housing. **(T-0) Note:** This excludes all privatized housing.

3.10.1.2. Installation safety offices will train applicable FCC personnel (Child and Youth Services Flight Chiefs, Child Development Center Directors, Airmen and Family Services Flight Chiefs, etc.) in hazard recognition to conduct all other FCC Home safety inspections to include new applicants, renewals, comprehensive, and multidisciplinary as required in DoDI 6060.02, *Child Development Programs (CDPs).* **(T-0)**

3.10.1.3. Any facility inspection performed under this paragraph does not need to be re-inspected as part of the annual safety inspection called for by paragraph **3.6** The annual inspection report called for by paragraph **3.6** will contain a memo indicating these facilities were completed as part of the inspections under AFI 34-144, *Child and Youth Programs.* **(T-1)**

3.10.2. Seasonal inspections will be conducted of recreational areas (e.g., sports fields, swimming pools, camp grounds, and recreational vehicle parks and other recreational areas). FSS will coordinate with the safety staff to jointly conduct pre-season inspections of seasonal areas belonging to FSS. **(T-1)**

3.11. Staff Assistance Visits (SAV). The purpose of the SAV program is to help develop solutions, not to inspect or evaluate, and to provide observations and recommendations for improvement. SAVs may be conducted at any level at any time, but only when requested by the commander who is receiving the SAV. The SAV Team Chief will produce and deliver a written report to the commander. **(T-2)** Do not require replies unless an action started during the visit needs monitoring by the higher headquarters safety staff or requires further staff action above the level of the visited unit.

3.12. Federal/State Inspections and Investigations. Federal/state officials may conduct inspections/investigations of nonmilitary-unique workplaces and operations where Air Force civilian personnel work (inspections may be unannounced). Refer to paragraph **13.3** for specific requirements.

3.13. Contract Performance Assessment. Installation or tenant unit safety offices, as applicable, will assist the MFT in validating that contractors are meeting the safety requirements of the contract. If the installation is pursuing Voluntary Protection Program certification, the contracting officer is responsible for notifying in writing, contractors who are performing work on the installation. **(T-2)**

3.13.1. The MFT will ensure contractors perform IAW the terms and conditions of the contract. **(T-1)** Discrepancies will be reported to the MFT via Contracting Office Representative (COR). **(T-1)** Commanders will ensure CORs that are required to monitor safety requirements are trained in the recognition of hazardous conditions/environments, the use of safety and health standards, and in other areas of safety, as necessary. **(T-1)** The appropriate safety office will assist commanders and CORs in specialized safety training requirements to ensure the COR is properly trained to provide oversight of the contract. **(T-2)**

3.13.2. Airmen who note potential safety violation(s) will report the hazard to the COR. **(T-1)** CORs notify the multi-functional team, and initiate the appropriate actions related to violations. Unless there is critical/imminent danger, Airmen should avoid reporting safety violations directly to the contractor, but should immediately report observed violations to the contracting officer or the installation safety office.

3.13.3. Inspection of Contractor Work Areas and Government-Owned Contractor Operated Work Areas. When Airmen conduct safety inspections in contractor work areas their primary concern is the potential risks to Airmen and government property. Hazardous conditions or violations of safety standards will be reported to the contracting officer, the responsible commander or to the installation safety office. **(T-1) Note:** Inspections of workplaces and operations in contractor installations where fewer than 25 DoD personnel are employed shall be at the COS's discretion, based on existing conditions and potential risks. **(T-2)**

3.13.3.1. Government-Owned Contractor Operated explosives activities must comply with the applicable portions of DoDM 4145.26, *DoD Contractor's Safety Manual for Ammunition and Explosives,* to assure safety of the activity and the prevention of mishaps. **(T-0)**

3.13.3.2. The requirements documents will specify compliance with appropriate provisions of Defense Explosives Safety Regulation (DESR) 6055.09, Volume 1, *General Explosives Safety Information and Requirements,* AFMAN 91-201, and this instruction. **(T-0)**

Chapter 4

HAZARD IDENTIFICATION, REPORTING AND ABATEMENT

4.1. Hazard Identification. Mishap prevention depends on personnel identifying, reporting and correcting hazards promptly and efficiently. Managers or supervisors will not allow coercion, discrimination or reprisal against an employee who exercises their right to report hazards. **(T-0)** Reports can be submitted anonymously.

4.2. Reporting Criteria. Submit hazard reports unless personnel can take corrective action under this instruction or any of these Air Force publications:

4.2.1. AFI 11-215, *USAF Flight Manuals Program (FMP).*

4.2.2. AFI 51-1101, *The Air Force Procurement Fraud Remedies Program*.

4.2.3. AFI 91-204, *Safety Investigations and Hazard Reporting*.

4.2.4. TO 00-5-1, *Air Force Technical Order System*.

4.2.5. TO 00-35D-54, *USAF Deficiency Reporting, Investigation and Resolution*.

4.3. Hazard Reporting System. Commanders must ensure an AF Form 457, *USAF Hazard Report,* or equivalent product is readily available to all personnel. **(T-1)** The AF Form 457 and its related process requirements meets the 29 CFR Part 1960 mandate for an employee hazard reporting system. Additionally, hazards may be submitted using the Airman Safety Action Program (ASAP) and MAJCOM specific hazard reporting forms. Readily available is defined as not being under lock and key or only accessible through electronic means when a member does not have immediate access to a government computer. Personnel have the option to submit hazard reports anonymously, to the responsible supervisor, or to the local safety office. To preserve easy access to the hazard report and anonymity when desired, commanders will consider posting the AF Form 457 in commonly visited areas like break rooms, training rooms, and debrief rooms, as well as safety bulletin boards. Any person assigned, attached or under contract to the Air Force may report a hazard. A hazard report may be submitted on any event that includes hazards, errors, unsafe procedures, practices or conditions that affects flight, occupational, weapons, systems or space safety. This process is not designed for readdressing hazards that are already being managed for abatement through another process such as a CE work request, job order, project or mishap investigation.

4.3.1. Refer to AFI 91-225, *Safety Programs,* for detailed guidance on ASAP's roles and responsibilities.

4.3.2. If the hazard presents critical/imminent danger, the supervisor or individual responsible for that area will take immediate action to mitigate or eliminate the hazard to protect personnel or property. **(T-0)**

4.3.3. Report hazards that cannot be eliminated immediately to the installation safety office via AF Form 457, telephone, e-mail, in person or ASAP (**https://asap.safety.af.mil**). **(T-1)** All reported hazards will be documented, processed, and maintained on file according to records disposition requirements. **(T-1)**

4.3.4. For Air Force Form 457 submissions, the Chief of Safety, in consultation with their safety staff, will determine the appropriate safety, fire or health discipline to investigate the

reported hazard. **(T-1)** The assigned investigator will investigate the reported hazard within one (1) duty day for critical/imminent danger situations, and three (3) work days for potentially serious situations and 10 work days for lesser conditions. The investigator discusses the reported hazard with the member who submitted the report (if known), the responsible supervisor or manager and other parties involved to validate the hazard and determine the best interim control and corrective action. **(T-1)**

4.3.5. If the hazard is validated:

4.3.5.1. The investigator assigns a control number, a RAC as appropriate and monitors all corrective actions until complete. **(T-1)**

4.3.5.2. The investigator completes the Form 457, Part II, *Investigation of Hazard, Actions Taken to Mitigate or Abate Hazard,* within 10 working days and returns the report to the safety office for monitoring. **(T-1)**

4.3.5.3. The OPR completes Part II, *Investigation of Hazard, Actions Taken to Mitigate or Abate Hazard,* within 10 working days and returns the report to the safety office for monitoring. **(T-1)**

4.3.5.4. The investigator informs the originator (if known) in writing about the corrective action or plans and conducts follow-up reviews until the action is completed. The investigator informs the originator, (if known), about the completed action within 10 workdays after the report is closed. If the originator is not known, inform the supervisor or manager of corrective actions. **(T-1)**

4.3.5.5. If the response is not satisfactory to the originator, the originator should resubmit the report and follow procedures in paragraph **4.5**

4.3.5.6. Validated hazards that result in an assignment of a RAC may be closed and corrective action monitored through the hazard abatement process. **Note:** Transference of tracking from the hazard reporting program to the master hazard abatement program or the RAC 4 and 5 mechanism does not relieve the investigator of the responsibilities called for in paragraph **4.3.4.4**

4.4. Additional Reporting Procedures. Transient personnel unable to report a hazard at a base where it is found should submit the AF Form 457 to the next Air Force base they visit, or to the safety office at their home base. The receiving safety office will send the report to the responsible installation safety office. **(T-1)** These types of reports may be submitted via ASAP.

4.4.1. The safety office sends reported hazards that cannot be corrected at the local level to the agencies that can take appropriate action. **(T-1)**

4.4.2. Tenant personnel send hazard reports involving activities for which the installation is responsible to the installation safety office for processing. **(T-1)**

4.4.3. Hazard reports requiring urgent action will be transmitted by the most expeditionary communication means available (overnight mail, official government e-mail, telephone). **(T-1)**

4.4.4. Persons identifying hazards involving weather forecasting must submit hazard reports as soon as possible to ensure that records are not destroyed. **(T-1)** Promptly advise the appropriate agency providing weather forecasting services, i.e., installation weather

flight/detachment supporting operational weather squadron, of their intention to submit a hazard report. Aircrews should consider using a Hazardous Air Traffic Report or ASAP.

4.4.5. Installation safety staffs will send reported hazards that involve other military services, foreign nations or other agencies outside the Air Force to AFSEC/SE, 9700 G Ave SE, Kirtland AFB, NM 87117-5670, or through e-mail at **CD.AFSC@us.af.mil,** and to the affected Air Force units and their chain of command as information addressees. **(T-1)** Upon receipt, AFSEC will maintain tracking and subsequent closing action of the report and will report results to both the sending and affected unit. **(T-1)**

4.5. Air Force Form 457, Airmen Appeal Procedures. If the submitter is dissatisfied with actions taken on a hazard report, they should resubmit the report to the appropriate installation safety, fire protection or health, and request the alleged hazard be reinvestigated. Reports can be submitted anonymously. The safety, fire and/or health representative must respond within 10 work days. **(T-1)** If the submitter is still dissatisfied, they may appeal to a higher level of safety, fire protection or health office in the following sequence:

4.5.1. Intermediate headquarters.

4.5.2. MAJCOM headquarters**.**

4.5.3. AFSEC/SEG (safety hazards), AFCEC/CXF (fire hazards) or AFMRA/SG3 (health hazards).

4.5.4. Assistant Secretary of the Air Force for Installations, Environment and Energy (SAF/IE). This is the final Air Force review for reports that originate at installations in foreign countries, from military personnel or involve military-unique operations or equipment.

4.5.5. Higher level appeals must be addressed promptly and a reply sent to the employee within 20 calendar days. **(T-1)** If a reply is not received within 20 calendar days or if the employee is dissatisfied with the reply, they may appeal to the next higher level. Each reply to an appeal will advise the employee of this right and will include the office symbol and address of the next higher level of appeal. If requested, the appropriate agency will assist the employee in obtaining technical information for clarification or for processing the appeal.

4.5.6. Civilian employees may submit appeals directly to the Office of Federal Agency Safety Programs, Occupational Safety and Health Administration, US Department of Labor. However, the procedures outlined in the paragraphs above are encouraged as the most expeditious means of correcting hazardous conditions.

4.5.7. The procedures outlined above do not prevent the use of agency or negotiated grievance procedures.

4.6. Risk Reduction and Mitigation. Commanders and supervisors at all levels are expected to determine the level of acceptable risk required to preserve assets and safeguard health and welfare. They should incorporate RM into daily activities, on-duty and off-duty, IAW AFI 90-802, *Risk Management.*

4.7. Preparation of Risk Assessments. See AFMAN 48-146, *Occupational & Environmental Health Program Management,* and AFPAM 90-803, *Risk Management (RM) Guidelines and Tools,* for additional and detailed guidance on preparation of risk assessments.

4.8. Hazard Abatement. The purpose of the hazard abatement program is to eliminate, control or limit exposure of personnel to hazardous conditions. It provides senior leaders, functional managers, supervisors and employees with a risk-based systemic process for identifying hazard mitigation and elimination strategies for hazards in all workplaces and operations. Additionally, it provides a tracking system for hazards from identification through closure.

4.8.1. Responsibilities.

4.8.1.1. Each installation establishes a program to abate hazards based on a priority system. **(T-1)**

4.8.1.2. Commanders, supervisors and employees at all levels are responsible for abating hazardous conditions.

4.8.1.3. Commanders protect national resources, both human and material, and have the responsibility to take action in implementing safety measures.

4.8.1.4. Functional managers correct hazards in their areas of responsibility. **(T-1)**

4.8.1.5. The safety office helps commanders assess and prioritize abatement actions and provide the commander with follow-up support until the hazard is eliminated.

4.8.1.6. Send projects beyond the capability of local commanders to the parent MAJCOM/FOA/DRU. **(T-1)**

4.8.2. Planning and Engineering. Use RM processes during the planning, design and execution phases to identify and eliminate hazards as early as possible when they will have the least cost and operational impact on the program. Continually review plans, specifications and drawings to identify and eliminate hazards until the equipment or workplace is operating with acceptable risk levels. **(T-1)** Reevaluate risk assessments when any factor applied in the decision-making process changes. **(T-1)**

4.8.3. Procedural Actions. Develop procedures or restrictions to minimize risk if planning or engineering actions cannot be used to eliminate hazards. **(T-1)** If necessary, impose restrictions such as operational limits, frequent inspections, protective equipment or stopping the operation until corrective action is taken.

4.9. Hazard Control Hierarchy. See AFMAN 48-146 and AFPAM 90-803 for additional and detailed guidance.

4.10. Hazard Abatement Requirements. To abate hazardous conditions:

4.10.1. Abate hazards in military-unique equipment and processes through established systems for modification and upgrade (e.g., Product Quality Deficiency Reporting Program [T.O. 00-35D-54,], and Flight Manual Changes [AFI 11-215]). **(T-1)** Additionally, when possible, use the same criteria specified in paragraphs **4.10.2.1** – **4.10.4.7**

4.10.2. Hazard abatement in nonmilitary-unique workplaces must:

4.10.2.1. Abate RACs 1, 2 and 3 hazards as soon as possible. **(T-1)**

4.10.2.2. Identify abatement actions for RACs 4 and 5 hazards as soon as possible. **(T-1)**

4.10.3. Select an abatement method and, if possible, interim control measures based on the hierarchy outlined in paragraph **4.9** **Note:** Assigned RAC will remain until completely abated even though interim control measures are in effect. **(T-1)**

4.10.4. Other factors that affect decisions on abatement actions are:

4.10.4.1. Impact to mission.

4.10.4.2. Technical feasibility and cost of available options.

4.10.4.3. Number of personnel exposed and length of time exposed.

4.10.4.4. Previous mishap experience.

4.10.4.5. Future use of workplaces or equipment.

4.10.4.6. Alternative methods to control the hazard or protect personnel.

4.10.4.7. Interim control measures in effect.

4.10.5. Paragraphs **13.7**, **13.8**, **15.1** and **15.2** provide additional instructions for assigning RACs, determining abatement priority numbers, and completing AF Form 3 and AF Form 1118.

4.11. Critical/Imminent Danger Situations. Anyone identifying a critical/imminent danger situation will immediately bring it to the attention of the commander and supervisor in charge. **(T-1).** Commanders or supervisors must take immediate action to eliminate or control the hazard or cease operations and withdraw exposed personnel until the hazard is mitigated or the elevated risk is accepted at the appropriate level. **(T-1)**

4.12. Posting Notification of Hazards. The fire, safety or health officials will complete the AF Form 1118 identifying RAC 1, 2 and 3 hazards IAW paragraph **15.1** and forward to the supervisor for posting not later than the end of the next duty day. **(T-1)** The control number for the AF Form 1118 will be assigned by the installation wing safety office. **(T-1)** This will ensure the control number is compatible with the associated AF Form 3, *Hazard Abatement Plan,* should it become required. A copy of the AF Form 1118 will be sent to the installation wing safety office by the office assigning the RAC. **(T-1)** Supervisors must alert all affected employees and contractors of the hazardous condition, any interim control measures and permanent corrective actions underway or programmed. **(T-1)** Supervisors post the AF Form 1118 in the workplace immediately upon receipt. AF Form 979, *Danger Tag*, may be used for this purpose on equipment. Refer to AFMAN 91-203 for additional guidance.

4.12.1. Location. Post AF Form 1118 on, at or as near as possible to the hazard. However, where the nature of the hazard or workplace is such that this is not practical, post notices in a prominent place where all employees can see them. The workplace supervisor must ensure the posted AF Form 1118 is maintained in good condition and employees are kept informed of any changes. **(T-1)** If adverse conditions are present, enclose the notice in a suitable protective cover. **(T-1)**

4.12.2. Removal. The issuing office will be the authority to remove a posted AF Form 1118. **(T-1)** Removal of notices will only occur after the hazard has been corrected, or three (3) working days (excluding weekends and federal holidays), whichever is later, following validation by the issuing authority. **(T-0)**

4.13. Installation Master Hazard Abatement Plan (MHAP). Commanders/Functional Managers will ensure all identified RAC 1, 2 and 3 hazards are entered into the formal installation MHAP, if not abated within 30 calendar days. **(T-1)**

4.13.1. Those RAC 1, 2 or 3 hazards will be entered on an AF Form 3 IAW paragraph **15.2** **(T-1)** Safety, fire or health officials assist functional managers in preparation of the AF Form 3. Commander/functional manager approves, signs and send the AF Form 3 to the installation safety office. **(T-1)**

4.13.2. The installation safety staff will maintain the installation MHAP. **(T-1).** The MHAP will consist of the following as a minimum:

4.13.2.1. A fiscal year log of all RAC 1, 2, and 3 items. **(T-1)**

4.13.2.2. A complete set of AF Form 3s and AF Form 1118s from across the installation. **(T-1)**

4.13.2.3. Other related or supporting documentation. **(T-1)**

4.13.2.4. The signed approval called for in paragraph **4.13.5** or a cross reference to the appropriate ESOHC minutes if the option is used to track commander approval via the ESOHC. **(T-1)**

4.13.3. Squadron commanders or functional managers will conduct a semiannual review of AF Form 3 pertaining to their areas of responsibilities and reflect that review in Block 38 of the AF Form 3. **(T-1)**

4.13.3.1. Commanders/functional managers notify the safety personnel of any changes in hazard abatement status and annotate changes on the AF Form 3.

4.13.3.2. Squadron commanders or functional managers will conduct a semiannual review of AF Forms 3 pertaining to their areas of responsibilities and reflect that review in Part IV--Semi-Annual Review Records of the AF Form 3. **(T-1)**

4.13.3.3. Completed hazard abatement projects must be certified by the appropriate agency; safety, fire, or health, to ensure the hazard was abated properly. **(T-1)** Certification in this particular instance means the appropriate official has performed a site visit to verify the hazard has been fully abated.

4.13.4. The ESOHC will review open MHAP items at least once a year. **(T-1)** They will address project delays and other problems during each ESOHC. **(T-1)** The ESOHC minutes will reflect the review and delays or problems respectively. **(T-1)**

4.13.5. Annually, the Chief of Safety will send a copy of the MHAP to the installation commander for review and approval of priorities for projects. **(T-1)** The copy sent to the commander will include a cover letter addressing the purpose of the review and description of the request for the commander's review and signature. **(T-1)** The package will include a list of all open plan entries and those closed since the last annual review. **(T-1)** The open list will be prioritized by RAC and abatement priority number. **(T-1)** See paragraph **13.8** **Note:** Locations utilizing the AF and MAJCOM/FOA/DRU level Risk models which are included in scheduled Facilities Boards and ESOHC meet the intent of this paragraph and that of paragraph **4.13.2.4**

4.13.6. The installation safety office will make the MHAP available for review locally by representatives of recognized employee organizations, if such organizations exist. **(T-1)**

4.13.7. MAJCOM/FOA/DRU occupational safety personnel will send copies of AF Forms 3 received from subordinate installations or units to AFSEC/SEG and AFMRA/SG3P or AFCEC/CXF, if appropriate, when MAJCOM funding authority for abatement action is exceeded. **(T-1)**

4.13.8. RAC 4 and 5 hazards are not part of the installation MHAP. Safety staffs, including tenant units, will track RAC 4 and 5 hazards not to exceed 180 days until closed. **(T-1)** Refer to paragraph **3.6.1** for more information. AF Form 3 or AF Form 1118 is optional for RACs 4 and 5. MAJCOM/FOA/DRU may delineate additional tracking requirements.

4.13.9. Once a hazard is transferred to the MHAP (RACs 1 – 3) or the RAC 4 and 5 tracking mechanism, close out applicable source hazard report or inspection report. **(T-1)**

4.14. Funding for Hazard Abatement. Funding for hazard abatement projects should be entered into the Planning, Programming and Budget process. Hazard abatement projects should compete for the necessary funds within the planning, programming, and budgeting system framework.

4.14.1. Incorporate safety, fire and health requirements into repair and construction projects. **(T-1)** For projects that exceed local funding authority, follow requirements in AFI 32-1021, *Planning and Programming Military Construction (MILCON) Projects*, or AFI 32-1032, *Planning and Programming Appropriated Fund Maintenance, Repair, and Construction Projects*, as applicable, and submit projects to the parent MAJCOM for prioritization and subsequent completion for funding. Identify the portion of project cost attributable to hazard abatement. **(T-1)**

4.14.2. CE provides actual cost data for abatement of hazards in workplaces and real property installed equipment to the functional manager. The functional manager consolidates the information and sends it to the installation safety staff at least once a year for centralized reporting.

4.15. End of Year Annual Master Hazard Abatement Survey and Facility/Workplace Inspection Report. At the beginning of each fiscal year, AFSEC/SEG will send a data call for end of year hazard abatement and facility/workplace inspection information. **(T-0)**

4.15.1. This data call will be sent to each MAJCOM/FOA/DRU for subsequent distribution to their subordinate units. **(T-1)** The report template is available on the AFSEC SharePoint® site.

4.15.2. Each installation safety manager obtains and maintains the data called for in the report.

4.15.3. MAJCOMs/FOAs/DRUs will compile all subordinate units' results and submit to AFSEC within required suspense date. **(T-1)** FOAs/DRUs are exempt from submitting a report, if their hazard abatement and facility/workplace inspection data is reported by their installation safety office.

4.15.4. At joint bases where the Air Force is not the lead, the Air Force safety office will complete the report to reflect only AF-specific hazards and facilities owned by the AF, where annual facility/workplace safety inspections are performed. **(T-1)**

4.15.5. Refer to paragraph **3.6.1** to define the facilities/workplaces each safety staff is responsible for inspecting. This could include, but is not limited to, electrical vaults, pump houses, hard stands, wash racks, guard towers, etc. The local OSM will act as the decision

authority for situations where uncertainty exists with regards to facility/workplace inclusion in this data call. **(T-1)**

4.15.6. Installations not completing 100 percent facility inspections will provide justification in their report to indicate factors preventing the completion of these required inspections along with planned corrective actions to ensure full compliance with the inspection requirements. **(T-1)**

Chapter 5

INFORMATION AND DATA ANALYSIS

5.1. Information Protection. Safety investigation reports contain privileged safety information and are for mishap prevention purposes only; they are not releasable outside of safety channels. Portions of such reports, though, contain factual, non-privileged information, which may be released to the public, as well as information that is not releasable to the public. For example, information that is For Official Use Only, may be restricted from public release by the Freedom of Information Act (5 USC § 552), the Privacy Act (5 USC § 552a), Health Insurance Portability and Accountability Act (Public Law 104-191, 21 August 1996), Arms Export Control Act (Title 22, USC § 2751 [Chapter 39]), Export Administration Act of 1979 (Title 50, USC § 2401), and other pertinent laws, regulations and policies. See DoDI 6055.19, *Aviation Hazard Identification and Risk Assessment Programs (AHIRAPs)*, and AFI 91-225, *Safety Programs*, for program details and personnel protections against adverse actions as a result of Military Flight Operations Quality Assurance (MFOQA) information. Requests for release of non-privileged information in safety reports or databases, AFSEC/JA is the release authority for requests from outside the Air Force; AFSEC leadership or chiefs of safety are the release authority for mishap prevention requests within the Air Force organizations.

5.2. Recurring Publications. The goal of these publications is to prevent mishaps by providing educational information and insights. These publications discuss topics like standards implementation as well as establishment/maintenance of nuclear surety, environment, safety and occupational health programs. The OPR for each publication will determine content and frequency. AFSEC/SEF posts monthly Blue Four News on the Air Force Safety Automated System (AFSAS) website, summarizing the previous month's Class A and B aviation mishaps. This summary contains privileged information and will be protected IAW AFI 91-204.

5.2.1. AFSEC/SE will issue recurring publications pertaining to the Air Force mishap prevention program. **(T-1)**

5.2.2. MAJCOM Publications. MAJCOMs/FOAs/DRUs will utilize a variety of media and mediums to disseminate command-specific safety information to subordinate units.

5.2.3. Periodic Summaries. AFSEC sends periodic mishap summaries to the MAJCOM/FOA/DRU safety staffs. These summaries include recent mishap experience, mishap statistics, analyses of current problem areas and proposed changes in safety policy. These summaries will be disseminated, as appropriate, to subordinate organizations for mishap prevention purposes.

5.3. Methods of Information Distribution. Select an appropriate distribution method by considering content, time available and audience. Each safety office will determine the appropriate distribution methods for privileged and non-privileged safety information for their subordinate organizations. Suggested methods of distribution of privileged and non-privileged safety information, see below:

5.3.1. Privileged Safety Information. Requires appropriate screening of attendees, marking of materials and reminders of the privileged nature of the information.

5.3.1.1. Safety meetings.

5.3.1.2. Supervisor safety briefings.

5.3.2. Non-privileged safety information.

5.3.2.1. Safety meetings.

5.3.2.2. Supervisor safety briefings.

5.3.2.3. Base newspapers and bulletins.

5.3.2.4. Safety publications.

5.3.2.5. AFSEC or MAJCOM/FOA/DRU publications.

5.3.2.6. Electronic means via e-mail, web page or video.

5.3.3. Forward reports of Air Force mishaps as directed by AFI 91-204. Some of these reports may contain recommendations requiring urgent action requirements by AF agencies. Treat these mishap reports as urgent action notices.

5.3.4. Urgent action notices will be forwarded to AFSEC through the Air Force Service Watch Center (AFSWC) at DSN 227-6103 or **usaf.pentagon.af-a3.mbx.afwatch@mail.mil**. **(T-1)** AFSEC will distribute these notices to safety offices through electronic distribution as appropriate to organizations with applicable guidance/instructions. **(T-1)**

5.4. Mishap Analysis Program. In order to reduce mishaps, Commanders and Chiefs of Safety need to know the types of mishaps and mishap rates, and number of mishaps that occur in their command. Once the type and number are identified, commanders can take risk mitigation actions based on sound mishap analysis. This historical look-back approach should be complemented by a proactive, forward looking mishap prevention plan based on pre-identified hazards that haven't yet caused a mishap.

5.4.1. MAJCOM/FOA/DRU and wing safety staffs will:

5.4.1.1. Conduct an annual analysis and develop specific actions to reverse adverse trends. **(T-1)** Analysis should target specific problem areas with recommendations for commander approval and appropriate actions. This analysis complements the data required in paragraph **13.2**

5.4.1.2. Identify successes, problem areas and trends to measure safety program effectiveness and guide prevention actions. **(T-1)**

5.4.2. AFSEC will perform an annual Air Force-level trend analysis and publish results. **(T-1)**

5.5. Mishap Prevention Analysis Methods. There are several ways to approach analysis of mishap data and proactive information for mishap prevention purposes. Program analysis functions are to target, monitor and/or study.

5.5.1. Target Approach. This approach is similar to the study method below. After determining causes of mishaps, recommendations are developed and prioritized based on the frequency and severity. Corrective actions are directed at the activities and mechanisms that result in the greatest number of injuries.

5.5.2. Study Approach. This is a detailed examination of a specific problem area through the use of a systematic process. A study should follow a systematic process. It typically follows

the format of the Scientific Method. The researcher first drafts a problem statement that clearly defines the goals of the study. For example, a suitably specific research question might be, "Determine a trend in the frequency of X and identify possible explanations for this trend." The researcher then conducts background research to identify factors and data relevant to the problem. Then the researcher drafts an objective statement that describes the problem and limits the study (the hypothesis or purpose). An example is "X is increasing because of Y." Then the researcher develops a plan on how these factors and data are going to be collected, tabulated, compared, plotted and analyzed (methods). Finally, the data is collected and analyzed and results reported confirming or denying the hypotheses. Conclusions and implications regarding application of the results of the study are the most important outcome of the study.

5.5.3. Additional Analysis Categories. In this method, the safety staff selects categories of raw data and reviews them regularly in the form of tabulations or rates. The object is to identify trends and problem areas. Selection of the areas to be monitored depends on the available data and the needs of the organization. Mishap reports are a good place to start, but other areas should not be overlooked. Some other categories that may be appropriate for analysis are:

5.5.3.1. Hazardous Air Traffic Reports.

5.5.3.2. Deficiency Reports.

5.5.3.3. Inspection/Evaluation/Assessment Reports.

5.5.3.4. Foreign Object Damage Reports.

5.5.3.5. First-Aid Cases.

5.5.3.6. Maintenance Logs or Reports.

5.5.3.7. Hazard Reports.

5.5.3.8. Airman Safety Action Program (ASAP).

5.5.3.9. Military Flight Operations Quality Assurance (MFOQA) Analyses.

5.5.3.10. Line Operations Safety Audit Reports.

5.5.3.11. Air Force Combined Mishap Reduction System Surveys (AFCMRS).

5.5.3.12. Organizational Safety Assessments (OSAs).

5.6. Use of Analyzed Data. The purpose of analysis is to help prevent mishaps and present conclusions drawn in a useful format that can be applied to prevention programs. Once corrective actions are taken, follow-up analysis may be required to determine effectiveness.

5.7. Air Force Combined Mishap Reduction System. AFCMRS provides any commander with an anonymous, no-cost, web-based safety culture survey designed for operators, maintainers, support personnel, medical personnel and headquarters staff. An additional survey assesses motor vehicle safety within a unit. Results are available immediately upon survey completion and commanders receive a telephonic debrief to explain the data and to explain how to utilize the AFCMRS analytic tools. Commanders may request AFCMRS survey at **https://www.afcmrs.org/** or by contacting the AFSEC Human Factors Division (AFSEC/SEH): DSN 246-6097, Commercial (505) 846-6097.

5.8. Organizational Safety Assessment (OSA). An OSA is a customized, in-depth, proactive mishap prevention tool that aids commanders in risk assessment and safety decision making. The program focuses on operations, maintenance and support functions with a direct impact on safety across the entire organization. The OSA team is comprised of safety professionals and subject matter experts who conduct in-person surveys and in-person interviews of all members within the installation organization. The focus of the assessment is on the organization's safety culture and additional related topics specifically identified by the requesting commander. Commanders may request an OSA through AFSEC/SEH. If approved by AF/SE, AFSEC/SEH will conduct the OSA and provide an immediate out-brief to the requesting commander. Contact AFSEC/SEH: DSN 263-3513 or Commercial 505-853-3513, for information.

5.9. Military Flight Operations Quality Assurance (MFOQA). The Air Force MFOQA Program is a proactive aviation safety initiative that analyzes routine flight data to detect, measure and mitigate mishap precursors while protecting crew identity.

5.9.1. Currently, the MFOQA Program uses former Air Force instructor pilots under contract with the Safety Center to analyze the flight data and produce monthly reports for aircrew, operational leaders and safety officers. The MFOQA analysts study the aggregate data to establish a baseline of normal flight operations, detect trends toward operational limits, and examine exceedances of preset parameters. The result of such analyses allows leaders to intervene to correct adverse mission and safety trends before they lead to mishaps. Subsequent analyses of the same data allow leaders to objectively measure whether the corrective action was effective.

5.9.2. Commanders and safety professionals can utilize MFOQA to validate effectiveness of tactics, training and procedures by measuring what actually happens out in the system; compare actual versus calculated aircraft performance data; obtain insight on how effectively flights are following mission profiles; learn where unstable approaches and go-arounds are most likely to occur; detect exact parts of profiles where over/under-loads, over-speeds, and over-temps are most likely to occur; measure variations in mission accomplishment within pre-established limits in order to optimize processes; and assess whether a procedural change has had a positive or negative effect on operations. Anyone with a common access card can view aggregate fleet-wide MFOQA analysis in the pubs and reference section of AFSAS at **https://afsas.safety.af.mil**. Also, safety professionals and leaders can request customized analyses that lend specific insights into their operations. Contact AFSEC/SEF at **afsec.prosef@kirtland.af.mil**.

5.10. Airman Safety Action Program (ASAP). ASAP is a voluntary, web-based capability to report errors and hazards by Airmen in all functional areas. It facilitates hazard submission via personal or government electronic devices, and provides means to view and analyze submissions within AFSAS. ASAP also provides leadership with evidence of risk that may otherwise be invisible, so that risk management actions can be taken to improve safety. Submit reports at **https://asap.safety.af.mil**.

5.11. Line Operations Safety Audit. The Air Force Line Operations Safety Audit Program is a non-punitive, unobtrusive, peer-to-peer observation program that collects safety-related flight data during normal operations in order to assess safety margins and improvement measures.

5.11.1. Line Operations Safety Audit is designed to provide early warnings of developing safety problems. The program works by selecting and training highly qualified crewmembers

to ride on jump seats during routine flights to record the threats encountered by aircrew, the types of errors committed and how the crews managed those threats and errors in order to maintain safety. How crews manage threats and errors provides excellent insights into training and organizational culture. Line Operations Safety Audit observers also study Crew Resource Management performance and perform a carefully structured interview to collect aircrew to improve mission and safety.

5.11.2. Line Operations Safety Audit can be used by commanders and safety professionals to systematically and scientifically identify the strengths and weaknesses of normal operations, decrease the frequency of undesirable events, assess the quality and usability of procedures, detect inappropriate techniques, identify design issues with automation as evidenced through mode errors and aircrew use, and detect normalization of deviance in the form of workarounds and shortcuts used by aircrew, air traffic controllers and dispatchers.

5.12. Standard Mishap Metrics. Mishap metrics (calculated as a number of events against some kind of exposure) are an effective way to compare the actions and accomplishments of the unit. Consideration must be given to the differences in operations, environment, equipment or other variables when comparing organizations or MAJCOMs/FOAs/DRUs. The metrics used by the safety community to this point have focused on results – the number of mishaps experienced over time relative to exposure. AFSEC uses standardized rates for metrics below:

5.12.1. Aviation Mishaps.

5.12.1.1. Total USAF Aviation Class A/B Metric. This metric identifies the number of USAF aviation mishaps (to include flight, flight-related, and aircraft ground operations) and mishap rates per 100,000 flying hours. The Class A/B rate is calculated as the total number of Class A/B mishaps multiplied by 100,000 flying hours divided by the total number of flying hours.

5.12.1.2. USAF Class A Aviation Flight Mishap Metric. This metric identifies the number of USAF Class A aircraft flight mishaps per 100,000 flying hours.

5.12.1.3. Aviation-Related Fatalities Metric. This metric identifies the number of fatalities due to USAF aviation mishaps and mishap rates per 100,000 flying hours.

5.12.1.4. Destroyed USAF Aircraft Metric. This metric identifies the number of destroyed USAF aircraft due to aviation mishaps and mishap rates per 100,000 flying hours.

5.12.1.5. USAF Unmanned (Remotely Piloted Aircraft [RPA], Unmanned Aerial System [UAS], etc.) A/B Metric. This metric identifies the number of USAF mishaps and mishap rate per 100,000 flying hours.

5.12.2. Class A & B Weapons Metric. This metric identifies the total Class A and B weapons mishaps.

5.12.3. Class A & B Space Metric. This metric identifies the total Class A and B Space mishaps.

5.12.4. Ground Mishaps.

5.12.4.1. On-duty Ground Metric (Rate). This metric applies to both military and civilian personnel and is used to identify the number of mishaps, fatalities or injuries experienced by military and civilian personnel while on-duty per 100,000 personnel per fiscal year

(FY). To calculate daily, monthly or yearly on-duty rates, multiply the total number of military and civilian mishap, fatalities or injuries by 100,000 personnel divided by the military and civilian strength. **Note:** AFSEC calculates daily and yearly statistics based upon AFPC/Air Reserve Personnel Center (ARPC) strength numbers.

5.12.4.2. Off-Duty Ground Metric (Rate). This metric applies only to military personnel and is used to identify the number of mishaps, fatalities or injuries experienced by off-duty military personnel per 100,000 personnel per year. To calculate daily, monthly or yearly off-duty rates, multiply the total number of military mishap, fatalities or injuries x 100,000 personnel divided by the military strength. **Note:** AFSEC calculates daily and yearly statistics based upon AFPC/ARPC strength numbers.

5.12.4.3. Private Motor Vehicle Off-duty Metric (Rate). This metric applies only to military personnel and is used to identify the number of off-duty private motor vehicle fatalities experienced by off-duty military personnel per 100,000 personnel.

5.12.4.4. Total Recordable Incident Rate (TRIR). This metric applies only to civilian personnel and is used to identify the total number of recordable (Class A, B, C, and D) civilian injuries and illness cases per 100 full-time employees that a site has experienced per year. The TRIR is calculated as follows: TRIR = (Total number of injuries x 200,000)/Number of man-hours worked. Rationale: The 200,000 hours are based on 100 full-time employees working 40 hours per week, 50 weeks each year (100 x 40 hours per week x 50 weeks). Total man hours worked equals the personnel strength x 40 hours per week x 50 weeks per year plus overtime hours worked. **Note:** Actual hours to include overtime should be used for computing civilian hours worked.

5.12.4.5. Days Away, Restricted, and/or Transfer (DART) Case Incidence Rate. This metric applies only to civilian personnel and is used to identify the total number of recordable civilian injuries and illness cases per 100 full-time employees resulting in *days away from work, restricted work activity, and/or job transfer* that a site has experienced in a given time frame. The DART is calculated as follows: DART = (Total incidents resulting in days away, restricted work or transfer x 200,000)/Number of man-hours worked. Rationale: The 200,000 hours are based on 100 full-time employees working 40 hours per week, 50 weeks each year (100 x 40 hours per week x 50 weeks). Total man hours worked equals the personnel strength x 40 hours per week x 50 weeks per year plus overtime hours worked. **Note:** Actual hours to include overtime should be used for computing civilian hours worked.

5.12.4.6. To compare the unit's TRIR and DART rates go to the Bureau of Labor Statistics website at **http://www.osha.gov/oshstats/work.html** for national averages.

5.13. Calculating Federal Employee Compensation Metric (Rate). This metric applies only to civilian personnel. These rates are related to civilian claims that result for on-duty civilian mishaps per 200,000 hours of exposure. To calculate the rates, multiply the number of civilian compensation claims by 200,000 hours divided by civilian strength multiplied by 2,000 hours plus overtime hours, e.g., (Total number of civilian compensation claims x 200,000)/Number of man-hours worked. Rationale: The 2,000 hours equates to 40 hours per week x 50 weeks per year. **Note:** This formula is also used to calculate the Non-Appropriated Fund employee compensation rates.

5.14. AFSAS Analysis and Query Tools.

5.14.1. AFSAS Data Extraction Tool (DET). The DET was developed to supply AFSAS users with a quick and easy tool for obtaining historical mishap data. The DET generally meets the majority of requests for raw data, with the added capability to extract the data to either MS-Excel, HTML or MS-Word.

5.14.2. AFSAS Advanced Query Tool. AFSAS Advanced Query Tool is a Business Intelligence capability that provides users a repository of ready-to-go reports, formatted to define requirements. Reports found within the repository were developed to fulfill the requirements of Air Force safety personnel to generate periodic dashboard-like briefings to senior leadership. Typically, these reports have specific, repetitive data and presentation requirements that change very little over time.

5.14.2.1. AFSAS Advanced Query Tool reports retrieve data directly from AFSAS and other systems automatically, on a daily basis, leaving safety professionals more time to focus on other important tasks other than building repetitive briefings.

5.14.2.2. Additionally, the Tool offers an advance query tool called Query Studio which offers users the ability to create simple queries, but with greater options to conform data into charts and graphs for presentations from the DET.

Chapter 6

DEPLOYMENT AND CONTINGENCY SAFETY

6.1. Deployment and Contingency Safety Program. The purpose of this chapter is to provide Commander, Air Force Forces (COMAFFOR) and Air Force Forces (AFFOR) a tool to preserve combat capability and manage risk to US based and deployed Air Force units supporting US homeland and worldwide contingency operations. The rotational nature of forces within an Area of Responsibility (AOR) necessitates an active program and commander involvement at all levels. Pre-planning, training, and preparation prior to deployments are essential to mission success.

6.1.1. Objectives:

6.1.1.1. Provide timely and accurate safety information to commanders.

6.1.1.2. Enhance deployed unit mishap prevention programs.

6.1.1.3. Recommend required mishap mitigation measures.

6.1.2. No aspect of this chapter is intended to conflict with existing AFPDs, AFIs or Tactics, Techniques and Procedures. It is intended to clarify the duties and responsibilities of the COMAFFOR, AFFOR and deployed Air Force Safety office in the context of a unique deployment environment. In the event that this instruction conflicts with safety guidelines set forth by AOR governing/executive agency, apply safety requirements consistent with paragraph **1.5.3** The requirements of the Deployed and Contingency Safety Program apply to all AFFOR assigned/gained/aligned units for the duration of their assignment or deployment. In specific areas where guidance is lacking in this instruction, good judgment and thorough communication throughout the chain of command must prevail.

6.1.3. Bare Base Safety.

6.1.3.1. Risk Management. While establishing bare base and short term operations, the single most important action a deployed chief of safety can take is real-time risk management. Specific programs as listed in this instruction will be implemented as resources are available to establish and maintain them. Once in place, sustainment ops commanders, supervisors and functional managers at all levels will develop and implement safety, RM and health programs that integrate hazard reduction and safety policy into all on-duty and off-duty operations and activities. **(T-2)**

6.1.3.2. Key Programs. Bare base safety priorities must include a Spot Inspection Program (ensures safety is in the work areas), the Unit Safety Representative program (conduit for information to and from the unit), and Mishap Response Plans. **(T-1)** As the location matures, the commander must evaluate the need for additional programs. **(T-2)**

6.2. Air Force Forces Chief of Safety (AFFOR/SE).

6.2.1. AFFOR/SE elements will forward deploy as needed within the AOR in support of Air Expeditionary Force tasking, Operational Plans (OPLANS), contingency operations, theater engagement or to perform assessments.

6.2.2. AFFOR/SE Responsibilities:

6.2.2.1. Guide the execution of the AFFOR Safety Program within the AOR.

6.2.2.2. Coordinate manpower requirements for staff safety functions in the AOR.

6.2.2.3. Coordinate and execute the AFFOR Hazard Review Board.

6.2.2.4. Coordinate with the COMAFFOR, Geographic Combatant Commands (GCC) and other Component Commands of the GCC, Host Nations, sister services, MAJCOMs/NAFs, other governmental agencies and non-governmental agencies on safety-specific theater issues and safety investigations.

6.2.2.5. Author AOR OPLAN annexes, as required.

6.2.2.6. Conduct semi-annual evaluations to ensure continuity of AFFOR-gained units, observe execution of unit safety programs and provide feedback, as necessary.

6.3. AFFOR Deployed Unit Safety Functions and Organizations. AFFOR deployed safety offices will establish and maintain all required mishap prevention programs as addressed in this instruction and applicable AOR procedures. **(T-1)** AFFOR/SE will provide guidance and assistance as necessary.

6.3.1. Scope. Most units are composed of an Air Expeditionary Wing (AEW) or Air Expeditionary Group (AEG), associated flying squadrons, maintenance units and mission support units. Where there is no parent AEW or AEG, squadrons/detachments will assume duties listed below, where applicable.

6.3.2. Air Expeditionary Wing/Group/Squadron Commander Responsibilities:

6.3.2.1. Coordinate/liaise with AFFOR/SE on requested manpower changes. **(T-2)**

6.3.2.2. Provide guidance to the assigned safety staff on performing safety duties. **(T-2)**

6.3.2.3. Expeditionary Squadron Commanders will appoint a USR for occupational safety. **(T-1)** Designate, by signed memo, USRs to the AEW/AEG safety office prior to departure of the current USR or within two weeks of arrival of new appointee. Newly appointed USRs must coordinate with the AEW/AEG Safety Office for training so that training may be accomplished within seven days of appointment notification. **(T-2)**

6.3.2.4. Expeditionary flying Squadron Commanders will designate, by signed memo, an Additional Duty Flight Safety Officer to the AEW/AEG safety office prior to departure of the current Additional Duty Flight Safety Officer or within two weeks of individual's arrival. **(T-1)** Additional Duty Flight Safety Officer should attend the Aviation Safety Program Manager (ASPM) or AFSEC-certified MAJCOM equivalent courses.

6.3.2.5. At operating locations where the unit stores, handles or transports explosives, the expeditionary unit commanders will designate, by signed memo, an Additional Duty Weapons Safety Representative to the AEW/AEG safety office prior to departure of the current Additional Duty Weapons Safety Representative or within two weeks of arrival, if possible. **(T-1)** Newly appointed Additional Duty Weapons Safety Representatives must coordinate with the AEW/AEG Safety Office for training so that training may be accomplished within seven days of appointment notification. **(T-2)**

6.3.3. Operating Location and Deployed Safety Office Responsibilities.

6.3.3.1. US homeland based Operating Locations and detachments supporting AFFOR AOR missions continue to employ safety program elements IAW their respective

MAJCOM/FOA/DRU directives. US homeland based AFFOR assigned/gained unit safety offices shall incorporate AFFOR/SE coordination into their programs as determined applicable by AFFOR/SE. **(T-2)**

6.3.3.2. Utilize the semi-annual ESOH Council to review recent safety events, items on the master hazard abatement plan, hazard reports, SAV results, mishap experience and weapons and flight-related issues of concern. **(T-2)** If an ESOH Council is not conducted at a specific location, establish a semi-annual safety council to perform these tasks.

6.3.3.3. Subject to any GCC limitations, attempt to meet at least bi-monthly with host nation air force or local airfield authority counterparts concerning safety issues. Document meetings, or attempts, in writing and include agenda, attendees, discussion summary, agreements, recommendations, action items and proposed date of next meeting. **(T-2)**

6.3.3.4. Maintain a Mishap Response Plan (separately or as part of the Installation Emergency Management Plan) reflecting working relationships with local and installation Agencies. **(T-2)** Mishap Response Plan will be employed and evaluated during Installation Major Accident Response Exercises. **(T-2)** This activity should include all disciplines of safety, if possible.

6.3.3.5. All identified hazards will be tracked IAW **Chapter 4,** *Hazard Identification, Reporting and Abatement.* **(T-1)** Forward all hazard abatement issues that require Higher Headquarters funding or involvement to AFFOR/SE for dissemination outside the AOR. **(T-1).** In addition to established MAJCOM hazard abatement processes, US based organizations supporting an AFFOR/AOR forward hazard abatement issues affecting AOR mission accomplishment to AFFOR/SE for additional coordination within the Combatant Command. **(T-1)**

6.3.3.6. Work with contracting officials to review procedures for procurement requests prior to purchase via the Government Purchase Card and AF Form 9, *Request for Purchase,* **Chapter 12,** *Contract Safety,* to assist purchase agents with procurement of items and equipment that meet or exceed safety requirements, depending on the location.

6.3.3.7. Continuity Books. Each safety office will maintain comprehensive continuity book covering all duties required of the safety staff. **(T-2)** The continuity books will contain at a minimum: End of Tour reports, Rotational Safety Councils, Confined Space Program team meetings, Flight Safety meetings, Airfield Operations Board meetings, and USR meetings. **(T-2)**

6.3.3.8. End of Tour Reports. All individuals deployed into safety positions will submit end of tour comments to the deployed Chief of Safety. **(T-2)** All deployed Chiefs of Safety will consolidate inputs from each safety discipline and submit a written report to AFFOR/SE before the completion of their deployment and maintain a copy in their continuity book. **(T-2)** This report should focus on lessons learned, positive and negative. Activities, actions and duties performed while deployed may be included but the primary focus of the report is to improve the Deployed Safety Program. These reports will be posted in the Air Force Joint Lessons Learned Information System Document Library (**https://www.jllis.mil**) and forwarded or made available to other organizations (e.g. AFSEC, MAJCOMs/FOAs/DRUs, NAFs and wings), as appropriate. **(T-2)**

6.3.3.9. Weapons Safety.

6.3.3.9.1. Explosives Site Planning. Site Planning will be accomplished IAW AFMAN 91-201, *Explosives Safety Standards.* **(T-1)** AFFOR Weapons Safety Division (AFFOR/SEW) is the MAJCOM-level coordination authority for deployed AOR base explosives site planning involving Air Force munitions assets. AFFOR Chief of Weapons (AFFOR/SEW) will coordinate/liaise on similar issues in other AORs in order to keep COMAFFOR appraised of issues which may affect AFFOR combat capability. **(T-1)**

6.3.3.9.2. Deployed Weapons Safety Managers are responsible for initiating action for the explosives site planning of potential explosives sites at their base. Deployed Weapons Safety Managers will direct any problems involving explosives site planning to AFFOR/SEW. **(T-1)** AFFOR/SEW will review all AOR explosives site plans and provide guidance/technical assistance to theater operating location Weapon Safety Managers. **(T-1)** Final approval must go through appropriate agencies as identified in AFMAN 91-201. **(T-1)**

6.3.3.9.3. Units that handle less than 1,000 rounds of small arms ammunition, and are not licensed, are not required to assign an Additional Duty Weapons Safety Representative. Supervisors are responsible to monitor activities of these units.

6.3.3.9.4. Radiation Hazard Zones. Ensure Radiation Hazard Zones are established with the focus on personnel, electro-explosive devices and petroleum, oils and lubricants. Ensure interoperability with other systems deployed to the same location. Refer to AFI 48-109, *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health Program*, AFI 48-139, *Laser and Optical Radiation Protection Program*, AFI 91-208, *Hazards of Electromagnetic Radiation to Ordnance (HERO) Certification and Management*, and AFMAN 91-201 for additional information. **(T-1)**

6.3.3.10. Occupational Safety Managers (OSMs) are responsible for:

6.3.3.10.1. Providing safety briefings for the Personnel Support for Contingency Operations office's RIGHT START or equivalent program. The safety briefing will address safety conditions/issues specific to that particular base/environment. **(T-1)**

6.3.3.10.2. Safety inspections, annual, spot, special, and high interest, will be conducted IAW **Chapter 4**. **(T-1)**

6.3.3.10.3. Review designs and plans for projects and construction, coordinating with AFFOR/SEW and AFFOR/SEF, as applicable. **(T-2)**

6.3.3.11. Space Safety. For operationally deployed space assets, system-related safety issues will be directed through Wing Safety (or equivalent), NAF/Center Safety, MAJCOM Safety and AFSEC/SES. **(T-1)** Wing or equivalent-level safety offices responsible for deployed assets are responsible for the following:

6.3.3.11.1. Directed Energy Systems. Ensure all directed energy systems are directed away from aircraft traffic patterns and personnel. Ensure coordination with local air traffic control to avoid development of flight patterns that may impinge upon Directed Energy clear zones. Directed energy systems aimed above the horizon must interface with the Laser Clearinghouse IAW DoDI 3100.11, *Management of Laser Illumination of Objects in Space*. **(T-0)**

6.3.3.11.2. Frequency Management. Deploying units contact a Spectrum Manager at the squadron, wing or installation, who, in turn, will contact the MAJCOM and AFFOR frequency managers prior to their unit's arrival at the operating location to de-conflict potential interference issues. **(T-1).** Upon arrival, deploying units contact the local frequency manager to follow up on any changes which may have occurred while en route. Ensure compliance with the published Joint Restricted Frequency List. **(T-0)**

6.3.3.12. Deployed Supervisor. Ensure subordinates receive a safety briefing from the deployed location safety staff on known hazards associated with deployed locations. **(T-1)** Provide and document job safety training at deployed locations as specified in paragraph **1.6.28.13** **(T-1)** The deployed supervisor will ensure the individual is provided a copy of the documented training to return to the home station supervisor. **(T-1)**

6.4. Mishap Prevention Program. AFFOR deployed safety offices will establish and maintain all required mishap prevention programs as addressed in this instruction and applicable AOR procedures. **(T-1)** AFFOR/SE will provide guidance and assistance as necessary.

6.4.1. Mishap Investigation. In general, COMAFFOR is not the convening authority for mishaps in the AOR. Convening authority falls to the home station MAJCOM/FOA/DRU IAW AFI 91-204. The convening authority may contact the COMAFFOR and/or AFFOR/SE to request local deployed safety office SIB support beyond ISB responsibilities, provided the deployed commander and AFFOR/SE support the request. Mishap investigations should be accomplished IAW AFI 91-204 with the following caveats:

6.4.1.1. Aviation. The COMAFFOR is the convening authority for all Class E and Hazard-BASH, Controlled Movement Area Violations (CMAVs), Hazardous Air Traffic Reports (HATRs), Class E and Hazard Laser events, and appropriate hazards to promote location-dependent trending and intervention.

6.4.1.2. Ground. The COMAFFOR is the convening authority for mishaps related to War Readiness Materiel assets or injury/death of an AOR permanent change of station member.

6.4.1.3. Explosives. The COMAFFOR is the convening authority for all munitions mishaps that don't involve improper weapons activation (not actuated from weapon/aircraft). For events involving accidental or improper weapons activation (misfire, jamming, etc.), the home station MAJCOM/FOA/DRU of the person/aircraft is convening authority.

6.4.2. Mishap Notification Procedures. AFFOR/SE will be notified immediately of any Class A or Class B mishaps and included as an addressee on all safety reports, e-mails and messages concerning events that involve USAF assets in or supporting contingency operations in the AOR **(T-2)** In the event of a Class A or Class B aviation, ground or weapons mishap, AFFOR/SE will be the primary coordinator with MAJCOM/FOA/DRU convening authorities and the Air Force Safety Center. **(T-1)**

6.5. Monthly, Quarterly and Annual Safety Awards. Deployed individuals and units are eligible for MAJCOM/FOA/DRU and AF-level safety awards. Refer to AFMAN 36-2806, *Awards and Memorialization Program,* for additional information regarding AF-level safety awards.

6.6. AFFOR/SE Visits. AFFOR/SE will conduct semi-annual visits to AOR Operating Locations and deployed units. **(T-2)** Additionally, AFFOR safety will conduct interim visits as

requested by AEW/AEG commanders. **(T-2)** Due to the cyclical nature of deployed personnel, these visits are an important tool to reinforce safety presence with the subordinate units. SAVs will focus on areas requested by the AEW/AEG safety office or as determined by AFFOR/SE, based on previous program evaluation (PE) reports and other correspondence.

Chapter 7

AVIATION SAFETY

7.1. Program Management. Each unit conducting or supporting flight operations, to include small unmanned aircraft systems operations, must have an aviation safety program. The Chief of Safety or senior installation safety representative will ensure an active safety presence at the installation through the plans, programs and training responsibilities outlined below. **(T-1)**

7.1.1. The installation safety office is responsible for the base aviation safety program.

7.1.2. Tenant units coordinate their flight safety programs with the installation to avoid duplication. If the installation does not have an FSO allocation, the largest tenant with an allocation manages the base flight safety program. If neither the installation nor the tenant has an FSO allocation, flight safety responsibilities revert to the installation Chief of Safety.

7.2. Plans. The FSO/Flight Safety Manager/FSNCO should help develop and review appropriate emergency response plans and coordinate on any other installation plans involving flight safety or aircraft emergencies. These plans will include but are not limited to:

7.2.1. Installation Emergency Management Plan. **(T-3)** The COS is responsible for ensuring that units develop an aviation specific portion of the Installation Emergency Management Plan. The Chief of Safety ensures the plan defines roles, responsibilities and notification requirements for leadership and all involved agencies. The Installation Emergency Management Plan should include elements of or a reference to existing plans concerning the disaster response required by AFI 10-2501, *Air Force Emergency Management Program*.

7.2.2. Bird/Wildlife Aircraft Strike Hazard (BASH) Plan. **(T-1)** The installation safety office, or assigned tenant unit with a flying mission, will establish the BASH plan, to include, defining the nature and extent of wildlife hazards and implementation of the plan. **(T-2)**

7.2.2.1. BASH Plan implementation must be consistent with all program requirements IAW AFI 91-212, *Bird/wildlife Aircraft Strike Hazard (BASH) Management*.

7.2.2.2. BASH plans for Outside Continental United States (OCONUS) locations should include environmental considerations included in the Status of Forces Agreement, and, when available, input from local, regional or governmental environment and wildlife personnel.

7.3. Programs. The COS will ensure the following programs are established, maintained and reviewed at least annually. **(T-1)**

7.3.1. BASH Program. Refer to AFI 91-212 for the responsibilities for establishing and administering the Air Force BASH Program.

7.3.2. Hazardous Air Traffic Reporting (HATR) Program. HATR information is vital to Air Force flight safety. Use of information taken from these reports is for mishap prevention, not intended to initiate disciplinary actions. HATR information is not privileged information and is releasable outside Air Force channels. The AF Form 651, *Hazardous Air Traffic Report (HATR)*, should not include identities or personal information. Responsibilities for establishing and administering the HATR program include:

7.3.2.1. Unit commanders will ensure AF Form 651 and AF Form 457, *USAF Hazard Report*, are available to aircrews at base operations facilities, flying squadron operations offices, in trip kits and USAF Air Traffic Control (ATC) facilities. **(T-3)** Commanders must emphasize the importance of identifying hazardous situations and direct the filing of appropriate HATR events as a method of preventing future mishaps. **(T-3)**

7.3.2.2. Unit safety offices will investigate high accident potentials (HAPs) and HATRs IAW AFI 91-204 and AFMAN 91-223**. (T-3)** The FSO or Flight Safety Manager will ensure HATR reporting procedures and requirements are briefed at least annually to aircrew and ATC personnel. Refer to AFMAN 91-223 for reporting requirements.

7.3.3. Midair Collision Avoidance (MACA) Program. Units with flying programs must establish a written MACA program. **(T-2)** The unit safety office is responsible for its creation, documentation and upkeep. **(T-3)** The FSO/Flight Safety Manager works closely with the Operations Group-determined OPR and other interested parties such as the Airfield Operations Flight Commander, the airspace manager, local Fixed Base Operators, Aircraft Owners and Pilots Association, and the local Flight Standards District Officer, to establish a comprehensive MACA program. Use the resources and services of the Federal Aviation Administration (FAA) Flight Standards District Officer accident prevention specialists. Tailor the MACA program to meet local needs. As a minimum, the FSO/Flight Safety Manager will coordinate with appropriate agencies to accomplish these key objectives:

7.3.3.1. Ensure the free flow of MACA information between installation and tenant organizations, effective communication between base, local military aviation units, local airport managers, fixed base operators, and local small unmanned aircraft systems operators and actively support the HATR Program. Actively engage and acquaint the local flying public and all military units that use the local airspace with configurations, speeds, and altitudes of routine operations in the vicinity. The FSO/FSM should schedule MACA meetings during a time that allows maximum participation of both civilian and military personnel.

7.3.3.2. Evaluate the midair collision potential with civilian operators and work with operators of nearby airfields to reduce risk and minimize the hazards. **(T-3)** Evaluate the midair collision potential with small unmanned aircraft systems and work with small unmanned aircraft systems operators to reduce risk and minimize the hazards. **(T-3)**

7.3.3.3. Develop a MACA pamphlet. **(T-3)** The MACA pamphlet is an installation-wing responsibility. Tenant units will provide MDS-specific information as required and will coordinate on the installation-wing pamphlet. **(T-3)** Overseas locations should consider publishing the pamphlet in the host country's language along with English. Provide educational programs/publications to general aviation servicing facilities to increase the use of available radar services among civil aircraft. Develop appropriate maps and graphics showing the base radar services and routes. **(T-3)** Distribute the maps to all civil airfield managers, fixed base operators, military base operations, airports, local small unmanned aircraft systems operators, including hobby shops and model aircraft clubs, and other flying operations that use the surrounding airspace. **(T-3)**

7.3.3.4. Units may combine MACA programs with other military organizations in a 50-mile range of their base. **(T-3)** This will require more coordination efforts but will result in a better product to be used by the area's civilian population.

7.3.4. Awards Program. Ensure proper recognition of personnel through the Air Force Safety Awards Program as outlined in AFMAN 36-2806. **(T-3)**

7.3.5. Operational/Training Squadron Flight Safety Program. The squadron commander will maintain overall supervision of the flight safety program. **(T-3)** The squadron assigned flight safety officer represents an extension of the wing flight safety program at the squadron level. In addition to managing the squadron flight safety program, these individuals are still responsible for carrying out all normal wing safety duties as requested by Wing Chief of Safety. Units possessing aircraft with enlisted crew positions should also consider appointing an enlisted crewmember as additional duty flight safety NCO to assist in the flight safety program. The squadron commander will ensure that the following actions are accomplished by the squadron assigned flight safety officers:

7.3.5.1. Upon appointment, contact the wing safety office for required training. **(T-3)**

7.3.5.2. Administer the unit safety program using this instruction as a guide and management tool. **(T-3)**

7.3.5.3. Disseminate flight safety information to unit crewmembers. **(T-3)**

7.3.5.4. Forward all flying safety matters of significance, which cannot be corrected at unit level through the unit commander to the COS. **(T-3)**

7.3.5.5. Assist in conducting wing safety spot inspections as requested and conduct unit self-inspections. **(T-3)**

7.3.5.6. Ensure a current file of applicable safety directives, to include this instruction, AFI 91-204, AFMAN 91-223 and AFI 91-212 are maintained by the unit. **(T-3)**

7.3.5.7. Maintain Volume V of the squadron Flight Crew Information File IAW AFI 11-202, Volume 2, *Aircrew Standardization/Evaluation Program,* if applicable. **(T-3)** Use of Volume V is optional IAW AFI 11-202, Volume 2. If Volume V is utilized, procedures will be implemented to ensure all aircrews review Volume V. **(T-3)**

7.3.5.8. Maintain unit safety bulletin boards. **(T-3)**

7.3.6. Data-centric Proactive Safety Programs. Chiefs of Safety and unit-level staffs will use MFOQA, ASAP and Line Operations Safety Audit proactive safety as correlated data streams for hazard identification and risk mitigation to prevent mishaps and accomplish the mission. **(T-2)** Proactive safety programs enable leaders, safety professionals, aircrews and support personnel to achieve efficiencies in maintenance, operations, safety, tactics and training. These programs affect positive change in the Air Force by engendering a culture where personnel are willing to identify hazards and errors, not cover them up. Refer to paragraphs **5.10** – **5.12** for a more detailed description of MFOQA, ASAP and Line Operations Safety Audit. Refer to AFI 91-225, *Safety Programs,* for how all proactive safety programs are conducted in a Just Culture.

7.3.7. Small Unmanned Aircraft Systems Flight Safety Program. Units conducting Small Unmanned Aircraft System Operations are typically not designated as Flying Squadrons (i.e., Maintenance, Public Affairs, CE, Security Forces or small flying units), however, they will comply with the following:

7.3.7.1. Will have an Squadron Assigned Flight Safety Officer/Flight Safety Manager assigned as an additional duty with responsibilities identified in paragraphs **7.3.5.1** through **7.3.5.8,** or may have the responsibilities of the Squadron Assigned Flight Safety Officer shared with another unit on base. **(T-3)**

7.3.7.2. Units up to the Wing level will designate a primary and alternate System Expert Small Unmanned Aircraft Systems Officer for each UAS operated by the unit, for the purpose of mishap investigations. **(T-3)**

7.3.7.3. At least one squadron assigned flight safety officer/Flight Safety Manager on a base supporting small unmanned aircraft systems will be ASPM and AMIC trained. **(T-3)**

7.3.7.4. Small unmanned aircraft systems operations must still adhere to requirements of this chapter. **(T-3)**

7.4. Aero Club Operations. The installation unit commander appoints an FSO as a safety advisor to the base Aero Club. **(T-3)** If the installation unit does not have an assigned FSO, the commander will obtain the assistance of a tenant unit FSO to provide safety assistance to the Aero Club. **(T-3)** The installation safety office may investigate Aero Club mishaps IAW AFI 91-204. However, the National Transportation Safety Board or host nation civil aviation authority has primary responsibility for investigating and reporting. Refer to AFI 34-101, *Air Force Morale, Welfare, and Recreation (MWR) Programs and Use Eligibility*, for further guidance on Aero Club support. The wing safety advisor should attend the monthly aero club safety meetings.

7.5. Training Meetings and Briefings. The COS will ensure the following:

7.5.1. Each flying unit will conduct quarterly aircrew flying safety meetings. **(T-3)** This requirement is fulfilled whether conducted as a unit or wing. Topics covered should include unit mishaps, MDS-specific trend analysis, local flying hazards (e.g., airspace, aerodrome), seasonal concerns (weather), human factors to include annual fatigue management and awareness training given by Aerospace Physiology or Aerospace Medicine, etc.

7.5.2. Maintenance units receive timely briefings on maintenance-related mishaps and trends relevant to the unit's mission/MDS. **(T-3)**

7.5.3. Airfield Operations personnel receive timely briefings on HATR and CMAV related events and trends. **(T-3)**

7.5.4. Interim Safety Board Training**.** The FSO/Flight Safety Manager conducts annual training for unit personnel identified to serve as interim safety board members in conjunction with or for the safety office. **(T-3)** This requirement is not applicable for AFRC. ISB composition is identified in AFMAN 91-223.

7.5.5. Other Activities Related to Flight Safety. The FSO/Flight Safety Manager/FSNCO or their designated representative, will attend Airfield Operations Board meetings, Foreign Object Damage Prevention Committee meetings and Standardization/Evaluation and Training review meetings. **(T-3)**

7.6. Inspections/Assessments and Monitoring.

7.6.1. Flight Safety personnel will conduct assessments/inspections of all assigned (installation) flying units' flight safety programs for compliance with USAF and wing safety requirements IAW **Table 3.1** **(T-3)** Assessments/inspections of tenant unit flying safety

programs will only be accomplished as stated in base support agreements. **(T-3).** The tenant's higher headquarters assesses the tenant's internal program. **(T-3)** Refer to **Chapter 3,** *Safety Assurance*, for additional guidance.

7.6.2. USAF Hazard Reporting. The FSO or Flight Safety Manager investigates reported flight-related hazards according to **Chapter 4.**

7.6.3. Flight Safety personnel (to include FSNCO and squadron assigned flight safety officer) will inspect, assess and monitor flight-related workplaces, operations and support IAW **Chapter 3** criteria. With the assistance of Occupational Safety, assign RACs to weapons safety hazards **(T-2)** Potential spot inspection/monitoring areas include, but are not limited to:

7.6.3.1. Airfield. Installation has responsibility for entire airfield. Tenant units need only inspect/monitor unit-specific ramps and taxiways. **Note:** May be accomplished in conjunction with activities prescribed in AFI 13-204V2, *Airfield Operations Standardization and Evaluations*, and AFI 13-204V3, *Airfield Operations Procedures and Programs*.

7.6.3.1.1. High-interest areas.

7.6.3.1.2. Ramps and runways, including taxiways, overruns, stressed pavement areas and unstressed pavement areas immediately next to runways.

7.6.3.1.3. Engine-run areas, including engine exhaust standoff distances and condition of pavement to prevent Foreign Object Damage.

7.6.3.1.4. Lighting systems, including runway lights, approach, taxiway, and ramp lights and vehicle control lights.

7.6.3.1.5. Barriers and arresting gear.

7.6.3.1.6. Airfield obstructions, including obstacles on approach paths.

7.6.3.1.7. Airfield markings, including runway markings, distance markings, taxi lines, etc.

7.6.3.1.8. Airfield signs, include distance remaining, instrument hold, visual flight rules hold, taxiway guidance, etc.

7.6.3.1.9. Vehicle traffic control on or around the airfield and parking areas.

7.6.3.1.10. Airfield vegetation and drainage.

7.6.3.1.11. Wildlife hazards present on the airfield.

7.6.3.2. Operations and Maintenance.

7.6.3.2.1. Supervisor of flying program.

7.6.3.2.2. Runway supervision program.

7.6.3.2.3. Emergency-response equipment, including crash-rescue vehicles, ambulances, communications and crash-recovery equipment.

7.6.3.2.4. Bird/Wildlife strike reporting.

7.6.3.2.5. Aircraft marshaling, fueling and towing procedures.

7.6.3.2.6. Foreign object damage-control program, control equipment and procedures.

7.6.3.2.7. Aero Club operations.

7.6.3.2.8. Aircraft generations, engine start and launch exercises.

7.6.3.2.9. Post-flight maintenance debriefing procedures.

7.6.3.2.10. Unit and transient (installation only) maintenance operations.

7.6.3.2.11. Product Quality Deficiency Reporting System.

7.6.3.2.12. Flight safety information use in maintenance training flight.

7.6.3.2.13. Maintenance engine-run training procedures.

7.6.3.2.14. Snow removal plans and operations, if applicable.

7.6.3.2.15. Deicing training for aircrew and maintenance, to include flightline-deicing procedures.

7.6.3.2.16. Low-level routes, weapons ranges and drop zones.

7.6.3.2.17. Functional check flight procedures.

7.6.3.2.18. Assigned and attached unit's flight workplaces, briefings and meetings.

7.6.3.2.19. Life-support workplaces and training programs.

7.6.3.2.20. Egress training.

7.7. Airfield Maintenance, Construction and Waivers (Installation). COS or designated SE representative monitors routine airfield maintenance and major construction projects. (**Note:** Ensure any conversations with the contractors concerning safety-related matters are not construed as contract changes). On major construction projects, the Chief of Safety or designated SE representative reviews the initial plan and follow-on plans for compliance with AFI 32-1023, *Designing and Constructing Military Construction Projects*, UFC 3-260-01, *Airfield and Heliport Planning and Design*, and attends the pre-construction conference or briefing to consider if it will affect unit operations. **Note:** At OCONUS locations, plans shall be IAW Status of Forces Agreement, Host Nation Funded Construction Agreement and Bilateral Infrastructure Agreement. **(T-3)**

7.7.1. Chief of Safety will participate in annual Airfield Manager's review of airfield waivers per AFI 13-204V3. **(T-3)**

7.7.2. When able, the Chief of Safety should participate in risk analysis of items needing waivers and work to eliminate those items. Consider these factors:

7.7.2.1. The inspection of areas before use.

7.7.2.2. The impact of maintenance and construction on daily flying schedule and emergency situations.

7.7.2.3. The communications between the tower and contractor, and the availability of the contracting agent.

7.7.2.4. Controlling vehicular traffic on the airfield and designating haul routes for contractor trucks.

7.7.2.5. Briefing pilots and transient aircrews with updated information.

7.7.2.6. Establishing the minimum allowable distance between equipment and the runway.

7.7.2.7. Marking obstructions, controlling foreign objects and assigning hearing protection.

7.7.2.8. Explosives safety criteria.

7.7.2.9. The potential impact of construction on wildlife hazards to airfield operations.

Chapter 8

OCCUPATIONAL SAFETY

8.1. Program Management. This chapter contains the minimum requirements for safety offices at all command levels. Occupational safety mishap prevention efforts include both on-duty and off-duty activities.

8.1.1. Each installation occupational safety manager will implement and manage a base-wide occupational safety program IAW applicable AFPD/AFI/AFMAN 90- and 91-series guidance, and other applicable regulatory guidance. **(T-1)** Newly assigned occupational safety managers will conduct and document an occupational safety program self-assessment within 90 days of taking the position. **(T-1)**

8.1.2. Installation safety offices may not impose host command-unique requirements on tenant units unless specified in the support agreement. Tenant USAF units without full-time qualified safety authorizations receive the same safety services as installation subordinate units. (**Note:** HAF, MAJCOM, AFOTEC and NAF safety offices are not configured as a traditional safety office IAW AFMS 11H100 and are, therefore, treated as a tenant unit without an assigned safety staff. They will follow the host program unless specified in a host tenant support agreement.) Support Agreements will identify and delineate responsibilities. IAW DoDI 4000.19, *Support Agreements,* and AFI 25-201, *Intra-Service, Intra-Agency, and Inter- Agency Support Agreements Procedures,* non-USAF tenant units may be provided safety services based on support agreements (host may require reimbursement for services provided). **(T-2)** Wing subordinate units and tenant organizations will implement a program that supports the installation program as defined within the host/tenant support agreements, when applicable. **(T-1)**

8.1.3. One-deep safety positions will develop and maintain complete and thorough continuity folders covering all duties required by their positions. **(T-1)**

8.2. Assurance Requirements. Occupational safety personnel will conduct inspections and assessments of all assigned units. **(T-1)** Refer to **Chapter 3**, *Safety Assurance,* for inspection and assessment guidance.

8.3. Installation Occupational Safety Staff Responsibilities. The installation Occupational Safety staff will manage:

8.3.1. Ensure all managers, supervisors, and employees are trained to identify, evaluate, and control workplace hazards. **(T-1)** Assist supervisors in developing and maintaining Job Hazard Analysis(es), and setting up programs to ensure organizational compliance with OSHA, DoD, and Air Force safety requirements. **Note:** Overseas installations will consider application of installation nation standards as well. **(T-1)**

8.3.2. Investigate and report all events IAW AFI 91-204, *Safety Investigations and Reports,* and AFMAN 91-224, *Ground Safety Investigations and Reports*. **(T-1)**

8.3.3. Will work cooperatively with other installation functions to include but not limited to tenant units safety staff, BE, CE, Security Forces, Personnel, Contracting, Logistics Readiness Squadron, Force Support Squadron, Public Health, Installation Occupational and

Environmental Medicine Consultant, FES Flight, and Aerospace and Operational Physiology Technician personnel to provide an effective occupational safety program. **(T-2)**

8.3.3.1. Coordinate with installation LRS to obtain GOV damage/mishap/abuse reports to evaluate and determine mishap reporting criteria. **(T-2)**

8.3.3.2. Coordinate with the installation Judge Advocate to obtain data on tort claims that reached Class D or higher threshold value. **(T-2)**

8.3.3.3. Coordinate with the installation contracting office to obtain data on contractor mishaps involving government losses that reached Class D or higher threshold value. **(T-2)**

8.3.4. Monitor on-base sports facilities and activities. **(T-2)**

8.3.5. Implement a traffic safety program IAW AFI 91-207, *US Air Force Traffic Safety Program.* **(T-1)** Joint bases will follow the established Memorandum of Agreement. **(T-0)**

8.3.6. Review and recommend for approval, as appropriate, the use of new hazardous materials IAW AFI 32-7086, *Hazardous Materials Management.* **(T-1)** Coordinate on updates of the installation's hazardous materials Authorized User List when requested by the installation Environmental Management office under the installation Hazardous Materials Management Program. **(T-1)**

8.3.7. Review CE work requests, project designs, and specifications for safety criteria. **(T-1)**

8.3.8. Provide technical safety consultation services to all base activities and promote on-duty and off-duty safety awareness. **(T-2)**

8.3.9. Budget for training safety professionals, safety educational materials, and safety promotional campaigns. **(T-1)** Refer to AFI 65-601V1, *Budget Guidance and Procedures,* for more information.

8.3.10. Work with contracting officials and unit purchasing personnel to ensure requests for equipment, products, and services using purchase orders and/or Government Purchase Card are reviewed for potential safety and health impact IAW AFI 64-117, *Air Force Government-Wide Purchase Card (GPC) Program,* AFI 32-7086, and **Chapter 12,** *Contract Safety.* **(T-1)**

8.3.11. Assist tenant units without full-time safety personnel with ground event reporting procedures and requirements IAW established applicable host/tenant support agreements. **(T-2)**

8.3.12. Coordinate Department of the Air Force civilian and Non-Appropriated Fund civilian mishap investigation information through the appropriate channels, and provide a representative to actively participate in the Federal Employee Compensation Act Working Group, if one is held at the installation level. **(T-0)**

8.3.13. Maintain records of reportable and recordable events IAW 29 CFR 1904, *Recording and Reporting Occupational Injuries and Illnesses,* DoDI 6055.07, *Mishap Notification, Investigation, Reporting, and Record Keeping,* AFI 91-204, AFMAN 91-224, and AFMAN 33-363, *Management of Records.* **(T-0)**

8.3.14. Maintain a master list or file of approved safety, fire protection, and occupational health variances or exemptions to AFMAN 91-203 and any variances to AFOSH requirements

that apply to the installation. **(T-1)** The current approved variances/exemptions are available at the AFSEC/SEG SharePoint® website: **https://cs2.eis.af.mil/sites/10178/SEGS/Pages/SEGSHome.aspx.**

8.3.15. Responsible for developing and implementing an OSHA Reception and Action Plan. This plan will address actions to implement prior to, during, and after an OSHA event. **(T-0)** This includes official OSHA representative installation visits and OSHA requests for self-investigation/inspection. These procedures will address all requirements called for in paragraph **13.3** and those contained within DoDI 6055.01, Enclosure 3. **(T-0)**

8.3.16. Assist in the development and review of emergency response plans and procedures for handling events such as, but not limited to ground and aircraft emergencies, toxic spills, ventilation malfunctions, cleanup operations, and emergency egress. **(T-1)** These areas of review include:

8.3.16.1. Disaster response required by AFI 10-2501.

8.3.16.2. HAZMAT response required by AFI 10-2501.

8.3.16.3. Response to severe weather warnings.

8.3.16.4. Crash recovery plans.

8.3.16.5. Notifying and convening Interim Safety Boards (ISBs) for ground-related mishaps.

8.3.17. Provide fully qualified occupational safety personnel in support of Air Expeditionary Force deployment tasks. **(T-1)** Occupational safety managers will know the current deployment status of all assigned military personnel and ensure the proper status information is provided for the Airman Readiness Tool Report. **(T-1)**

8.3.17.1. To ensure personnel are competent with occupational safety program responsibilities, the individual's supervisor or occupational safety manager will conduct a review of all appropriate skill level core tasks with individuals prior to their deployment. **(T-1)**

8.3.17.2. Individuals who do not meet required core tasks for appropriate skill level requirements will be required to receive appropriate training from their supervisor, OSM, or other recognized source prior to deployment. **(T-1)**

8.3.18. Ensure qualified and proficient Occupational Safety (1S0/0018) personnel conduct the Air Force Supervisor Safety Training (SST) that incorporates MAJCOM/FOA/DRU and organization/installation unique requirements, if any, into the core curriculum. **(T-1)** Group or Wing-level tenants with an assigned safety staff will conduct their own SST to ensure their assigned personnel are trained in their MAJCOM/FOA/DRU program specifics unless otherwise specified in host/tenant support agreements. **(T-1)**

8.3.19. Assist COS in new commander safety orientations/immersion when occupational safety interest are present in the organization. **(T-1)**

8.3.20. Administer the occupational safety awards program IAW AFMAN 36-2806. **(T-1)**

8.3.21. Ensure newly assigned USRs are trained within 30 working days after receipt of appointment letter. **(T-2)** Air Reserve Component primary and alternate USR will complete initial training within two unit training assemblies of appointment. **(T-2)**

8.3.21.1. USRs will receive localized training based on USAF, MAJCOM/FOA/DRU, and installation-specific requirements. **(T-1)**

8.3.21.2. Deployed USRs will complete the USR Training Course located on ADLS within three calendar days of the safety office receiving notification of appointment. **(T-2)** Upon completion of the computer based training, ensure a copy of the training certificate is provided to the safety office. **(T-1)** The supporting occupational safety office will provide localized training within seven calendar days of receipt of appointment letter. **(T-1)**

8.3.22. Evaluate and process safety related hazard reports, to include ASAP generated reports, and maintain a master hazard report log. **(T-1)**

8.4. Tenant Unit and Geographically Separated Unit Responsibilities. The tenant's higher headquarters will perform assessments of the tenant's internal program IAW **Chapter 3**. **(T-1)**

8.4.1. Tenant and Geographically Separated Units without full-time safety staff will appoint an occupational USR IAW paragraph **2.2** and comply with the responsibilities outlined in paragraphs **2.2** and **8.5,** and any applicable formal support agreements. **(T-1)**

8.4.2. Tenant units with authorized qualified safety personnel carry out all program elements not performed by the installation and conduct their assessments, inspections and mishap investigations IAW a host/tenant support agreement. The host/tenant support agreement will specify those responsibilities from paragraph **8.3** that have been agreed to. **(T-2)**

8.5. Unit Safety Representative (USR) Responsibilities. In additional to paragraph **2.2,** USRs will:

8.5.1. Advise the commander on safety related matters at least on a quarterly basis or more frequently as necessary and document key elements briefed. **(T-2)**

8.5.2. Assist supervisors and unit personnel in the hazard abatement process. **(T-1)**

8.5.3. Ensure mishap notification procedures are established in the unit and assist installation safety, unit commander, and supervisors with mishap investigations. **(T-1)**

8.5.4. Disseminate safety educational materials within the unit. **(T-1)**

8.5.5. Conducts spot inspections IAW paragraph **3.7.3** **(T-1)**

8.5.6. Comply with the safety program requirements to include attending USR meetings. **(T-1)**

8.5.7. Post AFVA 91-209, *Air Force Occupational Safety and Health Program*, in a conspicuous location readily accessible to all employees and applicants for employment. **(T-1)**

8.5.8. Provide their safety office with a current listing of all facilities owned/used by their unit for safety inspection purposes. **(T-1)**

8.5.9. Provide a Rapid Response Report for OSHA when requested by the safety office. **(T-1)**

8.6. Hazard Identification and Abatement. The installation occupational safety office will:

8.6.1. Assign RACs to safety hazards and deficiencies, as applicable, and coordinate with health and fire protection officials when it involves their area of expertise. **(T-1)** For additional instruction for assigning RACs, see paragraphs **13.7**, **13.8**, **15.1** and **15.2** **Note:** Tenant unit occupational safety staffs are permitted to assign RACs, but will coordinate RACs 1-3 with the installation occupational safety office to ensure the RACs are managed accordingly in the master hazard abatement plan. **(T-1)**

8.6.2. Complete abatement priority number when required to assist in establishing funding priorities. **(T-1)**

8.6.3. Maintain the installation master hazard abatement plan, including AF Form 3, *Hazard Abatement Plan*, covering safety, fire, and health hazards. **(T-0) Note:** Assignment of RACs for fire and health hazard(s) is the responsibility of the fire department and medical officials respectively. Fire safety deficiencies will not be included in the master hazard abatement plan as they are managed IAW AFI 32-10141, *Planning and Programming Fire Safety Deficiency Correction Projects.*

8.7. Federal/State Inspections of DoD Working Conditions and Mishap Investigations. For guidance related to federal/state Events, refer to paragraph **13.3**

8.8. DoL Occupational Safety and Health Administration Annual Visit Summary. AFSEC/SEG will use the procedures and information attained through the AFSAS OSHA Events Module to identify trends, corporate-wide issues, and complete the annual report required by the DoL. **(T-0)**

8.9. Occupational Safety Corporate Committee. The Occupational Safety Corporate Committee is a forum conducted at the direction of the AF Chief of Safety. The forum meets at least semi-annually to address issues of interest to the AF occupational safety community. The committee membership includes, AFSEC and MAJCOM/FOA/DRU occupational safety managers. The charter is posted on Air Force Occupational Safety SharePoint® website (**https://cs2.eis.af.mil/sites/10178/**).

Chapter 9

WEAPONS SAFETY

9.1. Program Management. The Weapons Safety program comprises four disciplines: Explosives Safety, Missile Safety, Nuclear Surety and Directed Energy Weapon (DEW) safety.

9.1.1. Units at and above squadron level with an explosives, missile, nuclear or directed energy weapons mission must have a weapons safety program**. (T-2)**

9.1.2. The installation safety office coordinates weapons safety for the entire installation. Tenant units implement mission unique mishap prevention programs where the installation does not have a mission in that area. Tenant units must coordinate, through an MOA or MOU, any additional program functions with the installation to avoid duplication and clearly delineate responsibility. **(T-3)**

9.1.3. Where the host owns the mission, the tenant organization is subject to the host's MAJCOM requirements.

9.2. Weapons Safety Personnel Management and Manning Plan. Weapons Safety personnel are normally from the 2WXXX or 2MXXX career fields. Civilian personnel with the appropriate series (0018, 0017) experience in the safety career program may be used in all positions that do not have a military necessity. It is the responsibility of the Chief of Safety to recruit, train and staff the Weapons Safety function. **(T-2)**

9.2.1. MAJCOM Chief of Weapons Safety must have munitions, missile or nuclear weapons experience.

9.2.2. Individuals will be scheduled for formal Weapons Safety Management Course L3AZR2W071-0C2A within 90 days of assuming weapons safety position and complete the course within six months of being assigned. MAJCOMs must ensure all weapons safety personnel in their command are properly trained. Additional nuclear surety training requirements are listed in AFI 91-101, *Air Force Nuclear Weapons Surety Program.*

9.2.3. Upon completion of training course L3AZR2W071-0C2A and six months in the Weapons Safety position, the Chief of Safety will ensure the individual is awarded special experience identifier (SEI) 375 and a two-year assignment deferment is initiated if the individual is satisfactorily accomplishing Weapons Safety tasks. **(T-3) Note:** Assignment deferment is not applicable for ANG or AFRC personnel.

9.2.4. Based on mission needs, Weapons Safety personnel are highly encouraged to attend the following courses: Mishap Investigation Non-Aviation (MINA), Introduction to Mishap Investigation, AMMO-47 Lightning Protection for Air Force Facilities, and AMMO-65 DoD Contractor’s Explosives Safety Standards.

9.3. Explosives Safety Standards. Air Force explosives safety standards are in AFMAN 91-201, *Explosives Safety Standards*. Criteria for specific explosives are specified in technical publications and other standard publications, such as command and local directives.

9.4. Weapons Safety Personnel. Manage Weapons Safety program to ensure Air Force units understand and comply with all explosives, missile, nuclear surety and directed energy safety standards.

9.4.1. Review waivers, exemptions and deviations from established explosives safety criteria and advise commanders of the increased damage potential these exceptions allow. **(T-1)**

9.4.2. Ensure units identify and integrate compensatory measures into locally written procedures. **(T-2)**

9.4.3. Assist units in performing a risk assessment for explosives operations according to applicable directives. **(T-2)**

9.4.4. Coordinate on all local written procedures affecting weapons safety and perform annual review. **(T-2)**

9.4.5. Remain aware of planning and activities on the installation that affect weapons safety. The Weapon Safety Manager must conduct and maintain documentation of initial and annual reviews on munitions-related written instructions, explosives test plans, deployment plans, OPLANs, operational orders and local directives involving the storage, handling and inspection of nuclear weapons, missiles, explosives or directed energy weapons. **(T-2)** Copies of reviewed documentation must be maintained by safety office. **(T-2)** Archived/inactive test plans, safety appendices or written procedures do not require annual review unless reactivated.

9.4.6. Advise each new wing and group level commander responsible for an explosive safety program within 60 days of appointment on applicable waivers, exemptions, deviations and compensatory measures as well as the associated risk for each. Commanders below group level will be briefed by appointed Additional Duty Weapons Safety Representatives, when appropriate. **(T-2)**

9.4.7. Participate in mishap prevention and Risk Management determination in the following areas:

9.4.7.1. Maintenance, storage, alert, research and developmental test, and operating locations. **(T-2)**

9.4.7.2. Flight line explosives operations. **(T-2)**

9.4.7.3. Operational procedures for aircraft carrying hazardous materials. **(T-2)**

9.4.7.4. Explosives Ordnance Disposal proficiency/demolition ranges. **(T-2)**

9.4.7.5. Nuclear surety elements. (See AFI 91-101). **(T-2)**

9.4.7.6. Munitions Material Handling Equipment quality assurance programs. **(T-2)**

9.4.7.7. Weapon systems maintenance. **(T-2)**

9.4.7.8. Weapon systems modifications, special exercises and test programs. **(T-2)**

9.4.7.9. Planning for contingencies. **(T-2)**

9.4.7.10. Concurrent Servicing Operations. **(T-2)**

9.4.7.11. Licensed locations. **(T-2)**

9.4.7.12. Installation support (Continental United States only) for Department of Energy (DoE) shipments (SAFE HAVEN). (See AFMAN 91-201). **(T-2)**

9.4.7.13. Weapons safety training for unit personnel. **(T-2)**

9.4.7.14. Weapons test review process, if applicable. **(T-2)**

9.4.7.15. Explosives movement route. **(T-2)**

9.4.7.16. Hot Cargo Pads and Inspection Points/Secure Holding Location for Explosives-Loaded Commercial Vehicles. **(T-2)**

9.4.7.17. Management, storage and disposition of Materials Potentially Presenting an Explosives Hazard. **(T-2)**

9.4.7.18. Aerial port explosives operations. **(T-2)**

9.4.7.19. Small arms ranges. **(T-2)**

9.4.7.20. Field training exercise areas where explosives are used. **(T-2)**

9.4.7.21. Missile Alert Facilities and Launch Facilities. **(T-2)**

9.4.8. Annually review installation explosives location map and provide changes and corrections to CE. Review must be documented and maintained by the safety office. CE published maps should be coordinated with logistics, operations and safety. The reviews can be documented on separate logs and will include but not be limited to the following applicable areas:

9.4.8.1. Explosives safety "clear zones" required around each location based on approved site plans.

9.4.8.2. Primary and alternate explosives movement routes through the installation.

9.4.8.3. Authorized flight line locations for conducting explosives operations to include concurrent servicing operations activities, explosives aircraft cargo on or off loading, and combat aircraft explosives loading.

9.4.8.4. Locations for handling hung ordnance and gun-clearing operations.

9.4.8.5. Arm and de-arm areas.

9.4.8.6. Explosives support workplaces, such as flightline munitions holding areas.

9.4.8.7. Base explosives prohibited zones (see AFMAN 91-201 and UFC 3-260-01). **Note:** At OCONUS locations, consideration must be given to Status of Forces Agreements, Host Nation Funded Construction Agreements and Bilateral Infrastructure Agreements.

9.4.8.8. Vehicle inspection points and suspect vehicle areas.

9.4.8.9. Parking spots for aircraft loaded with munitions or explosives identified in AFMAN 91-201.

9.4.8.10. DEW operations, including potential electromagnetic radiation hazard zones, and maintenance location hazard zones that could affect munitions operations. After 100 percent evaluation, plot only those zones that actually impact munitions operations to include primary and alternate explosive routes. Identify hazardous DEW effects to potential explosive sites, including ordnance and fuel. The review must be documented and maintained by Weapons Safety. **(T-2)** The reviews can be documented on separate logs.

9.4.8.11. Explosives Ordnance Disposal range(s).

9.4.8.12. Base weapons range(s).

9.4.8.13. Restrictive easement(s).

9.4.9. With the assistance of Occupational Safety, assign RACs to weapons safety hazards **(T-2)**

9.5. Weapons Safety Program Requirements. Units that maintain explosives must:

9.5.1. With the assistance of the installation CE and Safety offices, submit explosives site plans IAW AFMAN 91-201. The installation safety office is the OPR for all explosives site plans. **(T-2)**

9.5.2. Request a license for facilities that store small quantities of explosives according to AFMAN 91-201. **(T-2)**

9.5.3. Review and help develop plans and procedures for handling emergencies to include, but not limited to, SAFE HAVEN, HAZMAT response, AFI 10-2501 or UFC 3-260-01, and when required by law (e.g., Clean Air Act; Environmental Planning Community Right To Know Act; secure explosives holding areas IAW the Defense Travel Regulation, Part II, Chapter 25), or accidental release RM programs for explosives. **Note:** At OCONUS locations, consideration must be given to Status of Forces Agreements, Host Nation Funded Construction Agreements and Bilateral Infrastructure Agreements. **(T-2)**

9.5.4. Ensure the Weapons Safety Manager attend pre-construction meetings hosted by the Installation Community Planner and Airfield Manager. **(T-2) Note:** Weapons Safety Manager must be a coordination member on any construction that affects explosives clear zones, weapons or airfield operations. **(T-2)**

9.6. Missile Safety. Missile systems are ground-launched or air-launched and do not include unpiloted drones or remotely piloted vehicles. The aerospace vehicle, ground support and operational equipment, personnel, and the operational environment are all sources of mishaps. Missile launch operations will comply with DoDD 3200.11, *Major Range and Test Facility Base (MRTFB)*, DoDI 3200.18, *Management and Operation of the Major Range and Test Facility Base*, AFI 99-103, *Capabilities-Based Test and Evaluation*, and AFMAN 13-212V1, *Range Planning and Operations*, safety requirements as described in **Chapters 1** and **2,** and will be conducted from a MRTFB range. **(T-1)**

9.7. Nuclear Surety. The goal of the Air Force Nuclear Weapons Surety Program is to incorporate maximum nuclear surety, consistent with operational requirements, from weapon system development through dismantlement. Refer to AFI 91-101 for nuclear surety program requirements, policies on nuclear safety design certification, and AFI 63-125, *Nuclear Certification Program*, for the process for nuclear certification, to include design and operational certification of nuclear weapon systems.

9.8. Unit Directed Energy Safety Program Functions. Directed Energy Safety program requirements are broken down into two categories, weapons and non-weapon systems. Hazards presented by a directed energy system are intrinsic properties of the system and not a function of any distinction as a weapon system. However, there are different programmatic requirements based upon a system's operational use.

9.8.1. For operational units with non-weapon directed energy systems, the unit will execute occupational health and safety plans based upon the hazard(s) (e.g., laser and/or electromagnetic frequency radiation) of the directed energy system IAW the installation Laser Safety Officer, Installation Occupational and Environmental Medicine Consultant, BE, and/or

Public Health per AFI 48-139, *Laser and Optical Radiation Protection*, AFI 48-109, *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health Program*, and AFI 48-127, *Occupational Noise and Hearing Conservation Program*, respectively. **(T-1)**

9.8.2. For installations with directed energy weapons, base/wing Weapons Safety personnel will review directed energy weapon safety programs at least annually for each type of directed energy weapon system operated by the installation's units IAW this Instruction. **(T-1)**

9.8.3. In coordination with base/wing safety personnel, operational units will evaluate and document unit radio frequency weapons, laser weapons, and other directed energy systems for operational compatibility with ordnance, electronics, and fuel storage likely to be in the operating and maintenance environment of the directed energy system IAW DoDI 3222.03, *DoD Electromagnetic Environmental Effects (E3) Program*, AFMAN 91-201, and this instruction. **(T-0)**

9.9. Munitions Rapid Response Team. Hill AFB's Munitions Rapid Response Team is manned with personnel knowledgeable in conventional munitions areas. This team is available to support MAJCOMs and units whenever they have a conventional weapons mishap or problem. They can be activated to respond within 24 to 48 hours. Refer to paragraph **13.5** for specific guidance.

9.10. Department of Defense Explosives Safety Board (DDESB). The DDESB is a joint board of the DoD. It is subject to the direction, authority and control of the Secretary of Defense, under the Deputy Under Secretary of Defense (Environmental Security).

9.10.1. The board consists of a chairperson and an officer (O-6/GS-15 or above) from each of the military departments. In addition, each military department must designate an alternate. Within the Air Force, AF/SE provides the primary and alternate members.

9.10.2. The DDESB establishes DoD explosives safety policy and is responsible for the DoD Explosives Safety Management Program (ESMP). DDESB conducts Component-level programmatic evaluations according to DoDI 6055.16, *Explosives Safety Management Program*, which requires the Secretaries of the Military Departments to establish, resource, implement and maintain effective DoD Component-level ESMPs. Each year DDESB evaluates one of the Military Departments ESMPs. This is a top to bottom review (HAF, MAJCOM, NAF and installation) of the Services' explosives safety program.

9.11. Weapons, Explosives and DEW Training.

9.11.1. The MAJCOM/DRU/FOA weapons safety office must provide MAJCOM/Center-unique Weapons Safety Manager training to their NAF- and installation-level weapons safety personnel. Training should include all MAJCOM specific requirements and known challenges to increase effectiveness of newly assigned personnel.

9.11.2. The installation Weapons Safety Manager provides weapons safety training to all appointed Additional Duty Weapons Safety Representatives on their responsibilities and program management. **(T-2)** Additional Duty Weapons Safety Representatives are required to be trained within 30 working days of appointment, with recurring training as determined by the MAJCOM. Air Reserve Component primary and alternate Additional Duty Weapons Safety Representative will complete initial training within two unit training assemblies of appointment.

9.11.3. Weapons safety, Additional Duty Weapons Safety Representative or designated representative conducts explosives safety training, which augments the job training provided by the supervisor. **(T-2)** The installation weapons safety staff evaluates and monitors this training, approves lesson plans and reviews them annually. **(T-2)** All personnel (supervisory and non-supervisory) who operate, handle, transport, maintain, load or dispose of missiles, explosives or nuclear weapons must receive initial explosives safety training before performing any of these tasks. **(T-2)** All personnel tasked to work on aircraft configured with explosives/ordnance will receive training that includes how to identify an armed aircraft and a familiarization of the hazards involved when working on or around explosives loaded aircraft, ensure initial explosives safety training is provided before performing any of these tasks. **(T-2)** Recurring training must be provided not later than the end of the 15th month following initial training. **(T-2) Exception:** Personnel who store and/or handle only the following are exempt from initial and refresher explosives safety training.

9.11.3.1. Small arms ammunition, including cartridge-actuated tools in quantity-distance hazard class/division 1.4.

9.11.3.2. Document destroyers.

9.11.3.3. Small tear gas items, such as grenades.

9.11.3.4. Aircraft, vehicle and facility fire extinguisher cartridges.

9.11.3.5. Other hazard class/division 1.4 items in their packaged configuration only. Personnel who will unpack and handle unpackaged items other than the exceptions listed above still require training.

9.11.4. Personnel conducting or directly supporting DEW operations, maintenance, testing or training must receive training prior to use, within 30 days of assignment to unit, and every 24 months thereafter. **(T-3)**

9.11.5. Aircrew personnel trained per AFI 11-series (Flying Operations) guidance are exempt from initial and refresher explosives safety training.

9.12. Weapons Safety Committees. These committees include the Explosives Safety Committee, the Non-Nuclear Munitions Safety Board, the Nuclear Weapons System Safety Group and the Directed Energy Weapons Safety Board. The committees are chaired by an AFSEC/SEW representative and are composed of the chiefs of weapons safety or their MAJCOM representatives. These committees discuss matters of mutual concern that cross MAJCOM lines.

Chapter 10

SPACE SAFETY

10.1. Program Management. This chapter contains requirements for space safety offices at all command levels. Units conducting space-related missions must have a comprehensive Space Safety Program designed to improve operational effectiveness by identifying, managing and mitigating hazards, reducing mishaps, supporting mission assurance, and incorporating mishap prevention guidance across the life cycle of space systems and their unique support equipment. **(T-1)**

10.1.1. This includes design, system development, software safety, system safety, integration, testing, pre-launch, launch operations, range operations, space nuclear systems, orbital operations, reentry operations, and ground-based space systems.

10.1.2. Applicability. All Air Force organizations that develop, test, or operate any space system, or who provide launch/range services for space systems shall comply with this instruction. **(T-1)** This includes space systems under development, research and development systems, experimental systems, systems undergoing testing, operational systems, and systems at end-of-life. This chapter is applicable to the entire segment portion of the Space mission (e.g., systems architecting and design, manufacturing, launching, manufacturing, and operations through disposal) under Air Force control. Organizations designing and operating Air Force hosted payloads on non-Air Force satellite vehicles shall comply with this chapter for portions within their control. **(T-3)**

10.2. Space Safety Responsibilities. This section addresses the space safety responsibilities of wing and directorate-level organizations within the Air Force and those of mission partners outside of the Air Force. It also lays out responsibilities with regards to space waivers.

10.2.1. Wing/Directorate-level Organization Responsibilities. Organizations that acquire, maintain, upgrade, test, operate, and/or dispose of space systems shall coordinate with the NAF/Center Safety Office to implement a Space Safety Program. **(T-3)** At a minimum, the Wing/Directorate Safety Office shall:

10.2.1.1. Keep the Wing/Directorate Commander apprised of Space Safety issues. **(T-3)**

10.2.1.2. Ensure subordinate units execute Space Safety Programs, provide oversight to local Space Safety Programs, and train to ensure compliance with formal guidance. **(T-3)**

10.2.1.3. Ensure each subordinate unit has at least one trained Space Safety Manager appropriate to their mission. **(T-3)**

10.2.1.4. Manage, as applicable, the Launch/Range, Orbital, Ground-Based, or System Safety Program for the commander/director. **(T-3)**

10.2.2. Waivers Responsibilities.

10.2.2.1. By 1 October each year provide AFSEC/SES with all MAJCOM Commander approved and active space waivers to this publication.

10.2.2.2. The wing/center COS and System Safety Manager shall review all space safety waiver requests. **(T-3)**

10.2.2.3. MAJCOM's subordinate units (e.g., wings, centers, NAFs) shall provide the MAJCOM/SE copies of all dispositioned space safety waivers. **(T-2)**

10.2.2.4. MAJCOM safety offices shall provide copies of all dispositioned space safety waivers to other supporting or supported MAJCOM's safety offices.

10.2.3. Mission Partner Responsibilities. All organizations with participation from external mission partners with space safety considerations should establish MOAs or MOUs with those organizations. **Note:** Consult with NAF safety staff and MAJCOM/SE, as appropriate.

10.2.3.1. Such MOAs and MOUs should consider the following:

10.2.3.1.1. Each organization's responsibilities and requirements with regard to space safety mishap prevention.

10.2.3.1.2. Understanding and implementation of space safety requirements and policies of affected organizations.

10.2.3.1.3. Address which Space Safety policies apply to Air Force personnel assigned to non-Air Force organizations (e.g., National Reconnaissance Office, FAA, NASA).

10.2.3.1.4. The participating organizations' responsibilities to determine the lead agency, with respect to risk management approval authority.

10.2.3.2. When external organizations share launch services on Air Force launches, MOAs and MOUs with those organizations shall include responsibilities to provide a do-no-harm and National Space Policy compliance certification from a proper the applicable U.S. Government Department or Agency approval authority to include, but not limited to compliance with U.S. National Space Policy. **(T-2)**. The Air Force shall not launch any space vehicle which has not been certified as compliant with the National Space Policy, unless a waiver to the National Space Policy has been obtained. **(T-0).**

10.3. Space Safety Council (SSC). Assists the AF/SE or designated representative in providing oversight responsibilities on matters concerning safe operations in the space environment (and related mission areas) through effective governance and management. The SSC also serves to improve space safety effectiveness and advocate for the consistent application of DoD, civil, commercial, academic and international standards or practice across the space enterprise.

10.3.1. AFSEC/SES chairs the SSC and Air Force Space Command Director of Safety (AFSPC/SE) serves as vice-chair. The SSC has a composition of MAJCOMs/DRUs/organizations with space missions that affect Air Force operations.

10.3.2. The SSC convenes at least twice per year, and:

10.3.2.1. Recommends DoD/Federal and Air Force safety policy.

10.3.2.2. Prepares and monitors DoD/Federal and Air Force directives and/or instructions concerning Space Safety issues.

10.3.2.3. Promotes Space Safety initiatives for DoD/Federal space flight using Air Force resources.

10.3.2.4. Recommends, prepares, monitors, and promotes policies, directives, and/or instructions for commercial Space Safety, especially those associated with Air Force resources.

10.3.2.5. Maximizes collaboration with organizational Space Safety Offices.

10.3.2.6. Discusses Space Safety issues.

10.4. Space Nuclear Safety. Programs that use radioactive material and nuclear power systems in space shall follow AFMAN 91-110, *Nuclear Safety Review and Launch Approval for Space or Missile Use of Radioactive Material and Nuclear Systems*, for safety requirements, review processes, and approval processes. **(T-1)**

10.5. Ground Based Space System Safety.

10.5.1. Organizations which operate ground-based space systems, including unique space support equipment as well as space-related systems that do not directly support launch operations or on-orbit satellite operations shall establish a space safety program to address the unique ground based space safety aspects of the organization's mission. **(T-1)**

10.5.2. Radio Frequency Deconfliction. Organizations shall take special care not to produce unintended effects during operations. **(T-3)** Refer to Space Instruction 534-15, *Risk Management and Radio Frequency Deconfliction for Space Control Activities*, for further information.

10.5.3. Testing. Organizations with ground based space systems which will undergo testing shall have documented test program validation (to include procedures discipline, readiness reviews, and test execution risk management) and configuration control processes. **(T-3)**

10.6. Pre-Launch. This section outlines safety responsibilities and tasks for pre-launch. Pre-launch activities includes the design, development, and procurement acquisition stages and processing of space systems at the launch site.

10.6.1. Safety Responsibilities.

10.6.1.1. Different aspects of pre-launch safety may be the responsibility of different authorities. For example, the protection of a system's equipment from hazards may be the responsibility of the program office Director while the protection of the public from a space program's ground and/or flight hazards may be the primary responsibility of the Wing Commander.

10.6.1.2. The Wing Commander shall ensure range users comply with Air Force pre-launch/range safety requirements levied upon them as a condition of Air Force range use. **(T-3)**

10.6.1.3. The Wing Commander is responsible to ensure that pre-launch activities do not unreasonably endanger the health and safety of the public, mission essential personnel, and neighboring operations personnel, while providing for ground resource protection.

10.6.1.4. Responsibilities for pre-launch safety for FAA-licensed operations from AF ranges shall be established in agreements between commercial launch providers and the AF. **(T-3)**

10.6.1.5. Safety responsibility for pre-launch site processing is normally the responsibility of the program office PM or equivalent acquiring the system/services when occurring at a location outside of the launch site. The launch wing safety office normally has safety responsibility for pre-launch processing occurring on AF range property.

10.6.2. Pre-Launch Safety Activities.

10.6.2.1. Plan and execute the transportation of high-value and/or hazardous space systems to minimize hazards posed to and by the space system IAW Department of Transportation, state, local, and other applicable transportation requirements. **(T-1)** The responsible program office PM shall develop and approve a transportation plan (or equivalent document) for transportation from the factory to the operational site or range. **(T-3)** The receiving Wing Commander and program office PM, if any, shall coordinate on the plan. **(T-3)**

10.6.2.2. Appropriate Readiness Reviews shall occur before initiating final countdown so that the wing commander has assurance of launch safety and the readiness of all personnel and systems involved. **(T-3).**

10.7. Launch Safety.

10.7.1. This section outlines safety responsibilities and tasks for launch operations (to include return of launch vehicle stages/components to the launch site or other site), and the reentry of launch vehicle components. For on-orbit disposal safety responsibilities, requirements for spacecraft or launch vehicle components that achieve or remain in orbit, see paragraph **10.8**

10.7.2. Safety Responsibilities.

10.7.2.1. The Wing Commander is responsible to ensure that launch activities do not unreasonably endanger the health and safety of the public, launch area personnel, and other mission support personnel, while providing for ground resource protection. This responsibility for personnel and public safety extends from liftoff to orbital insertion, or from liftoff to sub-orbital impact. It includes jettisoned launch vehicle components, debris released prior to orbital insertion, and any controlled landing systems such as fly-back stages and recovering space vehicles to a launch/landing site.

10.7.2.2. The Wing Commander shall ensure range users comply with Air Force launch/range safety requirements levied upon them as a condition of Air Force range use. **(T-3)**

10.7.2.3. The AF will accept FAA licensing decisions/approvals for commercially licensed missions. The Secretary of Transportation has a statutory responsibility for all aspects of launch safety as required by Title 51 U.S. Code, *National and Commercial Space Programs.* This responsibility is executed through the FAA's Office of Commercial Space Transportation. Use established agreements for safety processes.

10.7.2.4. For all non-licensed launches and landings at Air Force ranges, including test and evaluation and DoD/civil space missions, the Air Force has responsibility for ensuring public health and safety and the protection of resources.

10.7.2.5. Use of Air Force safety standards or services is not required for FAA-licensed launches. If FAA-licensed launch providers choose to use Air Force services they will engage the owning wing through established processes.

10.7.3. Launch Mishap Prevention Program. The launch/recovery site commander shall perform review, and approve all risk analyses associated with launch/landing on the range. **(T-3)** The following outlines acceptable risk levels for hazards during the launch phase for launch

vehicles, jettisoned components, controlled landings to a launch and landing site, and for suborbital missions.

10.7.3.1. Personnel Risk. The risk to the general public, launch essential personnel, and neighboring operations personnel shall use criteria thresholds listed in Range Commanders Council (RCC) 321, *Common Risk Criteria Standards for National Test Ranges.* **(T-3)**

10.7.3.2. Critical Asset Risk. The probability of impact to critical assets shall not exceed 1×10^{-3}. **(T-3)** More stringent criteria may be applied as deemed necessary by the Wing Commander to protect assets critical to national security.

10.7.3.3. Launch Collision Avoidance (COLA) and Launch Conjunction Assessment (CA). Non-FAA licensed launches from Air Force ranges and all Air Force controlled launches from any range shall accomplish Launch COLA procedures accounting for all launched objects (e.g., booster segments, payloads, jettisoned components, and debris) with an altitude capability equal to or greater than 150 km. **(T-3)**

10.7.3.3.1. Launch operators/range users shall provide the launch wings and the 18th Space Control Squadron with planned flight profile data for all space launch vehicle and jettisoned components (to include upper stages pre-programmed for a controlled reentry, up until atmospheric reentry). **(T-3)** This data shall be provided to the 18th Space Control Squadron IAW the timelines referenced on **https://www.space-track.org/auth/login** website and the 18SPC Launch Conjunction Assessment Request Form 22. **(T-3)**

10.7.3.3.2. Wing Commanders shall establish and enforce launch window hold periods, based on the Launch conjunction assessments computed by the 18th Space Control Squadron against catalogued objects. **(T-3)** For Air Force launches from non-Air Force ranges, the senior Air Force representative involved with the launch assumes responsibility of Launch COLA risk management.

10.7.3.3.3. Timeframe. Launch COLA shall cover the period of time from when launched objects achieve an altitude equal to or greater than 150 km, until location uncertainty makes performing a pre-launch safety COLA infeasible, or until the suborbital or reentry components descend to less than 150 km. **(T-3)** The propagation of uncertainties in precise launch time, variability of delta V magnitude and direction, and growth rate should be considered in determining when Launch COLA becomes infeasible.

10.7.3.3.4. There is currently a gap between the end of the Launch COLA and the time when 18th Space Control Squadron can establish, or receive from a payload operator, reliable orbital data on launched objects, plus the time when an active asset can respond to an 18th Space Control Squadron conjunction assessment. This is known as the "COLA gap." For missions where a pre-programmed controlled reentry occurs, any portion of the mission after the end of the launch COLA is contained in the COLA gap. Programs should use industry best practices to mitigate the COLA gap risk to Human Space Flight objects. Examples of these practices are but not limited to, nodal separation and in-track screening, probability density model, and radial and argument of latitude screening.

10.7.3.3.5. Launch window hold periods. Determine the launch window hold periods based on one or a combination of the following methodologies and criteria:

10.7.3.3.5.1. The probability of collision between the launch components and a Human Spaceflight objects shall not exceed 1×10^{-6} (one in one million). The probability of collision between the launch components and Non-Human Spaceflight objects (to include active satellites and orbital debris) shall not exceed 10×10^{-6} (ten in one million). **(T-3)**

10.7.3.3.5.2. The safe separation distance for Human Space Flight objects shall consist of either ellipsoidal miss distance volumes with semi-axes of 200 km in-track, 100 km cross-track, or 100 km radial; or spherical volumes with a radius of 200 km. **(T-3)** The safe separation distance for non-Human Space Flight objects shall consist of three-sigma ellipsoidal miss distance volumes calculated from the covariance data. Where the covariance data are not available, utilize a spherical miss distance volume with a radius of 25 km for active satellites and 2.5 km for debris. **(T-3)**

10.7.3.3.6. Timeline. CA results for launch decision shall be computed no more than 24 hours prior to the end of the launch window. This requirement does not preclude early launch screenings, nor screenings within 24 hours when updates are warranted to account for significant updates to tracking or trajectory data. **(T-3)**

10.7.3.3.7. Control of Errant or Non-Nominal Vehicle Flight. The Wing Commander shall approve the methodology for controlling erratic vehicle flight while managing risks to the public and foreign countries for all vehicles launched from or onto Air Force ranges. **(T-3)**

10.7.3.3.8. The range shall coordinate with the FAA to ensure timely notification of any expected air traffic hazard associated with range activities. **(T-3)** To prevent increased risk to public safety in the event of a mishap, the range shall immediately inform the FAA of the affected airspace (impact on volume/duration). **(T-3)** Similarly, the range shall coordinate with the US Coast Guard to ensure timely notification of potentially hazarded ship traffic and in the event of mishap, inform the US Coast Guard of the affected sea area and duration of navigable waters. **(T-3)**

10.7.4. Space Debris. All launch vehicles (or components) shall be managed (mitigate and control) for potential space debris generation. **(T-0)** For the launch vehicle, debris mitigation practices shall be incorporated throughout system development, operations and end of life. **(T-0)** The launch vehicle shall be assessed for compliance with the National Space Policy, DoDI 3100.12, *Space Support,* and this instruction for generation of space debris during all mission phases. **(T-0)**

10.7.4.1. For launch vehicles, Orbital Debris Mitigation Standard Practices requirements shall be addressed as part of the Mission Architecture Options determination during Material Solutions Analysis phase of DoDI 5000.02, *Operation of the Defense Acquisition System,* or equivalent phase for non-DoD 5000.02 activities, documented in the Analysis of Alternatives report, or equivalent, and included as a compliance document in the development of the program/project statement of work for release of the request for proposal. **(T-1)**

10.7.4.2. Space systems not meeting the National Space Policy will follow the AF/A3 Exception to Policy process for a Secretary of Defense waiver. Accepted operational or acquisition safety risk assessments shall be included in the Exception to Policy package. **(T-1)** Risk acceptance assessments should be completed as early as possible based on determining a hazard exists, and prior to seeking approval with Exception to Policy packages.

10.7.5. Launch Vehicle End of Life Requirements.

10.7.5.1. Any launch vehicle component that achieves orbit will undergo passivation and disposal procedures as outlined in paragraph **10.8** **(T-1)**

10.7.5.2. Reentry hazards posed by expended launch vehicles or other jettisoned components that achieve orbit shall be in the analysis and risk budgets of the disposal and end of life phase. **(T-3)** Refer to DoDI 3100.12 for additional guidance.

10.7.5.3. For reentries of launch vehicle objects or recovery of objects jettisoned during ascent, the acquisition organization shall develop disposal recovery plans which include adequate steps to mitigate known hazards during recovery operations. **(T-3)**

10.8. Orbital Safety.

10.8.1. Scope and responsibility.

10.8.1.1. All organizations with Satellite Control Authority or that test or operate any space system (including satellites, payloads, and experimental systems) designed to complete one or more revolutions in Earth orbit, shall establish an Orbital Safety Program appropriate to the level of effort commensurate with organizational scope of operations**.** **(T-2)** The Orbital Safety Program shall span the on-orbit testing, operations and end-of-life actions. **(T-2)**

10.8.1.2. Units shall appoint Space Safety Managers for each Space Safety Program to manage the Satellite Control Authority's Orbital Safety Program. **(T-3)** Space Safety Managers shall:

10.8.1.2.1. Participate in all Operations Review Panel (ORP), Operational Review Board (ORB), Satellite Anomaly Resolution Team (SART) and similar or equivalent processes to observe trends and provide input on Space Safety related issues. **(T-3)**

10.8.1.2.2. Obtain and review ORP/ORB/SART minutes and information on orbital anomalies and events of significance to their program office and MAJCOM safety office for the purpose of trend tracking mishap prevention, and reporting. **(T-3)** If this information is classified, report and handle via appropriate classified channels.

10.8.1.2.3. Verify that routine, contingency, test, operations, experimental, and any other applicable procedures take no unnecessary risk, consistent with cost effectiveness and mission requirements. **(T-3)**

10.8.1.2.4. Participate in both routine operations and spacecraft anomaly recovery actions in order to gain experience and help prevent future anomalies. **(T-3)**

10.8.1.2.5. Tailor local Space Safety training for operations and operational test personnel for greater applicability to the assigned mission and conditions. **(T-3)**

10.8.1.2.6. Assist operations/operational test personnel in complying with Space Safety guidelines. **(T-3)**

10.8.1.2.7. Advise the unit commander on risks to the mission by monitoring things such as crew rest, training, system modifications, and any other aspect of operations. **(T-3)**

10.8.1.2.8. Participate in Systems Safety Working Groups to voice operations concerns relative to systems design decisions. **(T-3)**

10.8.1.2.9. Report safety related issues to the wing safety office. **(T-1)**

10.8.2. Orbital Anomaly Response.

10.8.2.1. To ensure proactive mishap prevention, organizations shall notify their Space Safety Manager of all anomalies. **(T-3)**

10.8.2.2. Refer to AFI 91-204 and AFMAN 91-222, *Space Safety Investigations and Reports*, for specific anomaly reporting criteria.

10.8.2.3. Unit commanders shall ensure Space Safety Managers are full members on all Anomaly Resolution Teams, Engineering Review Boards, Operational Review Boards, and/or similar constructs, and shall receive invitation to participate in all supporting events. **(T-3)**

10.8.2.4. Reporting. Organizations shall process the relevant findings and recommendations from anomaly resolutions through safety channels, in addition to normal reporting channels, to ensure proactive mishap prevention. **(T-2)**

10.8.3. Space Debris.

10.8.3.1. All spacecraft and launch vehicles (or components) that expect to achieve orbit shall be managed (mitigate and control) for potential space debris generation. **(T-0)** For spacecraft and launch vehicle, debris mitigation practices shall be incorporated throughout system development, operations, and end of life. **(T-0)** The spacecraft and launch vehicles shall be assessed for compliance with the US National Space Policy, DoDI 3100.12 and this instruction for generation of space debris during all mission phases. **(T-0)**

10.8.3.1.1. For spacecraft and launch vehicles, Orbital Debris Mitigation Standard Practices requirements shall be addressed as part of the Mission Architecture Options determination during Material Solutions Analysis phase of DoDI 5000.02, or equivalent phase for non-DoD 5000.02 activities, documented in the Analysis of Alternatives report, or equivalent, and included as a compliance document in the development of the program/project statement of work for release of the request for proposal. **(T-3)**

10.8.3.1.2. Spacecraft and launch vehicles not meeting Orbital Debris Mitigation Standard Practices will follow the AF/A3 Exception to Policy process for a Secretary of Defense exception. Safety risk assessments related to the noncompliance shall be included in the Exception to Policy package. **(T-1)** Risk acceptance assessments should be completed as early as possible based on determining a hazard exists, and prior to seeking approval with Exception to Policy packages.

10.8.3.2. Space Debris Assessment Report.

10.8.3.2.1. For all Air Force owned objects launched into space, the launch vehicle PM and the spacecraft PM shall prepare and deliver applicable space debris assessments, per the format and content defined in paragraph **13.11,** *Launch Vehicle Space Debris Assessment Report (SDAR),* and paragraph **13.12,** *Combined Space Vehicle Space Debris Assessment Report/End of Life Plan (SDAR/EOLP)***. (T-2)** Air Force owned hosted payloads are not required to develop a Space Debris Assessment Report, unless specifically required by the hosting spacecraft.

10.8.3.2.2. The Launch Vehicle Space Debris Assessment Report (paragraph **13.11**) shall address space debris associated with the launch vehicle. **(T-2)**

10.8.3.2.3. Spacecraft PMs shall combine the Spacecraft Space Debris Assessment Report with the Spacecraft End of Life Plan and deliver this per the format and content defined in paragraph **13.12 (T-2)**

10.8.3.2.4. The Space Debris Assessment Report shall include an assessment of debris generation risk during launch, on-orbit operations, and end of life disposal, and assess compliance with the Orbital Debris Mitigation Standard Practices. **(T-2)**

10.8.3.2.5. The space debris assessment shall specifically note requirements not met because of an overriding conflict with mission requirements or a prohibitive cost impact, along with the appropriate rationale and justification. **(T-2)**

10.8.3.3. Assessment of Debris Released During Normal Operations.

10.8.3.3.1. Operational or mission-related debris includes debris released during normal space operations (e.g., sensor covers, tie-down straps, explosive bolt fragments). It does not include slag ejected during the burning of a solid rocket motor or liquids dispersed from a spacecraft.

10.8.3.3.2. Total object-time of debris in Low Earth Orbit. **(T-3)** For missions leaving debris in orbits passing through Low Earth Orbit, the total object-time of debris larger than five millimeters (5mm) in any dimension shall not exceed 25 years per object and 100 object-years per mission. **(T-3)** The object-time of debris is calculated as the sum of time spent in Low Earth Orbit for all mission debris objects (below 2000 km altitude). Refer to NASA-STD-8719.14B, *Process for Limiting Orbital Debris,* for calculation of total object time. **(T-3)**

10.8.3.4. Assessment of Debris Generated by Accidental Explosions.

10.8.3.4.1. The program office PM for each spacecraft or launch vehicle shall demonstrate via failure mode and effects analyses (or equivalent) that the integrated probability of explosion for all failure modes (excluding collisions) is less than $1x10^{-3}$ (one in one thousand). **(T-3)**

10.8.3.4.2. The probability shall be met for all separate spacecraft and launch vehicle orbital stages during all phases of operations, and during the remaining orbital lifetime after disposal. **(T-3)**

10.8.3.4.3. The maximum time period for the assessment of this probability of explosion is 200 years. Reference NASA-STD-8719.14B.

10.8.3.5. Assessment of Debris Generated by Intentional Breakups.

10.8.3.5.1. Program offices and/or operators shall assess and limit the effect of intentional breakups of spacecraft and launch vehicle orbital stages on other users of space. **(T-2)**

10.8.3.5.2. Planned explosions or intentional collisions shall occur at altitudes such that, for orbital debris fragments larger than 10 cm, the object-time product does not exceed 100 object-years. **(T-1).** No debris larger than 1 mm shall remain in Earth orbit longer than one year. Reference NASA-STD-8719.14B. **(T-1)**

10.8.3.5.3. Immediately before a planned explosion or intentional collision, the probability of related debris larger than 1 mm colliding with any active spacecraft within 24 hours of the breakup shall not exceed $1x10^{-6}$ (one in one million). Reference NASA-STD-8719.14B. **(T-1)**

10.8.3.6. Assessment of Debris Generated by On-orbit Collisions.

10.8.3.6.1. Collisions with Large Objects.

10.8.3.6.1.1. Program office PMs shall demonstrate that, during the orbital lifetime of each spacecraft or launch vehicle component, the probability of accidental collision with space objects larger than 10 cm in diameter does not exceed 1×10^{-3} (one in one thousand). **(T-3)** For the assessment of collision probability, the orbital lifetime is defined as the time from end of launch collision avoidance to atmospheric reentry. The maximum time period for assessment is 200 years.

10.8.3.6.1.2. The reduction in probability of collision achieved by on-orbit collision avoidance performed by the spacecraft or launch vehicle component (i.e., for the system which the Space Debris Assessment Report is assessing) may be included in this assessment. When this reduction in probability is utilized, then the safety hazard risk assessment is based upon this reduction of probability.

10.8.3.6.2. Collisions with Small Objects. Program office PMs shall demonstrate that, during the mission of the space system, the probability of accidental collision with objects (including space debris and meteoroids) sufficient to prevent post-mission disposal is less than $1x10^{-2}$ (one in one hundred). Refer to NASA-STD-8719.14B for additional guidance. **(T-3)**

10.8.4. Conjunction Assessment and Collision Avoidance.

10.8.4.1. The Wing commander shall have and approve a conjunction assessment/collision avoidance process commensurate with the scope and effort of the operational mission. **(T-3)** The program begins following separation of the last launch vehicle component and shall continue through decommissioning, end-of-life disposal, or reentry. **(T-3)**

10.8.4.2. Orbital objects which are cataloged by the 18th Space Control Squadron but are not expected to remain on orbit long enough for orbital CA processes to be reliable (e.g. upper stages with pre-programmed reentry burns), should follow paragraph **10.7.3.3** (Launch COLA processes).

10.8.4.3. All Air Force launch and orbital space systems shall use 18th Space Control Squadron-generated CA data to inform safety COLA risk decisions. **(T-3)**

10.8.4.4. Organization with Satellite Control Authority of active on orbit spacecraft shall:

10.8.4.4.1. Have a process to receive conjunction assessment results at least every 24 hours. **(T-3)**

10.8.4.4.2. For orbital vehicles capable of controlling or altering their orbital parameters, the following collision risk levels and collision risk acceptance thresholds apply.

10.8.4.4.2.1. The probability of collision at any individual conjunction with a Human Spaceflight object shall not exceed 1×10^{-6} (one in one million). **(T-3)**

10.8.4.4.2.2. The probability of collision at any individual conjunction with other active Non-Human Spaceflight satellites shall not exceed 10×10^{-6} (ten in one million). **(T-3)**

10.8.4.4.2.3. The approved COLA process shall identify collision risk levels and collision risk acceptance thresholds for all other objects. **(T-3)**

10.8.4.5. Conduct collision avoidance to pre-screen planned maneuver vectors, to include operational, end of life, and controlled reentry burns. **(T-3)**

10.8.4.6. Proximity Operations.

10.8.4.6.1. Organizations executing proximity operations shall develop procedures to avoid unintended spacecraft-to-spacecraft contact (e.g., planning an orbit with a non-intersecting natural motion circumnavigation), unnecessary debris generation, or contamination of sensitive equipment, e.g., from spacecraft thruster firings, other off-gassing. **(T-3)**

10.8.4.6.2. Organizations shall notify 18th Space Control Squadron of their close proximity operations and any special support requirements. **(T-3)**

10.8.4.6.3. The approved COLA process shall identify collision risk levels and collision risk acceptance thresholds for all other objects. **(T-3)**

10.8.5. End-of-Life Actions.

10.8.5.1. All spacecraft and orbital launch vehicle components shall undergo passivation and disposal at End of Life. **(T-0)**

10.8.5.2. End of Life passivation and disposal shall comply with the National Space Policy and Orbital Debris Mitigation Standard Practices. **(T-0)**

10.8.5.3. Spacecraft End of Life Plan. All test, experimental, or operational orbital space systems shall develop End of Life Plans. **(T-2)**

10.8.5.3.1. Spacecraft PMs shall prepare, update, and deliver a pre-launch combined Space Debris Assessment Report and End of Life Plan to the operator(s) using a format and content outlined in paragraph **13.12** for the configuration of the space vehicle anticipated at end of life. **(T-2)**

10.8.5.3.2. Launch vehicle PMs shall ensure the launch vehicle Space Debris Assessment Report contains any orbital launch vehicle component End of Life Plan information. **(T-2)**

10.8.5.3.3. All organizations with satellite control authority shall update the end of life plan throughout orbital operations IAW paragraph **13.12** **(T-2)**

10.8.5.4. Reliability of post-mission end of life operations.

10.8.5.4.1. The probability of successful disposal shall be no less than 0.90 at end of life for reentry within 25 years, orbital storage disposal, or for direct retrieval. **(T-3)**

10.8.5.4.2. Programs shall ensure that all post-mission end of life operations incorporate designs and plans to meet this requirement. **(T-3)**

10.8.5.4.3. This calculation builds from an initial pre-launch assessment of the ability to execute end of life actions, and shall undergo re-assessment during the orbital operations phase as needed to address degrading health of spacecraft systems and increasing uncertainty in knowledge of remaining propellant. **(T-3)**

10.8.5.5. Disposal. Organizations with Satellite Control Authority shall dispose of orbital objects via atmospheric reentry within 25 years, orbital storage disposal, or direct retrieval. **(T-0)**

10.8.5.5.1. The preferred disposal option is atmospheric reentry.

10.8.5.5.2. For uncontrolled and controlled atmospheric reentry, the hazard threshold for kinetic energy of individual surviving inert debris objects shall be 15 Joules. Debris objects with kinetic energy less than this hazard threshold do not contribute to casualty expectation. Refer to NASA-STD-8719B for additional guidance.

10.8.5.5.3. Direct retrieval strategies shall comply with all disposal requirements in this instruction. **(T-1)**

10.8.5.5.4. To ensure that all disposal orbit parameters are met, the final disposal operation shall account for any induced ΔV due to depletion burns/venting. **(T-3)**

10.8.5.6. Passivation.

10.8.5.6.1. During space system design and development, the PM shall identify sources or potential sources of stored energy and develop a plan for depleting or safing all these sources at end of life. **(T-2)** The PM shall include a description of the passivation procedure in the Space Debris Assessment Report, and if applicable, the End of Life Plan. **(T-2)** This description shall also provide a notional timeline of when the procedures will take place. **(T-2)**

10.8.5.6.2. Sealed heat pipes and passive nutation dampers need not undergo depressurization at end of life.

10.8.5.6.3. Batteries.

10.8.5.6.3.1. Battery charging lines shall undergo de-activation. **(T-3)** If this is impractical, the batteries shall be left with a permanent electrical drain to prevent recharging. **(T-3)**

10.8.5.6.3.2. If possible, pressurized batteries shall undergo depressurization at end of life. **(T-3)**

10.8.5.6.3.3. Structurally, a two-fault tolerant battery casing design is preferred.

10.8.5.6.4. Self-destruct systems shall be incorporate designs to prevent unintentional destruction due to inadvertent commands, thermal heating, radio frequency interference, and/or internal hazards such as software and hardware faults. **(T-1)**

10.8.6. Orbital Reentry and Recovery.

10.8.6.1. For recovery of orbital vehicles, the operator and landing/recovery site commander or equivalent is responsible for all mission segments under their control. This includes reentry risks to the general public, landing recovery area personnel, other mission support personnel, and site facilities. Reentry safety begins with the final commitment to re-enter the atmosphere (i.e., the final command that initiates or enables the entry and landing sequence) and ends when all components associated with the reentry come to rest on the Earth and safing actions are complete.

10.8.6.2. Reentry/Recovery of Spacecraft. The landing/recovery site commander shall perform, review, and approve all risk analyses associated with each reentry event onto the range. **(T-3)** The following outline acceptable risk levels for hazards associated with reentry/recovery from orbit at ranges.

10.8.6.2.1. Personnel Risk. The risk to the general public, launch essential personnel, and neighboring operations personnel shall use criteria thresholds listed in Range Commanders Council (RCC) 321, Common Risk Criteria Standards for National Test Ranges. **(T-3)**

10.8.6.2.2. Critical Asset Risk. The probability of impact to critical assets listed below applies to all launches. The risk to critical assets shall not exceed 1×10^{-3}. More stringent criteria may be applied as deemed necessary by the Wing Commander to protect assets critical to national security. **(T-3)**

10.8.6.2.3. Control of Errant or Non-nominal Vehicle Flight. The Wing Commander shall approve the methodology for controlling erratic vehicle flight while managing risks to the public and foreign countries for all vehicles returning to ranges. **(T-3)**

10.8.6.2.4. The reentry/recovery site commander or equivalent has the authority to approve or deny the initiation of de-orbit. This includes the planned nominal and contingency sites.

10.8.6.3. The Wing Commander who has the last opportunity to control the reentry phase of flight shall implement the CA/COLA process for the reentry phase of flight IAW existing local CA processes for orbital operations until the reentry vehicle descends to less than 150 km or where location uncertainty makes performing a safety COLA infeasible, whichever occurs first. **(T-3)** The Wing Commander shall implement reentry holds to prevent collisions with any cataloged orbiting objects. **(T-3)**

10.8.6.4. It is United States policy to recover identifiable debris when it lands in foreign territory or the United States. Typically, the applicable acquisition organization is responsible for Air Force owned objects/assets and shall determine recovery requirements. **(T-3)** Develop written recovery procedures that include notification to HQ Air Force, DoD, the State Department and other appropriate organizations through the MAJCOM Headquarters when recovery is an option in foreign territory. Recovery procedures shall

include provisions for safing the objects in the event hazards remain after landing or impact. **(T-3)**

10.8.6.5. Prior to launch, the launching agency shall provide the appropriate land and recovery site with anomaly/contingency response plans, as well as debris and object recovery plans. **(T-3)**

Chapter 11

SYSTEM SAFETY & SAFETY RISK ASSESSMENTS

11.1. Overview. This chapter establishes policy requirements for Safety personnel in support of System Safety. System Safety is the application of engineering and management principles, criteria and techniques to achieve acceptable risk within the constraints of operational effectiveness and suitability, time and cost throughout all phases of the system life cycle. This chapter also defines how Safety personnel and organizations interact, influence and advise the other Air Force communities that are corporately responsible for System Safety in the Air Force. System acquisition and sustainment programs are subject to the mandatory policy and guidance described in paragraph **11.1.3** System safety principles are used to manage safety risks across many functional disciplines within the AF and form the basis for risk management.

11.1.1. System Safety must be a planned, integrated, comprehensive effort employing both engineering and management resources. Effective System Safety efforts depend on clearly defined safety objectives and system performance requirements. System Safety objectives shall include, but not be limited to, prevention or mitigation of all reportable mishaps that may be associated with a system's use and function throughout its life cycle. Losses of systems, mission degradation, cost and schedule impacts shall be considered. The intent is not to duplicate work performed by related or other functional disciplines, but to ensure it is done in a systematic manner that addresses and manages mishap risk.

11.1.2. IAW MIL-STD-882E, *DoD Standard Practice for System Safety,* System Safety efforts consist of eight essential elements that PMs will document and periodically review:

11.1.2.1. Documenting the system safety approach. **(T-1)**

11.1.2.2. Hazard identification and analysis over the system life cycle. **(T-1)**

11.1.2.3. Assessment of risk, expressed as severity and probability of consequences. **(T-1)**

11.1.2.4. Identification and assessment of potential risk mitigation measures. **(T-1)**

11.1.2.5. Implementation of measures to reduce risks to acceptable levels. **(T-1)**

11.1.2.6. Verification of risk reduction. **(T-1)**

11.1.2.7. Acceptance of risks by appropriate authorities. **(T-1)**

11.1.2.8. Tracking of hazards and risks throughout the system life cycle. **(T-1)**

11.1.3. Acquisition and sustainment communities implement system safety as an integral part of a Program Office's systems engineering activity as outlined in AFI 63-101/20-101, *Integrated Life Cycle Management.*

11.1.4. PMs organize their offices, based on system acquisition program size and complexity, to execute the system safety requirements elaborated by the DoD and Air Force in DoDI 5000.02, AFI 63-101/20-101 and MIL- STD-882E. Acquisition and Sustainment Program Managers integrate system safety into their program's overall Systems Engineering effort at the same level where day-to-day engineering decisions are made. This allows System Safety professionals to most effectively influence system design.

11.1.5. Within the System Safety Program, acquisition and sustainment programs must document and periodically review:

11.1.5.1. System Hazard Tracking Logs. **(T-1)** These logs shall communicate sufficient information to identify and track the status of each hazard. **(T-1)** To ensure appropriate management attention, the status of hazards is required to be presented at program and technical reviews. The System Safety effort supports program and technical reviews with current information of all hazards. Hazard tracking logs shall contain the minimum fields required by MIL-STD-882E. **(T-0)**

11.1.5.2. System Safety Risk Decisions:

11.1.5.2.1. Risk Mitigation. Programs shall use the system safety design order of precedence defined in MIL-STD-882E. **(T-1)**

11.1.5.2.2. Risk Acceptance. **(T-1)** Every hazard that cannot be eliminated must be mitigated to an acceptable level and formally accepted by the appropriate level of leadership as specified in DoDI 5000.02 and AFI 63-101/20-101. **(T-1)**

11.2. System Safety Applied to Acquisition Activities.

11.2.1. CAE-PEO(TEO)-PM Structured Programs. System Safety Programs based on a governing CAE-PEO (Technology Executive Officer [TEO])-PM structure. Such programs include ACAT, Business Acquisition Category (BCAT), Joint Urgent Operational Need (JUON), Urgent Operational Need (UON) programs as defined in AFI 63-101/20-101. The System Safety Risk Acceptance Authorities are the CAE; within the Air Force, the Service Acquisition Executive (SAE); SAF/AQ for High System Safety risks; the PEO(TEO) for Serious System Safety risks; and the PM for Medium and Low System Safety risks. These authorities may not be delegated.

11.2.2. Middle Tiered Acquisition. The below guidance is applicable to those acquisition activities following the rapid acquisition processes and/or being conducted at one of the Air Force's Rapid Capability Offices.

11.2.2.1. CAE-PEO(TEO)-PM structured Middle-Tiered-Acquisition programs: The System Safety Risk Acceptance Authorities are the Component Acquisition Executive (CAE); within the Air Force, the Service Acquisition Executive (SAE); SAF/AQ for High System Safety risks; the PEO(TEO) for Serious System Safety risks; and the PM for Medium and Low System Safety risks. These authorities may not be delegated.

11.2.2.2. All Middle Tiered Acquisition activities, to include rapid prototyping, procurement, and fielding activities, shall have a system safety program as defined in MIL-STD-882E paragraphs 3 and 4, as a minimum. **(T-3)**

11.2.2.3. Programs shall document their risk management process within their Systems Engineering Plan. **(T-1)** If a Systems Engineering Plan is not being used for the program, then programs shall document their risk management process within their PESHE. **(T-1)** It is recommended to follow MIL-STD-882E for this process.

11.2.2.4. Programs shall appoint an appropriately trained system safety manager to facilitate system safety matters. **(T-3)** Appropriate training is considered completion of a formal System Safety training course.

11.2.2.5. Programs shall maintain a hazard tracking system for all program related system safety risks. **(T-1)** It is recommended to follow MIL-STD-882E for this process.

11.2.2.6. Programs are recommended to conduct System Safety Groups IAW paragraph **11.4** System Safety Group membership should consist of the program manager, chief engineer, user representative, operational test representative, AF Safety Center representative, and, if applicable, the acquisition command representative.

11.2.3. System Safety Programs Not Adhering to a PEO(TEO) Structure. Other than CAE-PEO(TEO)-PM structured programs: The System Safety Risk Acceptance Authorities are the AFMC/CC or AFSPC/CC as applicable for high System Safety risks; the Center/CC for Serious System Safety risks; and the PM for Medium and Low System Safety risks. These authorities may not be delegated.

11.3. System Safety Risk Acceptance Process

11.3.1. For hazards determined to have a High or Serious level of System Safety risk, programs shall prepare a System Safety Risk Assessment IAW paragraph **13.9**

11.3.2. Designated System Safety Risk Acceptance Authorities must formally accept System Safety risks prior to exposing people, equipment, or the environment to known system-related hazards at any point in the system's life cycle.

11.3.3. Program risk acceptance packages are only necessary for those risks that are inside the design/specification/requirement envelope. Those outside the envelope are handled by the user's/operator's risk management process.

11.3.4. High System Safety Risk Acceptance.

11.3.4.1. CAE-PEO(TEO)-PM Structured Programs. High System Safety risk assessments shall be coordinated with lead Acquisition MAJCOM, Center/SE (for non-space programs), Air Force Life Cycle Management Center Engineering Office (AFLCMC/EN) for non-space technical review, the lead MAJCOM/CC (delegable to CV, CD or SE), PEO and AF/SE before submission for acceptance by the CAE.

11.3.4.2. Other than CAE-PEO(TEO)-PM structured programs: High System Safety risk assessments shall be coordinated with lead Acquisition MAJCOM, Center/SE (for non-space programs), AFLCMC/EN (for non-space technical review), the lead MAJCOM/CC (delegable to CV, CD or SE), Center CC, and AF/SE before submission for acceptance by AFMC/CC or AFSPC/CC as applicable.

11.3.5. Serious System Safety Risk Acceptance.

11.3.5.1. CAE-PEO(TEO)-PM structured programs: Serious System Safety risk assessments shall be coordinated with lead Acquisition MAJCOM, Center/SE (for non-space programs), AFLCMC/EZ (for airworthiness), the lead MAJCOM/A3/A4/SE and HQ AFSEC before submission for acceptance by the PEO. **(T-1)**

11.3.5.2. Other than CAE-PEO(TEO)-PM structured programs: Serious System Safety risk assessments shall be coordinated with lead Acquisition MAJCOM, center/SE (for non-space programs), AFLCMC/EN (for non-technical review), the lead MAJCOM/A3/A4/SE and AFSEC before submission for acceptance by the Center/CC. **(T-1)**

11.3.6. CAE-PEO(TEO)-PM and Other than CAE-PEO(TEO)-PM structured programs: Medium and Low System Safety risks are accepted by the Program/Project Manager.

11.3.7. High and Serious System Safety Risk Reacceptance: High and Serious System Safety risk assessments/acceptances are valid for four years at which time they must be re-accomplished. **(T-1)**

11.3.7.1. Re-accomplish means update the System Safety risk assessment using the latest information, re-coordinate it and reaccept the System Safety risk as if it were being addressed for the first time. **(T-1)**

11.3.7.2. When the High or Serious System Safety risk acceptance authority is replaced, the new System Safety risk acceptance authority must be notified on the prior assessment/acceptance within 60 working days. **(T-1)**

11.3.7.3. This action does not restart or extend the duration of acceptance or the four-year validation period.

11.3.7.4. When High and Serious System Safety risks are downgraded, a new risk assessment shall be prepared IAW paragraph **13.9,** coordinated with the offices required for the original level of risk and approved by the original System Safety risk acceptance authority.

11.4. System Safety Groups (SSG). SSGs are the organized committee of system safety stakeholders that augment/assist the program office system safety function. In addition to the day-to-day systems engineering and system safety activities, program offices should use SSGs to collect and cross feed user inputs/insights into the program's System Safety efforts and to provide all a view of all safety issues currently in work. SSG members are detailed in paragraph **11.4.3.1**

11.4.1. All Acquisition Category I (ACAT I) aircraft, weapons and space programs on the Acquisition Master List (AML) are required to conduct SSGs. Programs for subordinate systems used on aircraft or space systems shall address system safety issues within the SSG associated with the aircraft or space systems in which they are to be integrated, and are not required to have their own, separate SSGs. **(T-1)** Separate SSGs are not typically required for programs covered under AFI 91-205, *Nonnuclear Munitions Safety Board*, or AFI 91-401*Directed Energy Weapon Safety.* SSGs are optional for all other programs not previously addressed. AFSEC will maintain a list of aircraft and space programs that conduct SSGs. **(T-1)**

11.4.2. The program manager, deputy program manager or chief engineer chairs the SSG. SSG meetings are held at least annually as scheduled by the chair. In addition, any member of the SSG may request the chair call a meeting. The SSG Chair with concurrence of the PEO can postpone the SSG, but the SSG Chair must report on status of all safety modifications/Engineering Change Proposals (ECPs)/Time Compliance Technical Orders (TCTOs), open SSG action items, and High and Serious risks to the SSG Members with the postponement notice. The next SSG cannot be more than 24 months after the last SSG. Each SSG meeting will address the following as appropriate:

11.4.2.1. Program status. **(T-1)**

11.4.2.2. Fleet safety assessment. **(T-1)**

11.4.2.3. Analyses of major safety design trade-offs and modifications. Analysis will include risk hazard indices, proposed corrective actions and their effect and status. **(T-1)**

11.4.2.4. Status of planned, pending, active and disapproved safety modifications. Paragraph **13.9** has guidelines and considerations for modification planning and risk assessment. **(T-1)**

11.4.2.5. Safety investigation recommendations affecting the system. A discussion of High Accident Potential (HAP) reports that have occurred since the last meeting. **(T-1)**

11.4.2.6. User/operator issues. **(T-1)**

11.4.2.7. Safety risk mitigation options. **(T-1)**

11.4.2.8. Unmitigated hazards. **(T-1)**

11.4.2.9. System Safety program scope, including contractual requirements and deliverable System Safety data. **(T-1)**

11.4.2.10. Overall safety assessments, especially before milestone reviews. **(T-1)**

11.4.2.11. Major modifications or engineering change proposals. **(T-1)**

11.4.2.12. The need to establish SSWGs as necessary to work detailed System Safety issues. **(T-1)**

11.4.2.13. Making safety recommendations during design, development, test, operations, sustainment and disposal. **(T-1)** Assign risk indices to each discussion/action item as appropriate.

11.4.2.14. Aircraft Information Program status to emphasize the collection and analysis of safety data. **(T-1)**

11.4.3. The SSG System Safety Manager develops and coordinates the SSG charter. **(T-1)** The SSG charter will address the purpose and scope, mandatory membership, operating procedures and administration of the group. All mandatory members must commit to supporting SSG meetings and must sign the charter. **(T-1)** SSG membership consists of:

11.4.3.1. Minimum mandatory SSG members including the Chairperson (Program Manager, Deputy or Chief Engineer), Program SSM, AFSPC/SE (for space systems), AFMC/SES (for non-space ACAT 1 programs), the Lead MAJCOM safety office, Lead Operational and Developmental Test Agencies, and the Lead MAJCOM user representative. **(T-1)**

11.4.3.2. Minimum mandatory SSG advisors including the Center System Safety Manager, AFSEC and AFMC/SE (for non-space systems other than ACAT 1). **(T-1)**

11.4.3.3. Additional SSG members or advisors may include SAF/AQRE, the contractor system safety manager, program engineering staff (as needed based on issues at hand), Space Launch Ranges, National Guard/Air Force Reserve representatives, and other DoD and industry organizations (as appropriate) as determined by mandatory members. **(T-1)**

11.4.4. Within 30 working days, SSG meeting minutes shall be sent to all members, advisors, SAF/AQR, and AFMC Directorate of Engineering (AFMC/EN) or Space Missile Center

Directorate of Engineering (SMC/EN), as applicable. MAJCOM/SEF will ensure SSG meeting minutes are distributed to affected NAF and Wing Flight Safety representatives.

11.4.5. SSG recommendations that require capability changes or materiel modifications by the program office must be validated and documented IAW the process and criteria outlined in AFI 10-601, *Operational Capability Requirements Development* .

11.5. Non-Developmental Items. Program managers and purchasing activities/procuring agencies are required to conduct a System Safety analysis appropriate for the system or item. For non-developmental items, the analysis should review usage history, verify intended use similarities, evaluate differences, and plan for adequate safety evaluation for all Air Force-unique modifications or changes in use. This System Safety review should be accomplished by the procuring/buying agency that is in the best position to assess the intended use and necessary modification. For example, Federal Aviation Regulation (FAR) certification requirements are incrementally implemented and may not apply to all models or year groups of similar aircraft. Operations from military fields and or with military support equipment provide unique hazard opportunities that may not have been considered in the original design.

11.6. System Safety Engineering Analysis (SSEA). The SSEA program evaluates new operations that are currently prohibited due to the perceived risks (e.g., aircraft hot refueling, concurrent servicing operations, concurrent servicing operations supporting combat sortie generation and wet wing/rapid defueling operations). Based upon the successful demonstration and evaluation, approval may be granted to use the operation/procedures.

11.6.1. SSEA of a proposed operation is performed by a highly qualified team under controlled conditions. The team conducts actual demonstrations and analysis of the operation to validate overall risk assessment and recommend actions. The SSEA team is normally chaired by the AFLCMC System Safety Office and includes experts from AFMC/SES, AFSEC/SEF/SEG, and the developing/supporting and operational commands, and any other technical experts (as needed) as determined by the SSEA Chair. At the discretion of the SSEA Team Chief, Low-Risk SSEAs may be done via the in-house “tabletop” method without a demonstration.

11.6.2. A using command requests a SSEA in writing to AFLCMC/SES and informs HQ AFSEC and AFMC/SES. Requests must include:

11.6.2.1. A complete description of the proposed operation. **(T-1)**

11.6.2.2. Justification for accepting the increased risk. **(T-1)**

11.6.2.3. Recommended location and dates for the SSEA demonstrations. **(T-1)**

11.6.2.4. Identification of other DoD, Government or foreign agencies that might be involved. **(T-1)**

11.6.3. The SSEA team reports the results of the analysis, including operational concepts, system descriptions, risk assessments, hazard analyses, descriptions of the demonstrations and conclusions and recommendations to the requester. **(T-1)**

11.7. Application of a Safety Risk Assessment (SRA).

11.7.1. A formal SRA is a decision-making tool that may be required to communicate and document key elements of safety risk management processes. In acquisition programs, System

Safety processes are used to develop risk data and determine decision authorities; that information is then used in an SRA for decision-making. An SRA is usually associated with a non-conformity, abnormality, inability to demonstrate compliance with requirements or regulations, a previously unforeseen condition that creates a potentially hazardous environment, intended operations outside of known or approved environments, intent to operate equipment that has exceeded design service limits or that has not been maintained IAW standards or requirements, or when failures, mishaps or unexpected issues have indicated that previous assessments or expectations may be incorrect or incomplete. SRAs may also be used to evaluate new and innovative activities that could result in accidental losses and/or injuries. Paragraph **13.9** provides a sample SRA layout.

11.7.2. An SRA may be used as part of the in-depth deliberative risk management planning outlined in AFI 90-802, *Risk Management*; to support safety risk management decisions within acquisition and sustainment life cycle management processes carried out under DoDI 5000.02 and AFI 63-101/20-101 or DoDD 5030.61, *DoD Airworthiness Policy*, and AFI 62-601, *USAF Airworthiness*, and other internal guidance; as well as deliberative operational risk decisions, mishap recommendation closure decisions and other contemplative evaluations of safety risk where foreseen hazards require mitigation or formal risk acceptance.

11.7.3. When an SRA is required by Air Force instructions or policy, or an SRA is needed for technical, operational, airworthiness, acquisition or other purposes, a process must be developed that fulfills the core SRA principles described in this Chapter. Other instructions may prescribe detailed provisions for applying these principles in a specific manner. **(T-1)**

11.7.4. An SRA is generally the summary document for a package of materials that provides supporting details for the assessment and a decision. Do not rely upon information presented to the decision-maker separately. The SRA may be prepared on a Staff Summary Sheet that includes the core SRA principles or a separate SRA form may be prescribed. The SRA combined with supporting documents forms an SRA package that must sufficiently document all aspects pertinent to the decision regarding the mission or activity, involved systems, identified hazard(s), risk calculations, data sources and the mitigation options considered. **(T-2)**

11.8. Safety Risk Assessment Purpose and Risk Decision Authority Empowerment.

11.8.1. SRA packages are prepared to facilitate decisions on whether to accept safety risks, or mitigate them to reduce the predicted consequences. The primary purpose of an SRA is to ensure the Risk Decision Authority (RDA) has adequate information on potential adverse safety consequences, mitigations and alternatives to make an informed risk management decision.

11.8.2. A secondary purpose of an SRA package is to document the safety risk decision process and the factors that were known or presumed at the time of the decision. The documentation may be used to support leadership oversight, to inform the successor RDA or others who may inherit the accepted risks, and to provide a basis for preparing future SRA packages for required periodic revalidation.

11.8.3. While some guidance refers to the RDA as a Risk Acceptance Authority, it is essential that an RDA has the authority to direct and fund risk mitigation alternatives in addition to accepting risks without mitigation. The RDA must be in a position to balance safety risks with

potential mission, operational, programmatic and other benefits. In acquisition and sustainment programs, the RDA must also be in a position to evaluate impacts on costs, schedules and other risks. **(T-1)**

11.9. Core Safety Risk Assessment Principles. An SRA must include the following seven key elements: (**Note:** Additional information may be required for specific decision purposes.)

11.9.1. Hazard description. **(T-1)** An SRA must include a statement of the hazard, along with an explanation of the associated mission, operation or system that creates or warrants the exposure to the hazard. **(T-1)** The counter-balancing benefits of the activity should be described in overview in the SRA, with additional details provided in the SRA package supporting documents.

11.9.2. Level of Risk. **(T-1)** An SRA must include an assessment of the potential adverse consequences that could realistically result from exposure to the identified hazard. **(T-1)** Risk level is expressed in terms of severity of consequences and probability of consequences. Estimate the probabilities for the most severe credible adverse consequences that may be realized, expressed in terms of losses per operational event or time period. When a hazard has potential to result in multiple consequences of different severities, assess the probability for each and include the consequence with the most severe net losses for an exposure period along with other consequences that produce losses within an order of magnitude of those losses during the exposure period. Potential losses suffered, as well as potential losses imposed upon others, must be addressed. The potential adverse consequences must include all entities exposed to the hazard, including damage to equipment and environmental damage as required by AFI 32-7020, *The Environmental Restoration Program*, and injuries or death of operators, participants and uninvolved parties. **(T-1)**

11.9.2.1. Consequences are generally expressed in terms of the number and cost of equipment losses and the number of injuries or deaths. A monetized aggregate total for both losses and injuries/deaths may be used by applying valuations for injury costs and the OSHA Value of Statistical Life adjusted to current-year dollars for fatalities. Such aggregated costs can be useful in evaluating the cost of mitigations against the cost of consequences. AFI 91-204 provides guidance on calculating Air Force mishap losses. Alternative methods of valuation may be used if they more accurately describe the consequences, but rationale must be provided.

11.9.2.2. Consequences and probability may be combined and expressed as a risk level (sometimes referred to as a Hazard Risk Index, Risk-Hazard Index or RAC). Risk levels are primarily used to determine an RDA or evaluation process and may also be used to characterize a degree of danger. They should are not be used as the sole consideration for risk acceptance decisions because they fail to reflect the critical element of exposure, which ultimately determines is a key element in determining projected losses.

11.9.3. Exposure Period. **(T-1)** If RDA approval is sought for a limited period or a limited number of exposures, define that exposure period and use it for projected loss calculations. An exposure period is usually the time until risk mitigations are expected to be incorporated or hazard exposure otherwise ends, but may be for the life cycle of a system if no practical mitigations are identified. **(T-1)**

11.9.3.1. Where RDA approvals are sought for the life cycle of a system, establish a process for periodic re-accomplishment of the SRA, which will validate previous assumptions using accrued data and reassess potential mitigations considering technological advances and process changes. **(T-1)** State the date when re-accomplishment is required in the SRA. **(T-1)**

11.9.3.2. When an RDA accepts risk for the life cycle of a system, establish a process to provide accepted risk information to RDA successors or persons assuming similar levels of responsibility for the system. **(T-2)**

11.9.4. Projected Losses. **(T-1)** Provide statistical calculations for the losses projected to occur during the exposure period for which the RDA is making a decision. **(T-1)** State the losses on an annual basis and for the entire exposure period. **(T-1)** Show the calculation of projected losses that will occur during the period of exposure (typically the period for which approval is sought), as well as losses extrapolated across the lifetime of the system or foreseeable activity. **(T-1)** Projected losses mathematically express consequences and probability combined with exposure. To determine projected losses, multiply the losses per period or event (as used to determine risk level) by the number of periods or events for which risk acceptance is being considered. **(T-1)**

11.9.4.1. Include a calculation for projected losses across the lifetime of the system or foreseeable activity if risk were to continue at the same level without mitigation, to provide perspective on the need for mitigation. **(T-2)**

11.9.4.2. If safety risk acceptance is sought for an exposure period equal to the life cycle of a system, include a calculation for projected losses that will occur prior to the next periodic reassessment. **(T-2)**

11.9.4.3. If an SRA is prepared to address a non-conformity or non-compliance in a system, include all projected losses that are expected to result, both those suffered within that system and those imposed on other involved systems, personnel and entities. **(T-1)** This is required because only the RDA for the non-conforming or non-compliant system will have the authority and means to correct the shortfalls and mitigate the resultant safety risks.

11.9.4.4. For the purposes of an SRA, when multiple potential adverse consequences are evaluated (e.g., both Catastrophic and Critical severity outcomes), projected losses do not need to be included for outcomes with loss projections substantially lower than the most severe projected loss, unless the uncertainty is large or the less-severe outcomes are particularly relevant.

11.9.5. Mitigation Options. **(T-1)** Describe available or obtainable mitigation options, including expected effectiveness and resultant reduction in projected losses, along with impacts to cost, schedule, mission accomplishment and other important factors. **(T-1)** Mitigation options usually include an evaluation of the consequences with no mitigation as well as an evaluation of not conducting the operation or activity that requires exposure to the hazard, and may include transfer of mission responsibility to other entities. Consider and evaluate mitigations that include reducing exposure, redesign of systems, protective devices to reduce severity of consequences, warnings, training, restrictions and limitations. **(T-1)** Include a recommendation for the RDA. **(T-1)**

11.9.6. User and Stakeholder Views. **(T-1)** Provide the RDA a summary of the views of organizations responsible for users and interacting organizations that may experience potentially significant losses of assets or injuries to their personnel due to their exposure to the risks. **(T-1)** Other organizations may be required to prepare another SRA for a different RDA if hazard exposure may produce elevated risk levels for other entities. Address such situations as stakeholder views. Also provide the evaluation of reviewing safety organizations when such a review has been obtained or is required by policy. **(T-1)**

11.9.7. Document the Risk Decision Authority (RDA) Authority and Decision. **(T-1)**

11.9.7.1. In the SRA package, cite the policy that designates the RDA based upon the level of projected losses, level of risk, or other institutionalized responsibility. **(T-1)** The RDA (also referred to as Risk Acceptance Authority) must be empowered to direct mitigation measures and/or operational restrictions that reduce safety risk, as well as accepting risks or prohibiting exposure to the hazard. While risk level may be used for identifying an RDA, the actual risk decision must be based upon projected losses to ensure risk exposure period is considered. Document the decision of the RDA and any directed mitigations or limitations. **(T-1)**

11.9.7.2. Many acquisition programs (and MIL-STD-882E) use risk level to establish RDAs, without considering the exposure to the risks; however, the preferred method for identifying an RDA is to use projected loss thresholds with higher annual loss projections requiring higher leadership levels as decision authorities. **Note:** For example, Wing Commanders could be empowered to accept projected losses up to $100 million per year, MAJCOM commanders could accept projected losses up to $1 billion per year, and SECAF acceptance could be required for projected losses above that level.

11.10. Safety Office SRA Reviews. When organizational policy directs a review of SRA packages by AF/SE, AFSEC or other safety offices, those reviews will be completed before the SRA package is presented to the RDA for a decision. **(T-1)** Include the results of safety office reviews in the user and stakeholder views presented to the RDA in the SRA package. **(T-1)** Safety reviews of SRA packages will include:

11.10.1. An evaluation of the hazard description to ensure it is accurate and comprehensive. **(T-1)**

11.10.2. A review of calculations for risk levels and an assessment of the validity and accuracy of the data used as a basis for the calculations. **(T-1)** Safety reviews may recommend additional data, data sources or subject matter experts that should be used to improve confidence in the conclusions.

11.10.3. A review of the basis for qualitative risk assessments to determine if any data in the SRA is inappropriate for the assessment, or if additional applicable historical data is available in safety databases. **(T-1)** Safety offices may identify comparative assessments for similar operations or activities and provide information on historical acceptance for similar levels of risk.

11.10.4. Validation for projected losses calculations in the SRA, research into mishap data and/or expert opinions that may verify or refute the reasonableness of the assumptions made. **(T-1)**

11.10.5. Periodic reassessments. **(T-1)** Programs requiring an SRA must provide a timeframe of validity, after which an SRA must be re-accomplished, to include briefing and documenting RDA decisions and risk re-acceptance. **(T-1)** SRAs should also be considered invalid and re-accomplished if a mishap event or history of events demonstrate assumptions or supporting data in the SRA package are found to be significantly inaccurate, or when technology or improved operational practices provide viable new mitigations for safety risk.

Chapter 12

CONTRACT SAFETY

12.1. Contract Safety Program. The purpose of this chapter is to provide guidance on the responsibilities of the applicable safety office in the contracting process; with the overarching goal of protecting government personnel, equipment, facilities and mission from hazards posed by contractor operations. It is imperative that safety involvement begins early in the process to prevent hazardous conditions from developing or costly changes to the contract after implementation. **Note:** This chapter will be supplemented as needed by MAJCOMs and installations to ensure proper safety criteria is defined and adhered to in all AF acquisitions and/or AF procured contracts. **(T-1)**

12.2. Contract Types. The majority of contracts fall in two broad categories: services (includes construction) and commodity (supply) contracts. See **Table 12.1** for a list of possible issues to consider when dealing with contracts and subsequent design and review processes.

12.2.1. Service Contracts. Under a service contract, the Air Force pays a civilian company to perform a service. Service contracts generally include, but are not limited to, custodial services, ground maintenance operation of government-owned equipment, housekeeping services, etc. Construction contracts include new facilities, additions to existing facilities or modifications to existing facilities. The requesting organization will submit an AF Form 332, *Base Civil Engineer Work Request*, when required, defining facility criteria and needs to the installation CE office. **(T-2).** Construction contract reviews by safety personnel should begin at preplanning conferences, continue through design reviews, preconstruction conferences and facility acceptance inspections.

12.2.2. Commodity (Supply) Contracts. Commodity contracts are normally used for the local procurement of items not available through the AF or General Services Administration (GSA) supply systems. These contracts may include rental or leased equipment obtained for specific purposes. Installation organizations regularly initiate procurement actions for items or equipment that may not be designed, manufactured, installed or used according to safety criteria. Items in the Air Force or General Services Administration supply system are evaluated for safety and normally meet minimum standards.

12.2.3. The organization/user will coordinate AF Forms 9, *Request for Purchase*, and other purchase requests with the applicable safety staff before sending them to the contracting office unless locally established exemptions exist. **(T-3)**

Table 12.1. Contract Considerations.

Services and Construction Contracts.
Are there safety requirements required for the unit personnel? If so, what are the safety requirements, and who is responsible to ensure these requirements are met?
Will the service contract place unit personnel at risk of potential hazards, to include safety issues, such as slips, trips or falls, or HAZMAT? If so, does the contractor ensure supervisors of exposed personnel are made aware of the hazards?
Are flightline safety requirements briefed to contractors who work there?
Are contractors who work within explosive arcs, munitions, or weapons storage areas briefed on safety requirements?

Are contractors briefed on unit emergency procedures?
Do contractors adhere to federal or state safety training requirements that may be specified within the contract?
Are contractors made aware of how to contact emergency personnel on the installation?
What type of facility and occupancy (administrative, industrial, combination) will be constructed or modified?
What is the proposed number of personnel who will occupy the facility?
What is the specific use of the facility, i.e., aircraft maintenance hangar, industrial shop for welding or brazing, corrosion control facility or administrative building?
Is the equipment within the contract government owned/provided? If government owned are related safety standards included in the contract?
What are the potential hazards for the proposed operation of the facility?
Can potential hazards be eliminated or engineered out in the development phase of the construction contract?
Is the facility equipped with adequate ramps for handicap personnel that meet the requirements of the American Disabilities Act (ADA)?
Ensure adequate parking for personnel.
Ensure adequate handicapped spaces are identified and applicable signage is applied.
Have traffic safety concerns been addressed?
Does the new facility or facility modification affect weapons or flight safety requirements?
Does the facility meet National Fire Protection Association life safety code?
Are Small UAS use to support Operations.
Commodity Contracts.
Are AF Form 9 purchases reviewed for safety concerns/implications prior to being sent to the installation contracting office?
Are GPC purchases, not GSA-approved, reviewed to meet safety requirements?
Does the safety office review contracts/purchases that specify certain required and/or optional safety features for tools and equipment?
Are contracts reviewed for specific uses, e.g., explosion-proof equipment for hazardous locations?
Note: This list is not all-inclusive. Ideally, these questions would be addressed during the development phase of the contract.

12.3. Contractor Compliance. Contractors are responsible for complying with federal and state occupational safety and health standards for their employees, except where the Air Force contractually agreed to assume responsibility. Further detail can be found in DoDI 6055.01, Enclosure 5.

12.4. Safety Office. Safety personnel will:

12.4.1. Ensure the appropriate safety staff is included during the development of any contractual or government purchase card requirement and/or project processes to include safety requirements in the Performance-Based Work Statement or Statement of Work. **(T-1)**

12.4.2. Coordinate with the installation contracting office to ensure notification of the safety staff for relevant conferences, meetings, inspections and applicable designs reviews, e.g., blueprints, Computer-Aided Designs, etc. **(T-1)** The safety staff will participate as part of the

Multi-Functional Team (MFT), when prescribed by AFI 64-102, *Operational Contracting Program,* and AFI 63-138, *Acquisition of Services.* **(T-1)**

12.4.3. Ensure the requesting activities/organization communicates specific requirements outlined in operating directives or technical orders, to include operation plans, training needs, storage needs, traffic considerations, etc. **(T-1)**

12.4.4. Visit the proposed project location or facility during the site selection process, if needed. **(T-1)**

12.4.5. Review contractor safety plans to ensure materials used or operations conducted do not endanger public safety and government personnel or property. **(T-1)**

12.4.6. Not take actions that would put them in direct control of a worksite owned or controlled solely by a contractor or contract personnel. **(T-0)**

12.4.7. Report observed safety violations to the contracting officer or their representative. **(T-1)** In cases of observed critical and/or imminent danger safety personnel will take action to stop the operation and immediately contact the contracting officer. **(T-1)**

12.4.8. Consider host nation and OSHA or the national consensus standards of the United States (e.g., National Fire Protection Association and National Electrical Codes) when Statement of Work or Performance-Based Work Statement are developed for contract work outside the jurisdiction of the United States.

Chapter 13

SUPPORTING GUIDANCE

13.1. Air Force Safety Management System (AFSMS).

13.1.1. Purpose. AFSMS utilizes the four pillars (depicted in **Figure 13.1**) and the AFSMS framework (**Figure 13.2**) to structure the AF mishap prevention program. Activities associated with each pillar set policy, identify and mitigate hazards and risk, and reduce the occurrence and cost of injuries, illnesses, fatalities and property damage. Managing mishap prevention activities requires goal setting, planning, executing and measuring performance utilizing continuous improvement processes through the Plan-Do-Check-Act (PDCA) model as described in paragraph **13.1.4**

Figure 13.1. AFSMS Pillars.

13.1.2. Leadership implements the mishap prevention program by providing guidance and goals, establishing safety responsibility and accountability, applying risk management to all activities, and promoting the program throughout the organization. The result is a program designed to prevent mishaps, safeguard Airmen, protect resources and preserve combat readiness.

13.1.3. AFSMS Framework.

13.1.3.1. Policy and Leadership. Safety policy provides a structure for building a sound and proactive mishap prevention program. Active leadership involvement in the implementation and execution of the system supported at all levels of command is critical. The following are descriptions and examples of safety policies, leadership engagement and Airmen participation.

13.1.3.1.1. Safety policy is the foundation for the SMS framework of requirements and expectations. The structure is built of AF mishap prevention programs and activities that support the AF safety mission, vision, goals and objectives.

13.1.3.1.2. Leaders have overall responsibility for safe operations and must clearly establish safety responsibility and accountability throughout the organization, communicating their commitment to the safety and health of our Airmen. Safety staffs at all levels assist commanders with the integration and implementation of safety management elements into organizational activities.

13.1.3.1.2.1. Leaders set safety policies and goals and lead SMS implementation, communicating safety management throughout the organization by identifying and controlling safety risk, applying management principles and promoting a strong safety culture.

13.1.3.1.2.2. Leadership engagement includes: publicly committing to and taking responsibility for a safe working environment for all personnel; directing the organization to implement and maintain a mishap prevention program that includes appropriate authority and accountability levels; communicating the safety policy to all Airmen; and holding Airmen at all levels accountable for effective program implementation.

13.1.3.1.3. Airmen Participation. Organizational leadership shall establish and implement processes to ensure effective participation by its Airmen at all levels. **(T-1)** Proper use of the AFSMS elements enhances Airmen engagement and system effectiveness and drives continuous improvement. Organizational leadership will: encourage and support Airmen participation in the mishap prevention program, safety committees, and safety briefings; educate Airmen on the goals of safety-related inspections, risk assessments, and job safety analyses and how to accomplish them; and encourage Airmen to communicate safety concerns to leadership via hazard reports and other safety feedback mechanisms. **(T-1)**

Figure 13.2. AFSMS Framework.

13.1.3.2. Risk Management (RM). Risk management is the key to mishap prevention. The Air Force's five-step Deliberate RM process (see **Figure 13.3**) is the core of the Air Force's safety and mishap prevention program. Utilize RM to the maximum extent possible to

identify and assess hazards, develop and implement mitigating controls, and monitor and analyze the controls to assess their effectiveness. More details are available in AFI 90-802, *Risk Management,* and AFPAM 90-803, *Risk Management (RM) Guidelines and Tools.*

Figure 13.3. The Air Force 5-Step RM Process.

13.1.3.3. Assurance. Safety assurance is how commanders determine the elements of the mishap prevention program are implemented, and guides continuous improvement efforts. The assurance functions of evaluation, monitor, and review measure whether organizations conform to standards and are making progress toward established goals.

13.1.3.3.1. Evaluation. Evaluate system conformance and effectiveness through monitoring, measurements, inspections, assessments, evaluations, and mishap, near miss, and hazard investigations. Corrective action must be taken when non-conformance with system processes or execution is identified. **(T-1)**

13.1.3.3.1.1. Evaluation of safety assurance processes concentrates on validating, through collection and analysis of objective evidence(i.e., documents, records, metrics, inspection, evaluation), that operation, process, or system expectations are met or exceeded. These processes focus on compliance and conformance with the mishap prevention program, and that desired effectiveness results are achieved.

13.1.3.3.1.2. Safety assurance data is obtained from numerous sources, including continuous program monitoring/measurement, self-inspection, independent internal process/program evaluation, external inspection/evaluation (Unit Effectiveness Inspection [UEI], Management Inspection [MI], etc.), safety investigation and internal reporting systems (Hazard Reports, Airman Safety Action Program [ASAP] Reports, Military Flight Operations Quality Assurance (military FOQA) reports, Management Internal Control Toolset [MICT], etc.). **(T-1)** Ensure acquired data is actionable and adequately measures operations, program processes, and/or system performance. **(T-1)**

13.1.3.3.2. Monitoring. Commanders determine whether the system is performing effectively and meeting regulatory requirements by monitoring the status of corrective

and preventive actions, injury/illness metrics, findings of safety investigations (including hazards and near misses), inspections, assessments, audits, effectiveness measures and trend analysis. **(T-2)** To be effective, monitoring should ensure the necessary information is available for leadership to evaluate the continuing suitability, adequacy, and effectiveness of the mishap prevention program, which then helps commanders set continuous improvement targets.

13.1.3.3.3. Leadership Review (Annual Program Management Review [APMR]). This review allows leadership and applicable process owners to conduct a strategic and tactical critical evaluation of the conformance and effectiveness of the mishap prevention program and AFSMS framework. Results, recommendations, and action items from this review shall be documented, prioritized, communicated to affected organizations and tracked to completion. **(T-1)** See paragraph **13.2** Following the APMR, communicate expectations to each Airman, and incorporate these expectations into actionable tasks with clear deliverables and estimated completion dates. Additionally, revise program and/or system requirements, as needed.

13.1.3.3.4. Additional safety assurance considerations:

13.1.3.3.4.1. Design Review and Management of Change. Identify and take appropriate steps to prevent or otherwise control hazards at the design and redesign stages using tools found in the System Safety and RM processes. Commanders, supervisors and planners will utilize change management tools to assess and address change-induced risks associated with operations and contingencies. **(T-2)**

13.1.3.3.4.2. Procurement. Identify and evaluate potential hazards prior to purchasing products, goods and/or services. Ensure procedures and requirements are communicated to suppliers and service providers.

13.1.3.3.4.3. Contracts. As appropriate, include safety program requirements and processes in the Performance-Based Work Statement (PWS) for contracted work.

13.1.3.3.4.4. Emergency Preparedness. Periodically evaluate plans IAW AFI 10-2501, *Air Force Emergency Management Program.*

13.1.3.3.4.5. Early Intervention of Hazards. Participate in existing Air Force proactive safety programs, such as Air Force Combined Mishap Reduction System (AFCMRS) and ASAP, that provide early identification and intervention for hazards. Use such programs to identify, measure and mitigate hazards; revisit existing risk controls; and determine the effectiveness of newly implemented risk mitigations. Traditional mishap investigation data sources, i.e., Air Force Safety Automated System (AFSAS), and proactive safety data sources, e.g., Military Flight Operations Quality Assurance (MFOQA), are available to measure the risk hazards pose to operations, and the efficacy of mitigation controls.

13.1.3.3.4.6. Consultation. Safety professionals provide consultation services regarding all aspects of safety. This includes by request, through assurance processes and/or any other opportunities.

13.1.3.3.4.7. Resourcing. Programming resources for safety management to include manning, promotion and education, hazard abatement, etc.

13.1.3.4. Promotion, Training and Education. Ensure Airmen are provided safety awareness information, organizations have embedded ongoing training into the mishap prevention program, organizations have implemented effective risk control measures, and that Airmen are actively engaged in the mishap prevention program. **(T-1)**

13.1.3.4.1. Airmen and contractors shall know the mishap prevention program requirements that apply to their daily duties. This includes understanding hazard identification, control and reporting procedures, and where and how they can participate in the mishap prevention program. **(T-0)** Records of training are generated and maintained as directed by this instruction and other guidance.

13.1.3.4.2. The ideal context for maximizing mishap reduction through the AFSMS should be defined as an Informed Safety Culture, comprised of a Just Culture, Reporting Culture, Learning Culture and Flexible Culture. Commanders and leaders throughout the organization promote and enforce these aspects.

13.1.3.4.2.1. The foundation of an Informed Culture is a Just Culture, which encourages personnel to provide safety-related information without fear of reprisal. Leaders establish a Just Culture environment by encouraging hazard and error reporting for safety analysis and mishap prevention purposes. At the same time, they must understand and promote the idea that more can be learned through full reporting and detailed investigation of safety issues than by assigning blame and punishment. Leaders must also establish clear guidelines on acceptable and unacceptable behavior. Commanders may not use safety investigation reports for any purpose except mishap prevention, while other investigations (e.g., Commander-Directed Investigation) may be used as a basis for command disciplinary action, as appropriate.

13.1.3.4.2.2. The value of a Reporting Culture should be continuously promoted and reinforced by leadership actions, not only in soliciting information on hazards and threats to safety, but also in taking action. Addressing hazards is critical to a healthy Reporting Culture, as Airmen will stop reporting if they feel their concerns are not taken seriously.

13.1.3.4.2.3. A Learning Culture exists when the organization is not afraid to change direction, processes, or way of doing business simply because it's always been done that way. Leaders endorse a Learning Culture by showing a willingness to change procedures and practices based on uncovered hazards and mistakes.

13.1.3.4.2.4. A Flexible Culture is continuously promoted and reinforced by leadership actions throughout organizations by empowering personnel to recommend procedural and behavioral changes to manage risk.

13.1.4. Continuous Improvement. The AFSMS implements and supports a continuous improvement process by creating the framework to review safety conformance and effectiveness. It creates deliberate opportunities to refine and refocus suboptimal elements as trends develop, interventions are successful or fail, or new technology is introduced. While **Figure 13.2** depicts continuous improvement under the Assurance pillar, there is, in fact, a benefit of continuous improvement through execution of the mishap prevention program using all pillars of the AFSMS. Leaders from the squadron to the headquarters will use the PDCA

methodology to ensure that continuous improvement is being accomplished. **(T-1)** PDCA is an iterative four-step management method used for the control and continuous improvement of processes and products.

13.1.4.1. Plan. Establish the objectives and desired end state. Study programmatic shortfalls, emerging trends and/or changing conditions. Outline possible countermeasures and the necessary policy, programs, processes and actions necessary to deliver results IAW the expected outcome (the target or goals). By establishing output expectations, the completeness and accuracy of the specification becomes a part of the targeted improvement.

13.1.4.2. Do. Implement the plan, execute the process and make the product. Collect data for charting and analysis in the following "CHECK" and "ACT" steps.

13.1.4.3. Check. Study the actual results (measured and collected in "DO" above) and compare against the expected results (targets or goals from the "PLAN") to ascertain any differences. Look for deviations in implementation from the "PLAN" and "DO" parts of the cycle that may have affected execution. Charting data can make it much easier to see trends over several PDCA cycles and convert the collected data into information. Information is what you need for the next step, "ACT."

13.1.5. Act. Request corrective actions on significant differences between actual and planned results. Analyze the differences to determine their root causes. Determine where to apply changes that will include improvement of the process or product. **(T-1)** At the conclusion of the reviews in this part of the cycle, there should be evidence of the future direction of the mishap prevention program and any needed changes to the policy, priorities, objectives, resources or other program elements.

13.2. Annual Program Management Review (APMR).

13.2.1. Annually reviewing safety programs and analyzing results is essential to successful execution of the mishap prevention program under the Safety Management System (SMS). This analysis and resulting adjustments to the safety program should improve the program processes and procedures, reduce risk exposure, and consequently, decrease the frequency and/or severity of mishaps. The APMR provides senior leaders with a clear picture of the effectiveness of their safety function as well as its impact on the mission of the organization. The review will contain a statement declaring the mishap prevention program conformance and effectiveness under the systemic processes of the AFSMS was either met and effective, met but needs minor improvement(s), met but needs significant improvement(s), or was not effective. **(T-1)**

13.2.2. Minimum Required Elements of the APMR, as applicable: (**Note:** These elements are designed to preserve consistency across the safety enterprise.)

13.2.2.1. Executive Summary. A brief overview of how the organization's activities fit into the SMS concept and structure. **(T-1)**

13.2.2.2. Safety goals, objectives, and priorities for the next fiscal year. **(T-1)**

13.2.2.3. Analysis of the prior fiscal year's safety goals, objectives and priorities; identify areas of success and areas needing additional work. **(T-1)**

13.2.2.4. Mishap reduction progress. Include at least five years of data in the applicable categories. **(T-1) Note:** The Business Intelligence Tool of AFSAS will format/provide these slides at the MAJCOM, NAF, Wing and Squadron levels. **(T-1)**

13.2.2.5. Review of findings, recommendations (closed and new), and trends. **(T-1)**

13.2.2.6. Review results, deficiencies and corrective actions from CCIP and UEI reports conducted IAW AFI 90-201. **(T-1)**

13.2.2.7. Effectiveness of safety processes. Address both successes and failures of the safety processes in order to identify areas for improvement, where applicable. **(T-1)**

13.2.2.8. Review of Master Hazard Abatement plans and Open Risk Assessment Codes.

13.2.2.9. Continuous Improvement. **(T-1)**

13.2.2.10. Reference links to safety division related annexes, tabs, attachments or other products containing greater detailed breakdown of relative data. **(T-1)**

13.2.2.11. Signature of Commander (Installation/NAF/MAJCOM, as appropriate). May be delegated no lower than vice or deputy commander, or executive director. **(T-1)**

13.3. Federal/State Inspections of DoD Working Conditions and Mishap Investigations. Refer to DoDI 6055.01, *DoD Safety and Occupational Health (SOH) Program*, for additional information on announced or unannounced inspections, federal/state official access, opening and closing conferences, resolving conflicts and hazard abatement. OSHA inspection procedures for federal agency workplaces are provided in OSHA's Field Operations Manual. The current OSHA Field Operations Manual is located on the AF Occupational Safety SharePoint® website: (**https://cs2.eis.af.mil/sites/10178/**). **Note**: State OSHA officials, operating under a federally-approved plan and subject to the terms of any variance, tolerance or exemption granted by the DoL, may enforce state OSHA standards in workplaces. Verify with the base legal office to determine which areas of the installation falls under state versus exclusive federal jurisdiction. **(T-1)**

13.3.1. Federal/state officials may conduct, as part of their evaluation program, annual targeted inspections or program assistance visits of AF installations based on the comparative incidence of worker compensation claims. Federal/state officials may also request installations perform self-investigations and self-inspections on a case-by-case basis. Installation commanders, through execution of a locally approved OSHA Reception and Action Plan (example located on the AF Occupational Safety SharePoint® website: (**https://cs2.eis.af.mil/sites/10178/**), will:

13.3.1.1. Ensure Security Forces are provided a letter of instruction outlining notification procedures to the installation safety office upon federal/state official(s) arrival at the gate. **(T-2)**

13.3.1.2. Without delay, ensure the federal/state official(s) are met by a member of the installation safety office and escorted to where an opening conference will be conducted during normal duty hours. **(T-0)**

13.3.1.3. Host an opening conference with federal/state officials. **(T-2)** The installation safety office will notify their CC/CV, JA and IG of federal/state official's arrival. **(T-2)** Notify BEE, FES, PH, Civilian Personnel Office, Contracting Office, tenant unit safety

offices, labor representatives, and other agencies as required based upon the federal/state official's stated purpose of the visit. **(T-2)**

13.3.1.4. A safety representative and/or other functional representative (e.g., FES, BEE, PH, etc.) will escort the federal/state official to other parts of the installation after the opening conference. **(T-2)** When federal/state officials require entry to a classified or restricted area, the official will meet established security requirements for the area. **(T-1)**

13.3.1.5. Provide upon request, access to available safety, fire protection and health information in workplaces, unless prohibited by this instruction or other AFI guidance. **(T-1)** Access to privileged safety information is prohibited by DoDI 6055.07 and AFI 91-204. Federal/state officials may review non-privileged portions of mishap/incident reports in the workplace during the course of their investigation. Do not release "For Official Use Only" marked reports or materials to federal/state officials. Federal/state officials requesting access to additional information and records may obtain the information IAW the provision of DoDI 6055.01 and AFI 91-204.

13.3.1.6. Provide photographic or video support, if required. Videos or photographs taken on installations fall under the exclusive control of the installation commander. AF officials may review photographs and videos before release if they suspect possible disclosure of classified or proprietary information without the review. During federal/state inspections or investigations, take (or obtain from officials) photos of identified physical hazards/discrepancies which may result in an OSHA Notice of Unsafe or Unhealthful Working Conditions.

13.3.1.7. Host a closing conference with the federal/state officials and invite required agencies to attend. **(T-0)** If significant hazards or deficiencies are identified or problems occur during a federal/state inspection or investigation, notify the MAJCOM/FOA/DRU safety staff. **(T-1)** The MAJCOM/FOA/DRU will in turn immediately notify AFSEC/SEG.

13.3.1.8. Treat OSHA Notice of Unsafe or Unhealthful Working Conditions in the same manner as a fire, safety or health AF inspection report. **(T-1)** Evaluate and assign a RAC to each hazard identified by OSHA personnel. **(T-1) Note:** DoD agencies (i.e., DeCA, AAFES, etc.) are responsible for resolving issues related to OSHA Notice of Unsafe or Unhealthful Working conditions or requests for delays, variations, tolerances or exemptions of applicable safety and health standards.

13.3.1.9. Ensure appropriate members of the fire, safety or health offices verify federal/state inspection results, including all testing. **(T-1)** AF tests or sampling for future testing should be accomplished at the same time and at the same location as the federal/state testing, if possible.

13.3.1.10. Upon completion of the federal/state visit, health and fire officials, as applicable, shall coordinate responses to federal/state visits and OSHA Notice of Unsafe or Unhealthful Working Conditions with the installation safety office. **(T-1)**

13.3.2. Contractor Operations.

13.3.2.1. Within the 50 states and US territories, AF contractors operating from AF or privately-owned workplaces located on or off AF installations are subject to enforcement authority by federal and state safety and health officials. Authorized safety officials from

states without OSHA-approved safety and health plans may, subject to the exceptions in this instruction, exercise jurisdiction over contractor operations. At overseas locations, local government agencies may conduct inspections of contractor workplaces or operations as stipulated in status of forces or country-to-country agreements. **(T-0)**

13.3.2.2. Federal/state officials may perform OSH inspections of AF contractor workplaces in areas where the US holds exclusive federal jurisdiction. Verify with base legal office to determine which areas of the installation fall under federal jurisdiction. **(T-1)**

13.3.2.3. The DoL does not have authority over working conditions for which another federal agency or certain state agencies exercise statutory authority to prescribe or enforce standards or regulations affecting safety and health. Thus, OSHA authority does not extend to working conditions specifically covered by:

13.3.2.3.1. Any nuclear safety or health standard or instruction implementing Title 42, U.S.C., 2012, 2021, 2121(b), and 2201(b).

13.3.2.3.2. Any explosives safety standard or instruction implementing Title 10, U.S.C., 172, Ammunition Storage Board.

13.3.2.4. Regardless of whether or not a state has an OSHA-approved plan, state safety and Industrial Hygiene officials have no authority in AF contractor workplaces located in areas where the US holds exclusive federal jurisdiction.

13.3.2.5. Federal/state inspections or investigations of contractor operations on an AF installation will be reported IAW this instruction.

13.3.3. AFSAS OSHA Event Module.

13.3.3.1. OSHA Events shall be entered into the AFSAS OSHA Events Module. **(T-1)** An OSHA Event is defined as any official contact (i.e., email, fax, telephonic, in person) initiated between the AF and federal/state officials requesting inspection of processes, facilities or projects (military, civilian or contractor) or investigation of a mishap/incident on the installation. Any request for mishap/incident investigation information, i.e., the OSHA Rapid Response Report (see paragraph **13.3.4**) or AF Form 978, *Supervisor's Preliminary Mishap/Incident Report*, is considered an OSHA Event. Detailed instructions can be found in the AFSAS OSHA Events Module Guide located on the AF Occupational Safety SharePoint® website (**https://cs2.eis.af.mil/sites/10178/**). **Note:** Self-investigation responses, the OSHA Rapid Response Report or AF Form 978 requested by federal/state officials do not require coordination with appropriate MAJCOM/DRU/FOA (SE, FES, SG, JA) and HAF (AFSEC, AFCEC, AF/SG, AF/JA).

13.3.3.2. All OSHA Event correspondences will be uploaded into the AFSAS OSHA Events Module as the official recordkeeping process for OSHA Events. **(T-1)**

13.3.4. OSHA Rapid Response Report. If a Rapid Response Report is requested by OSHA, the installation safety office may ask OSHA if they will accept the AF Form 978 in lieu of the Rapid Response Report.

13.3.4.1. The affected organization will ensure the appropriate report is completed by the supervisor or USR and appropriately routed to the installation safety office. **(T-1)**

13.3.4.2. The installation safety office will:

13.3.4.2.1. Ensure the report does not contain any privileged information. **(T-1) Note:** To prevent inadvertent release of privileged information, a 1S0X1 or 0018 will not complete a Rapid Response Report.

13.3.4.2.2. Notify the installation commander or designated authority. **(T-1)**

13.3.4.2.3. Ensure the report is uploaded to the appropriate AFSAS OSHA Event. **(T-1)**

13.3.4.2.4. Provide the report to OSHA by their suspense date. **(T-1)**

13.3.4.3. The Rapid Response Report Worksheet is located on the AF Occupational Safety SharePoint® website (**https://cs2.eis.af.mil/sites/10178/**).

13.3.5. OSHA Notice of Unsafe or Unhealthful Working Conditions. Upon receipt of an OSHA Notice of Unsafe or Unhealthful Working Conditions, the installation safety office will upload the Notice into the AFSAS OSHA Events Module within two workdays and notify AFSEC by Email (**afscseg@us.af.mil**). **(T-1)** This reporting requirement applies to AF workplaces or operations performed by a contractor in which AF workplaces, equipment or procedural deficiencies are identified in the Notice. **Note:** OSHA Notice of Unsafe or Unhealthful Working Conditions include those issued and abated on the spot.

13.3.5.1. Although units receive notices individually at a particular location, the identified hazard may be classified as an Corporate-wide Repeat violation, previously identified at another AF location. All OSHA Notice of Unsafe or Unhealthful Working Conditions correspondence to OSHA will be coordinated with the appropriate MAJCOM/DRU/FOA (SE, FES, SG, JA) and HAF (AFSEC, AFCEC, AF/SG, AF/JA). **(T-1)** If required, AFSEC will coordinate with SAF/IEE. The MAJCOM and AFSEC track all violation(s) from identification through proposed response to OSHA and subsequent closure.

13.3.5.2. Informal Conference. The installation safety office will request an Informal Conference with the local OSHA office. Exceptions to an Informal Conference shall be coordinated through affected disciplines (i.e., BEE, FES, PH, etc.), MAJCOM and AFSEC/SEG. **(T-1)**

13.3.5.3. Pre-informal Conference. A Pre-Informal Conference involving applicable local representatives, MAJCOM and AFSEC will be held to discuss expectations of the Informal Conference. It shall be held no later than two days prior to the Informal Conference. **(T-1)** The Pre-informal Conferences will be scheduled by the applicable safety office and will:

13.3.5.3.1. Be scheduled with the local OSHA office as soon as possible IAW the OSHA Notice of Unsafe or Unhealthful Working Conditions instructions. **(T-1)**

13.3.5.3.2. Be used to contest violations and/or seek lesser classification, i.e., Serious to Other-Than-Serious. **(T-1)**

13.3.5.3.3. Be used to request extension on abatement dates (Petition for Modification of Abatement Date) and/or allow time for multi-level coordination through specific disciplines, MAJCOM, AFSEC and SAF/IEE. **(T-1)**

13.3.5.3.4. Involve, via teleconference, applicable MAJCOM and HAF-level agencies to include AFSEC/SEG. **(T-1)**

13.3.5.4. Petitions for Modification of Abatement Date (PMA) requested from OSHA (to include interim control measures) will be initiated by the installation OSM as the OSHA process manager for the installation commander. An electronic courtesy copy shall be sent to the MAJCOM/DRU/FOA and AFSEC. **(T-1)**

13.3.5.5. After the Informal Conference with OSHA, or approved exception, the commander or designated official will draft and coordinate the proposed official response to the violation, which will then be sent to the applicable MAJCOM/DRU/FOA safety office and AFSEC in parallel. **(T-1)** The MAJCOM/DRU/FOA will forward their coordinated position to AFSEC via e-mail to **afscseg@us.af.mil** for review and approval. AFSEC/SEG will determine SAF/IEE coordination. AFSEC/SEG will send the approved OSHA response to the installation for release. Units will build this additional coordination process into the time frame allowed for the response suspense to OSHA. **(T-1)**

13.3.5.6. In addition to local notifications, such as installation IG, JA, PA, CC or CV, and affected organizations or tenant activities, the installation safety office shall notify:

13.3.5.6.1. Applicable MAJCOM/FOA/DRU/SEG/SGP/SGPB/CE.

13.3.5.6.2. Applicable Intermediate Command/SEG/SGP/CE.

13.4. USAF Aviation Safety Equipment Database Reporting.

13.4.1. Purpose and Scope. The database will be maintained by AFSEC/SEFE in an electronic spreadsheet format and will be organized into aircraft categories of Bomber, Cargo/Transport, Fighter/Attack, Helicopter, Remotely Piloted Aircraft, Reconnaissance/Battle Management/C3I, Special Operations, Tanker, Trainer and Other.

13.4.2. Aircraft. Each aircraft model will be described to the level necessary to convey configuration differences, e.g., EC-135N, KC-135R, F-16CM, F-16B Block 15.

13.4.3. Inventory. The number of aircraft in this model as of the end of the fiscal year will be provided. If still in production, the planned production buy and current inventory as of the end of the fiscal year will be reported. Provide the following information for each item listed below:

13.4.3.1. The nomenclature, manufacturer and status of each equipment item for each Model Design Series.

13.4.3.2. If an update or procurement is in progress, document the current configuration, the new configuration, its Initial Operational Capability (IOC) date and its expected completion date by Fiscal Year Quarter.

13.4.3.3. If an item is planned but not funded, do not report it. If an item is in source selection, report it as to be determined (TBD) and include estimated IOC and completion dates.

13.4.3.4. If an item is installed only on a portion of the fleet, identify the extent of its installation (e.g., 20% of fleet).

13.4.3.5. Elaboration of each data element and requests for more detailed information are provided in the descriptions below. For each item, provide a Point of Contact to address further questions or clarifications.

13.4.4. Crash Survivable Parametric Recorder (Flight Data Recorder). Report any data recorder specifically designed to survive an aircraft crash and provide parametric data to a mishap investigation, e.g., LAS-209F, MU-1003. Additionally, document program's current compliance with applicable Air Force requirements contained within Aircraft Information Programs publications (AFH 63-1402, *Aircraft Information Program*). For any retrofit programs in progress, indicate when the retrofit program commenced, the status of the program (number complete), and what organization is accomplishing the retrofits.

13.4.5. Crash Survivable Acoustic Recorder (Cockpit Voice Recorder). Report any acoustic recording device specifically designed to survive an aircraft crash and provide evidence to a mishap investigation, e.g., A90A, VADAR. Additionally, document its compliance with USAF/SE requirements statement of 1997 for 2-hour recording capability and compliance with FAA TSO 123a.

13.4.6. Emergency Locator Transmitter (ELT)/Crash Position Indicator (CPI). Report any devices whose purpose includes alerting Search and Rescue to the location of aircraft wreckage and/or crew. Document compliance with FAA TSO C-126.

13.4.7. Traffic Alerting and Collision Avoidance System (TCAS). Identify the generation of the TCAS system (TCAS I, TCAS II, ETCAS, V7.0 ACAS) or transponder only mode. Also, identify any Automatic Airborne Collision Avoidance Systems.

13.4.8. Global Positioning System (GPS). Identify either stand-alone receiver or integrated GPS capability. If integrated into a navigation/avionics suite, then provide information of next higher-level assembly.

13.4.9. Ground Collision/Proximity Warning Systems (GPWS). Identify the generation of the GPWS system (First, Second, Third, Fourth, EGPWS, TAWS) and Class (Class A, B, C). If an additional function of another device, then provide information about the device that generates the warning, e.g., Flight Control Computer. Document compliance with USAF/XO Memorandum, Implementation of AF Navigation and Safety Master Plan and Policy Clarification for GPWS, ADF, and GPS Navigation Systems, 13 March 1997 and FAA TSO C151b.

13.4.10. Ground Collision Avoidance System (GCAS). For Bomber, Fighter/Attack and Special Operations aircraft, identify any type of GCAS equipment, or if an additional function of another device, then provide information about the device that generates the warning or pull-up command, e.g., GCAS, AGCAS, TFR, TAR.

13.4.11. Windshear Detection System (WDS). If an additional function of another device, then provide information about the device that provides detection, e.g., FSAS, MARK VII GPWS.

13.4.12. Other Electronic Storage Devices. Identify any other devices that if they survive a mishap, contain recorded information that could be of use to a mishap investigation. Examples could be a central computer that stores information on system faults, Head-Up-Display tapes, Multi-Function Display tapes, Quick Access Recorders, Signal Acquisition Units or a structural life usage recorder.

13.5. Mishap Response.

13.5.1. General. Pre-mishap response planning by safety staffs must address appropriate participation in all base-level responses, including:

13.5.1.1. Major mishaps.

13.5.1.2. Hazardous materials mishaps.

13.5.1.3. Natural disasters.

13.5.1.4. Nuclear weapons mishaps.

13.5.1.5. Conventional weapons mishaps.

13.5.1.6. Directed Energy Weapons mishaps.

13.5.2. The basic response planning document for Major Accident Response, Natural Disasters, Enemy Attack, and Distribution is AFI 10-2501, *Air Force Emergency Management Program.*

13.5.3. Emergency Operations Center (EOC). The EOC responds to peacetime major accidents and natural disasters to provide on-scene command and control of Air Force military resources and functional expertise. The EOC and its members will meet the requirements in AFI 10-2501.

Note: Ideally, the safety representative to the EOC should not be responsible for assembling the interim safety board (ISB). **(T-2)**

13.5.4. Safety Response to Other than Major Peacetime Accidents. Some mishaps may not warrant a full activation of the Disaster Response Force (DRF). However, the safety staff may need some EOC elements to support investigation of these less severe incidents, such as Combat Camera or Civil Engineering Specialists. Each safety staff should consult with their supporting readiness and emergency management flight to determine how to formally provide for partial EOC support when the full DRF is not activated.

13.5.5. Munitions Rapid Response Team. The Air Force Life Cycle Management Center Munitions Sustainment Division (AFLCMC/EBH) has developed a conventional munitions rapid response team to support Air Force units throughout the world anytime a munitions incident occurs. The team includes experts (engineers, equipment specialists, program managers and safety personnel) from associated conventional munitions and commodities programs. These personnel are able to travel anywhere in the world within 24 to 48 hours to assist safing the affected system, determining cause of failure, and assessing salvage ability of the system. If your MAJCOM/FOA/DRU or unit has an incident, and this team's help is desired, contact the AFLCMC Munitions Operations and Readiness Branch (AFLCMC/EBHM) via the Global Ammunition Control Point (GACP) Customer Relationship Management (CRM) System at **https://www.my.af.mil/ammoprod/wm/** to request support or by calling DSN 312-777-AMMO (2666); DSN 312-775-AMMO (2666); Commercial 801-777-AMMO (2666) or 801-775-AMMO (2666).

13.6. Job Hazard Analysis (JHA).

13.6.1. JHAs are conducted on all work processes, where appropriate, to identify potential hazards, determine appropriate PPE and include preventative measures in procedures to mitigate hazards. Part of the JHA process overlaps BE efforts to link tasks to hazards and identifying Occupational and Environmental Health PPE requirements. The JHA shall involve BE to avoid duplication of effort and to ensure proper awareness of process changes. **(T-1)**

Note: A JHA is not required when existing guidance adequately ensures all safety requirements of an operation or process.

13.6.2. A JHA Guide and worksheet are available at the AF Occupational Safety SharePoint® website (**https://cs2.eis.af.mil/sites/10178/Pages/Links.aspx**). Additional information on JHAs can be found in OSHA 3071, *Job Hazard Analysis*.

13.7. Risk Assessment Codes (RAC). Note 1: This instruction is not for use for System Safety processes. Those are addressed in MIL- STD-882E, *DoD Standard Practice for System Safety.*

Note 2: AF Bioenvironmental Engineering will refer to the latest version of DoDI 6055.01, *DoD Safety and Occupational Health (SOH) Program,* Appendix to Enclosure 3 – *Determining RACs,* to determine appropriate health RACs.
Note 3: This instruction is not for use to determine Fire Safety Deficiencies (FSDs). FSDs are addressed in AFI 32-10141, *Planning and Programming Fire Safety Deficiency Correction Projections.*

13.7.1. Risk Assessment Codes are an expression of the degree of risk associated with a hazard that combines hazard severity and mishap probability into a single numeric identifier. RACs are tools used by fire, safety and health professionals and commanders to prioritize abatement plans and mitigate hazards. It may not be possible to assign a RAC to every hazard or circumstance and the lack of a RAC should not dissuade efforts to mitigate hazards.

13.7.1.1. This instruction describes the basic RACs and provides some guidelines for assigning priorities based on cost, effectiveness and exposure. The discipline specific chapters also provide additional guidance for assessing the risks of the applicable hazards.

13.7.1.2. Risk Assessment Codes. Only qualified occupational safety, fire and/or health personnel shall assign a RAC to each hazard after an evaluation of the concern. (T-2)

13.7.2. Safety and fire RACs are determined by plotting the probability (A, B, C or D) that a mishap will occur and the potential mishap severity (I, II, III or IV) if it does happen (**Table 13.1**). FSDs will not be assigned a RAC. Fire safety deficiencies are addressed in AFI 32-10141, *Planning and Programming Fire Safety Deficiency Correction Projects.*

13.7.3. Health-related RACs are determined by plotting the health hazard severity and illness probability categories.

13.7.3.1. Health Hazard Severity Category (HHSC). The HHSC reflects the magnitude of exposure to a single physical, chemical or biological agent and the medical effects of exposure. Determine the HHSC by totaling the exposure and medical effects points and use the following table: **(T-2)**

13.7.3.2. Illness Probability Category (IPC). The IPC is a function of the duration of exposure and the number of exposed personnel. Determine the IPC for health hazards by totaling the exposure duration and number of personnel exposed points and use the following guide:

13.7.4. Commanders will consider this RAC system when determining which hazards/ deficiencies warrant the expenditure of limited resources. **(T-2)**

13.7.5. Assigned RACs 1-3 will be tracked in the installation master hazard abatement plan. RACs 4 and 5 will be tracked IAW locally prescribed processes. All RACs will be tracked until completely abated. **(T-2)**

Table 13.1. Safety and Ergonomic Hazard Risk Assessment Code Matrix.

Hazard Severity		**Mishap Probability**			
Description	Code	A Likely to occur immediately	B Probably will occur in time	C Possible to occur in time	D Unlikely to occur
Death, permanent total disability, or loss of facility or asset of $2,500,000 or more	I	1 Critical/Imminent	1 Critical/Imminent	2 Serious	4 Minor
Permanent partial disability or major property damage of $600,000 up to $2,500,000	II	1 Critical/Imminent	2 Serious	3 Moderate	4 Minor
Lost workday injury or compensable injury, or minor property damage $60,000 up to $600,000	III	2 Serious	3 Moderate	4 Minor	5 Negligible
Injury involving first aid or minor supportive medical treatment, a minimal threat to personnel or property (damage up to $60,000), or a violation of a standard	IV	4 Minor	4 Minor	5 Negligible	5 Negligible

13.8. Abatement Priority Number (APN).

13.8.1. The APN is a two-part code: the RAC and the Cost Effectiveness Index (CEI). CEI measures cost effectiveness of a hazard abatement project and represents a ratio of the project cost and its potential effectiveness. The APN will be used to determine the relative priority of abatement actions. Use the APN in establishing funding priorities for hazard abatement projects during the budgetary cycle. Compute APN:

13.8.1.1. Step 1. Determine RAC from **Table 13.1,** based on mishap severity and probability of occurrence. **(T-2)**

13.8.1.2. Step 2. Determine the severity probability multiplier (M) from the matrix in **Table 13.2,** using the same severity and probability used to determine the RAC. **(T-2)**

Table 13.2. Severity and Probability Multiplier Matrix.

Probability				
Severity	**A**	**B**	**C**	**D**
I	188	63	21	7
II	63	21	7	2
III	21	7	2	1
IV	7	2	1	0.26

13.8.1.3. Step 3. Determine exposure (E), or the average number of personnel exposed daily to the hazard during the course of the year. **(T-2)**

13.8.1.4. Step 4. Determine the total abatement project cost (C). **(T-2)** If actual costs are not known, use best available estimate.

13.8.1.5. Step 5. Compute the CEI by dividing the C for abatement by the product of M and E, or CEI = C/ (M) (E). **(T-2)**

13.8.1.6. Step 6. Determine APN by listing the RAC followed by the CEI in parenthesis, or APN = RAC (CEI). **(T-2)**

13.8.1.7. Step 7. Determine relative priority of abatement projects by comparing the CEI of projects within identical RACs. **(T-2) Note:** The lower the CEI, the higher its relative priority within the same RAC.

13.8.2. To use APNs to establish a priority list of projects, follow these steps:

13.8.2.1. Step 1. Determine RAC. **(T-2)** Assumptions: Given a hazard that will probably occur in time (Probability B) and would result in a permanent partial disabling injury (Severity II) if it resulted in a mishap. Therefore, the assigned RAC from **Table 13.1** would be 2.

13.8.2.2. Step 2. Determine multiplier (M). **(T-2)** Plot mishap probability (B) versus hazard severity (II) on **Table 13.2** to obtain a multiplier of 21.

13.8.2.3. Step 3. Determine exposure (E). **(T-2)** Assumption: The functional manager or supervisor determined that on an average day 25 people are exposed to the hazard.

13.8.2.4. Step 4. Determine the total cost of project (C). **(T-2) Example:** The total cost of the project to abate the hazard as provided to the functional manager by CE is $2,100.

13.8.2.5. Step 5. Determine CEI. **(T-2)** CEI = C/ (M) (E); (M) (E) = 21x25, therefore CEI = 2100/ (21) (25) = 4.

13.8.2.6. Step 6. Determine APN. **(T-2)** APN will be (RAC) (CEI) = (2) (4).

13.8.2.7. Step 7. Determine relative priority. **(T-2)** The APN will now be used to prioritize this project in relation to other RAC 2s for which APNs have been computed. A hypothetical priority listing containing this project is shown in **Table 13.3**

Table 13.3. Abatement Priority Number Index.

RAC	CEI	APN	Priority
1	(3)	1(3)	1
1	(113)	1(113)	2
2	(4)	2(4)	3
2	(15)	2(15)	4
3	(11)	3(11)	5
3	(96)	3(96)	6

Note: The APN system is not used to compare projects of two different RACs.

13.9. Preparation of Safety Risk Assessments. A risk assessment succinctly documents the results of several steps in the risk management process and supports follow-on decision-making processes. A suggested risk assessment layout is show in **Figure 13.4**

Figure 13.4. Sample Risk Assessment Layout and Guidance.

Risk Assessment Title

1. **Background**: Broadly describe the situation being evaluated. Provide sufficient detail so the remainder of the risk assessment may be easily understood.
2. **Hazard Identification:** Accurately and succinctly describe the hazard (e.g., deficiency with engineering design, material, quality, software, operations, maintenance) being analyzed.
3. **Initial Risk:** Using quantitative (preferred) and qualitative (alternate) means, identify the probability and severity of a mishap that could result from the hazard, based upon the exposure of personnel or assets to the identified hazard. Use the baseline or "as designed" state as the basis for determining the initial risk. Fully explain the methodology used, data considered (e.g., reported mishaps/events, deficiency reports, test results, etc.) and rationale for determining initial risk.
4. **Interim Risk:** Many times initial mitigation steps have already been taken prior to the completion of a written risk assessment. These steps may include permanent risk mitigation measures or temporary stop-gap risk mitigation measures. Describe these measures and explain how the initial risk is being mitigated, their effectiveness and the resulting interim risk until final risk mitigating options can be implemented.
5. **Risk Mitigation Options:** It is likely several options still exist to mitigate the risk of the identified hazard. Effective control measures reduce or eliminate one of the three components (i.e., probability, severity or exposure) of risk. Investigate specific strategies and tools that reduce, mitigate or eliminate risk. Address each risk mitigation option separately. One option to always consider is "taking no further action" which is the equivalent of accepting the initial risk and acknowledging and accepting projected future losses.
6. For each option, including accepting the initial risk, address:
    1. **Description:** Describe the option being evaluated.
    2. **Impact:** Describe the impact of this option. What are its benefits; limitations? Address its effectiveness and explain how it will eliminate or control future losses. Does it address other hazards/problems or introduce new ones?
    3. **Cost:** Estimate the costs (i.e., financial, operational, maintenance) to implement this option.
    4. **Schedule:** Estimated timeline needed to implement this option.

5. **Target Risk:** Great risk mitigation options eliminate hazards and their risk entirely; others only reduce the risk. Assuming this risk mitigation option is implemented; identify the probability and severity of a mishap that could result from the hazard based upon the exposure of personnel or assets to the identified hazard. Fully explain the methodology used (including analytical assumptions and limitations), data considered, and rationale for determining the target risk.
6. **Projected Losses:** Estimate the projected losses with implementation of this option. Express losses over a period of time, a number of events or for a given population as appropriate. Fully explain the methodology used, data considered and rationale for determining these projected losses. Note: If qualitative means were used to determine the probability of a mishap, use the upper and lower bounds of the selected probability and the expected exposure (i.e., as appropriate, remaining life of asset, period of test, etc.) to calculate the range of projected future losses.
7. **Summary of Options:** If the number of risk mitigation options is lengthy, a tabular summary may be appropriate. Include, as necessary.
8. Recommendation: State the recommended courses of action, including rationale.
9. Endorsements: Document the program office's preparation and review of the risk assessment by providing dates, signature blocks and signatures for the risk assessment's author, the System Safety Manager, the Chief Engineer, and the Program Manager.

13.10. Safety Release.

13.10.1. Requirements.

13.10.1.1. The Program Manager shall provide a safety release for the system prior to each developmental and operational test involving personnel. **(T-3)** The safety release must identify the known ESHO hazards that may affect the test and their associated risk acceptance. **(T-3)** A Safety Release provides the Test and Evaluation community the known system-related Environment, Safety and Occupational Health (ESOH) hazards prior to exposing people, equipment or the environment. The safety release must transmit system ESOH hazard data to the operators, maintainers, trainers and testers. **(T-3)** Test organizations use the safety release and other relevant data, documents and expertise to assess, further mitigate and accept test risks as appropriate. Refer to the Defense Acquisition Guidebook, DoDI 5000.02, *Operation of the Defense Acquisition System*, MIL-STD-882E, *DoD Standard Practice for System Safety*, and AFMAN 63-119, *Certification of System Readiness for Dedicated Operational Testing*, for additional information. As a minimum, the safety release will contain: **(T-1)**

13.10.1.1.1. Known hazards and mitigation actions/measures identified and tracked by the program office (e.g., master hazard list, Safety Assessment Report, SSG tracked hazards, previous test identified hazards, airworthiness analysis/certificates).

13.10.1.1.2. A cover letter or equivalent by the PM stating the item/system is safe to test given known hazards and mitigating measures, signed by the appropriate acquisition risk acceptance authority (A16.1.2).

13.10.1.2. The PM shall document that the associated risks have been accepted by the appropriate acquisition acceptance authorities as specified in DoDI 5000.02. **(T-2)** The user representative shall be part of this process throughout the life cycle and shall provide formal concurrence prior to all serious- and high-risk acceptance decisions. **(T-2)**

13.10.2. Format. The AFSEC recommended format for a safety release is provided in **Figure 13.5**

Figure 13.5. Safety Release Letter (Example).

MEMORANDUM FOR [Test Organization(s)] [Date] FROM: [Organization/Office Symbol] [Organizational Address]
SUBJECT: [Program Name] [Specific Activity, (e.g., RDT&E, FDE, OA, OT&E)] Safety Release
Ref: DoDI 5000.02, Operations of Defense Acquisition Systems [include any system safety and programmatic documentation (e.g., SSHA, SAR, PESHE) used to prepare this document]
1. Purpose. [State the purpose of the program, services involved, which service has lead, which office has been designated at the Program Office lead. State what time frame/operations/testing this safety release will cover.]
2. System Description. [Give a brief system description with the name, type, model number/designation, software version and the system mission (as applicable). Indicate how the system/materiel works and/or how it will be used/worn/operated.]
3. Discussion. [Discuss sources of data and summarize the open, mitigated and unmitigated ESOH hazards affecting this safety release. Provide the resultant risk level of those hazards. Provide which user representative(s) are/were a part of this process and have/will provide formal concurrence prior to all serious- and high-risk acceptance decisions.]
4. Conclusions/Recommendations. [Indicate whether the system is safe for testing and whether or not there are any exceptions that need to be detailed. Highlight any known safety problems requiring additional investigation during test. List any technical or operational limitations or precautions needed to prevent injury or equipment/property/environmental damage.] [Org/office] must be immediately notified of any safety related anomalies regarding the use of the system under test.
5. Point of Contact (POC). The POC is [Program Manager (and System Safety Manager, as required), office symbol(s), DSN and Commercial phone numbers, e-mail address(es).]
[Signature]
[Signature block of appropriate risk acceptance authority (see paragraph **A16.1.2** above)]
[Number of attachments] Attachments
1. [List of the appropriate attachments/documents used to support this safety release] Distro: [List the organizations/office symbols of the user representatives and testing organizations which will require/coordinate this safety release]
AFSEC/[XX]
AFOTEC/SE [or MAJCOM/SE, if an FDE]
AFMC/SES [LDTO]
[User]

13.11. Launch Vehicle Space Debris Assessment Report (SDAR).

13.11.1. Delivery Requirements Note: SDAR delivery will be IAW the requirements specified below. The normal schedule is:

13.11.1.1. Preliminary Design Review (PDR) draft SDAR: 30 days prior to the program or project PDR or equivalent program/project development milestone. The program manager (PM) receives the draft document and distributes it to the Chief Engineer and Safety Office and other offices as required. The purpose of preparing the report early in the design and development process is to ensure early identification of orbital debris issues when resolutions are least costly to implement. Any orbital debris mitigation compliance issues not resolved by the PDR require resolution no later than the Critical Design Review (CDR) or equivalent program/project development milestone.

13.11.1.2. CDR Draft SDAR: 45 days prior to the program or project CDR or equivalent program/project development milestone. The purpose of the CDR draft is to update and clarify the issues and changes to the PDR Draft. The PM will submit the CDR draft for review and concurrence to the Center-level (or equivalent) Chief Engineer, both the Center-level and NAF-level (or equivalent) Safety Offices, and any other offices as required.

13.11.1.3. Final Launch Vehicle SDAR: The PM will submit the Final Launch Vehicle SDAR 30 days prior to the launch approval process (Air Force Operational Readiness Review, Flight Readiness Review, or equivalent) for approval and signature by the appropriate acquisition authorities (Center Commander or equivalent, or designated approving official). Prior to final SDAR approval the Center (or equivalent) technical and/or safety subject matter expert will independently review the final launch vehicle SDAR. In addition, in the event of non-compliances requiring user concurrence on risk acceptance, the NAF (or equivalent) technical and/or safety subject matter expert will also review the final launch vehicle SDAR prior to approval. Note: SDARs are not required for suborbital missions.

13.11.2. **Format Note:** Each launch vehicle SDAR will follow the format shown in **Table 13.4** below and, at a minimum, include the content indicated.

Table 13.4. SDAR Format.

Cover and Front Matter
Cover showing the document version and date of delivery. Inside cover signed by (at a minimum): document preparer(s), program management, Chief Engineer, and Safety Office reviewers. Statement of any restrictions on the data in the SDAR, such as proprietary, International Traffic in Arms Regulations, or export controls. Ife the document does not contain any restrictions, then include a statement to that effect. If the document does contain restricted information, then summarize and clearly mark on the page(s) where it occurs and on the cover. The document history page shows each version of the report. This page will include reviews of the previous versions by the Chief Engineer or Safety Office.
Section 1: Program Management and Mission Overview
a. Identification of the program sponsoring the mission and the PM. b. Identification of any mission partners' participation in the program and a summary of the Air Force's responsibility under the governing agreement(s).

c. Schedule of mission design and development milestones through proposed launch date, including preliminary design review and critical design review (or equivalent) dates. d. Summary table indicating compliance or noncompliance with each debris mitigation requirement of DoDI 3100.12 and this instruction. e. Brief description of the mission. f. Identification of the anticipated launch site. g. Identification of the proposed launch date and mission duration. h. Description of the launch and deployment profile, including all parking, transfer, and operational orbits with apogee, perigee, and inclination. i. Identification of all launch vehicle orbital stages and all other launch vehicle released objects (> 5 mm in diameter), including their orbital parameters, following insertion of the spacecraft into a mission orbit or into an Earth escape orbit. j. Identification of any interaction or potential physical interference with other operational spacecraft.
Section 2: Spacecraft Description
a. Brief physical description of the spacecraft, including spacecraft bus, payload, and all appendages, such as solar arrays, antennas, and instrument or attitude control booms. b. Illustration of the entire spacecraft in the mission operation configuration. c. Total spacecraft mass at launch, including all propellants and fluids. d. Dry mass of spacecraft at launch, excluding solid rocket motor propellants. e. Description of all propulsion systems (cold gas, monopropellant, bipropellant, electric, nuclear). f. Identification of any radioactive materials on board.
Section 3: Launch Vehicle Description
a. Identification of launch vehicle used. b. Identification of any upper stages used. c. Identification of any launch vehicle stage identified for permanent insertion into Earth orbit. d. Dry mass of each orbital stage after spacecraft deployment. e. Detailed illustration of each orbital stage.
Section 4: Assessment of Launch Vehicle Debris Released during Normal Operations
a. List of any object(s) greater than 5 mm identified for release into Earth orbit from any stage, including, but not limited to, dual payload attachment fittings and stage separation devices. b. Rationale/necessity for release of each object. c. Time of release of each object, relative to launch time. d. Release velocity of each object with respect to orbital stage. e. Expected orbital parameters (apogee, perigee, and inclination) of each object after release. f. Calculated orbital lifetime of each debris object until reentry. g. Assessment of launch vehicle compliance with the relevant paragraphs of DoDI 3100.12 and this instruction, and the rationale for any non-compliances.
Section 5: Assessment of Launch Vehicle Potential for Explosions and Intentional Breakups
a. Identification of all potential causes of launch vehicle orbital stage breakup during operations, including during and after passivation.

b. Summary of failure modes and effects analyses (or equivalent analyses) of all credible failure modes which may lead to an orbital stage accidental explosion. c. Detailed plan for any designed orbital stage breakup, including explosions and intentional collisions. d. Detailed plan, under normal end of life conditions and deployment malfunction scenario, for passivating each orbital stage, including the depletion of residual propellants and fluids as thoroughly as possible. e. Assessment of launch vehicle compliance with the relevant paragraphs of DoDI 3100.12 and this instruction, and the rationale for any non-compliances.
Section 6: Assessment of Launch Vehicle Potential for On-Orbit Collisions
a. Calculation of each orbital stage probability of collision with known space objects larger than 10 cm in diameter during the orbital lifetime. For the assessment of collision probability, the orbital lifetime is defined as the time from end of launch collision avoidance to atmospheric reentry. The maximum time period for the assessment is 200 years. The reduction in probability of collision achieved by on-orbit collision avoidance performed by each orbital stage may be included in this assessment. b. Assessment of launch vehicle compliance with the relevant paragraphs of DoDI 3100.12 and AFI 91-202, and the rationale for any non-compliances.
Section 7: Assessment of Launch Vehicle Post-mission Disposal Plans and Procedures
a. Description of orbital stage disposal option selected. b. Plan for any orbital stage maneuvers required to accomplish disposal after end of orbital stage mission. c. Calculation of area-to-mass ratio after completion of all orbital stage operations, including disposal maneuvers, if the controlled reentry option not selected. d. Procedure for executing orbital stage disposal plan, including timeline from final shutdown of each orbital stage to completion of passivation and disposal operations. This includes, but not limited to burning residual propellants to depletion, venting propellant lines and tanks, venting pressurized systems, discharging batteries and preventing recharging, depressurizing gas and liquid filled batteries, deactivating flight safety systems and de-energizing control moment gyroscopes. e. Demonstration of reliability of orbital stage disposal operations. f. Assessment of launch vehicle compliance with the relevant paragraphs of DoDI 3100.12 and AFI 91-202, and the rationale for any non-compliances.
Section 8: Assessment of Launch Vehicle Reentry Hazards
Note: If a reentry hazard assessment already exists for an orbital stage, refer to that report and make any necessary adjustments for orbital inclination and year of reentry. a. Detailed description of launch vehicle components by size, mass, material, and shape, if atmospheric reentry option selected. b. Summary of objects expected to survive an uncontrolled reentry, specifying software tool(s) used for the analysis (such as NASA Debris Assessment Software, NASA Object Reentry Survival Analysis Tool, or comparable software). c. Calculation of expectation of human casualty for the expected year of reentry and the orbital stage inclination.

d. If appropriate, preliminary plan for launch vehicle controlled reentry. e. Assessment of launch vehicle compliance with the relevant paragraphs of DoDI 3100.12 and this instruction, and the rationale for any non-compliances.
Section 9: Reference List
a. Complete reference list of cited material, analysis, requirements, and a list of acronyms.

13.11.3. Review. **Note:** The Center Chief Engineer in coordination with the Center Safety Office will review each SDAR delivered and provide recommendations for improvements to the PM.

13.12. Combined Space Vehicle Space Debris Assessment Report/End-of-Life Plan (SDAR/EOLP). Note: The SDAR/EOLP will be a living document that evolves with the program.

13.12.1. Delivery Requirements.

Note: Deliver IAW the requirements specified below. The normal schedule is:

13.12.1.1. Preliminary Design Review (PDR) draft SDAR/EOLP: 30 days prior to the program or project PDR or equivalent program/project development milestone. The PM receives the draft document and distributes it to the Chief Engineer and Safety Office, and other offices as required. The purpose of preparing the report early in the design and development process is to ensure early identification of orbital debris issues when resolutions are least costly to implement. Any orbital debris mitigation compliance issues not resolved by the PDR require resolution no later than the Critical Design Review (CDR) or equivalent program/project development milestone.

13.12.1.2. CDR Draft SDAR/EOLP: 45 days prior to program CDR for the spacecraft or equivalent program/project development milestone. The PM will submit the preliminary draft for review and concurrence to the Center-level (or equivalent) Chief Engineer, both the Center-level and NAF-level (or equivalent) Safety Offices, and any other offices as required.

13.12.1.3. Final pre-launch SDAR/EOLP: The PM will submit the final pre-launch SDAR/EOLP 30 days prior to the launch approval process (Air Force Operational Readiness Review, Final Readiness Review, or equivalent) for approval and signature by the appropriate acquisition authorities (Center Commander or equivalent, or designated approving official). Prior to final SDAR/EOLP approval, the Center (or equivalent) technical and/or safety subject matter expert (SME) will independently review the final pre-launch SDAR/EOLP. In addition, in the event of non-compliances requiring user concurrence on risk acceptance, the NAF (or equivalent) technical and/or safety SME will also review the final pre-launch SDAR/EOLP prior to approval. The program office PM will provide the operational organization that will assume satellite control authority with a copy of the final SDAR/EOLP prior to the Operational Readiness Review or Final Readiness Review. **Note:** SDARs are not required for suborbital missions.

13.12.1.4. The operating unit shall update the SDAR/EOLP at the major program operational milestones identified in the SDAR/EOLP. Updates shall have the following title: *[date]* Update to the SDAR/EOLP.

13.12.1.5. Develop/deliver the final operational SDAR/EOLP IAW USSTRATCOM and Air Force operational guidance.

13.12.1.6. The Center/NAF/Wing-level (or equivalent) technical and safety SMEs will independently review each SDAR/EOLP developed/delivered IAW this instruction. **(T-3)**

13.12.2. Contents of SDAR/EOLP. **Note:** **Table 13.5** below parenthetically identifies the data added during operations; the required assessments will reflect achieved operational orbit parameters and on-orbit state of the spacecraft.

Table 13.5. Contents of SDAR/EOLP.

Cover and Front Matter
Cover showing the document version and date of delivery Inside cover signed by (at a minimum): document preparer(s), program management, Chief Engineer, and Safety Office reviewers. Statement of any restrictions on the data in the SDAR/EOLP such as proprietary, International Traffic in Arms Regulations, or export controls. If the document does not contain any restrictions, then include a statement to that effect. If the document does contain restricted information, then summarize and clearly mark on the page(s) where it occurs and on the cover. The document history page shows each version of the report. This page will include reviews of the previous versions by the Chief Engineer or Safety Office.
Section 1: Program Management and Mission Overview
a. Identification of the program sponsoring the mission and the PM. b. Identification of any mission partners' participation in the program and a summary of the Air Force's responsibility under the governing agreement(s). c. Schedule of mission design and development milestones through proposed launch date, including spacecraft PDR and CDR (or equivalent) dates. d. Schedule of mission operational milestones from launch through end of life. e. Summary table indicating compliance or noncompliance with each debris mitigation requirement of DoDI 3100.12 and this instruction. f. Brief description of the mission. g. Description of operational orbits with apogee, perigee, and inclination. h. Chronology of management reviews of the EOLP to include changes in spacecraft operability which may affect the ability to passivate and dispose per the plan in Section 6 of the EOLP. i. Identification of the anticipated launch vehicle and launch site. j. Identification of the proposed launch date and mission duration. k. Identification of all released objects (> 5 mm in any dimension), including their orbital parameters following insertion of the spacecraft into a mission orbit or into an Earth escape orbit. l. Identification of any interaction or potential physical interference with other operational spacecraft.
Section 2: Spacecraft Description
a. Physical description of the spacecraft, including spacecraft bus, payload, and all appendages, such as solar arrays, antennas, and instrument or attitude control booms.

b. Detailed illustration of the entire spacecraft in the mission operation configuration. c. Total spacecraft mass at launch, including all propellants and fluids. d. Dry mass of spacecraft at launch, excluding solid rocket motor propellants. e. Total mass of post-passivation spacecraft, including all propellants and fluids. f. Description of all propulsion systems (cold gas, monopropellant, bipropellant, electric, nuclear). g. Identification, including mass and pressure, of all fluids (liquids and gases) planned to be on-board during mission, including end-of-life maneuvers. h. Description of all fluid systems, including size, type, and qualifications of fluid containers such as propellant and pressurization tanks. i. Description of all active and/or passive attitude control systems with an indication of the normal attitude of the spacecraft with respect to the velocity vector. j. Description of any range safety or other pyrotechnic devices. k. Description of the electrical generation and storage system. l. Identification of any other sources of stored energy not noted above. m. Identification of any radioactive materials on board. n. Table of the following on board the spacecraft at time of issue of SDAR/EOLP version, expected at commencement of passivation, and expected at completion of passivation. (Data to be updated during operations.) Fluids Pyrotechnic devices Electrical generation and storage system Identification of any other sources of stored energy not noted above Any radioactive materials o. List of changes in the propulsion systems and energy systems which have occurred since launch. Include a detailed illustration of the entire spacecraft in the EOL configuration. (Data added during operations.) p. Status of the major systems on board the spacecraft, including any changes in redundancy. (Data added during operations.)
Section 3: Assessment of Spacecraft Debris Released On Orbit
a. Identification of any object (>5 mm in any dimension) expected to release from the spacecraft any time after launch, including object dimensions, mass, and material. b. Rationale/necessity for release of each object. c. Time of release of each object. d. Release velocity of each object with respect to spacecraft. e. Expected orbital parameters (apogee, perigee, and inclination) of each object after release. f. Calculated orbital lifetime of each object, including time spent in low earth orbit. g. Assessment of spacecraft compliance with the relevant paragraphs of DoDI 3100.12 and this instruction, and the rationale for any non-compliances.
Section 4: Assessment of Spacecraft Potential for Explosions and Intentional Breakups
a. Identification of all potential causes of spacecraft breakup, including during and after passivation. b. Summary of failure modes and effects analyses (or equivalent analyses) of all credible failure modes which may lead to an accidental explosion.

c. Detailed plan for any designed spacecraft breakup, including explosions and intentional collisions. d. List of components identified for passivation at end of life, including method of passivation. e. Rationale for all items identified for passivation but not designed to be passivated. f. Assessment of spacecraft compliance with the relevant paragraphs of DoDI 3100.12 and this instruction, and the rationale for any non-compliances.
Section 5: Assessment of Spacecraft Potential for On-orbit Collisions
a. Calculation of spacecraft probability of collision with known space objects larger than 10 cm in diameter during the orbital lifetime. For the assessment of collision probability, the orbital lifetime is defined as the time from end of launch collision avoidance to atmospheric reentry. The maximum time period for the assessment is 200 years. The reduction in probability of collision achieved by on-orbit collision avoidance performed by the space vehicle may be included in this assessment. b. Identification of all systems or components required to accomplish any post-mission disposal operation, including passivation, and maneuvering. c. Calculation of spacecraft probability of collision with space objects, including orbital debris and meteoroids, of sufficient size to prevent post-mission disposal. d. Assessment of spacecraft compliance with the relevant paragraphs of DoDI 3100.12 and this instruction, and the rationale for any non-compliances.
Section 6: Assessment of Spacecraft Post-mission Disposal Plans and Procedures
a. Demonstration of reliability of post-mission disposal operations. b. Description of spacecraft disposal option selected. c. Plan for any spacecraft maneuvers required to accomplish post-mission disposal. d. Calculation of area-to-mass ratio after post-mission disposal, if controlled reentry option not selected. e. Procedure for executing post-mission disposal plan. f. Detailed plan for passivation of the spacecraft, including the depletion of residual propellants and fluids as thoroughly as possible, the disabling of charging circuits, and the de-energizing of rotational energy sources. This includes, but not limited to burning residual propellants to depletion, venting propellant lines and tanks, venting pressurized systems, discharging batteries and preventing recharging, depressurizing gas and liquid filled batteries, deactivating flight safety systems, and de-energizing control moment gyroscopes. g. Assessment of spacecraft compliance with the relevant paragraphs of DoDI 3100.12 and this instruction, and the rationale for any non-compliances.
Section 7: Assessment of Spacecraft Reentry Hazards
a. Detailed description of spacecraft components by size, mass, material, and shape, if atmospheric reentry option selected. b. Summary of objects expected to survive an uncontrolled reentry, specifying software tool(s) used for the analysis (such as NASA Debris Assessment Software, NASA Object Reentry Survival Analysis Tool, or comparable software). c. Calculation of expectation of human casualty for the expected year of reentry and the spacecraft orbital inclination. d. If appropriate, preliminary plan for spacecraft controlled reentry.

e. Assessment of spacecraft compliance with the relevant paragraphs of DoDI 3100.12 and this instruction, and the rationale for any non-compliances.
Section 8: Assessment for Tether Missions
a. Type of tether (e.g., momentum, electrodynamic). b. Description of tether system, including (1) tether length, diameter, materials, and design (single strand, ribbon, multi-strand mesh) and (2) end-mass size and mass remaining at EOL. c. Determination of minimum size of object that will cause tether severance. d. Tether mission plan, including duration and post-mission disposal. e. Probability of tether colliding with large space objects. f. Probability of tether severance during mission or after post-mission disposal. g. Maximum orbital lifetime of a severed tether fragment. h. Assessment of compliance with the relevant paragraphs of DoDI 3100.12, and the rationale for any non-compliances.
Section 9: Reference List
a. Complete reference list of cited material, analysis, requirements, and a list of acronyms.

13.12.3. Review. **Note:** The Center Chief Engineer in coordination with the Center Safety Office will review each SDAR/EOLP delivered and provide recommendations for improvements to the PM.

Chapter 14

SAFETY TRAINING

14.1. Job Safety Training Outline.

14.1.1. Training Requirements. Supervisors will provide and document safety training to all newly assigned individuals (i.e., PCS, PCA or work center change to include deployment) on the hazards of their job before they start work and immediately when there is a change in equipment, processes, work environment or safety, fire and health requirements. Refresher training will be conducted and documented when employees demonstrate a lack of understanding of their required safety responsibilities or training such as is called for in AFMAN 91-203, Chapter 21, *Hazardous Energy Control*, has a specified frequency for recurrence. **(T-1)**

14.1.1.1. Supervisors will review and update the JSTO annually and/or when there is a change in equipment, processes or safety, fire and health requirements, to include procedural input as a result of a completed JHA. JSTO reviews will be accomplished by the supervisor and documented with the date of review and the person conducting the review. Safety, fire protection and health personnel will provide technical assistance to supervisors in developing a training outline to meet AFI/AFOSH requirements. JSTOs will be reviewed by safety inspectors during the scheduled safety assessment. **(T-1)**

14.1.1.2. Document safety, fire and health training as specified in paragraph **1.6.28.1** Documentation will be maintained by the supervisor within the work center. **(T-2)**

14.1.1.3. Designated Employee Representatives. The civilian personnel flight will schedule and monitor safety, fire protection and health training for employee representatives. **(T-0)** Upon request, coordinate training for designated representatives of civilian employees to assist in maintaining safe and healthful workplaces. The extent of such training will depend on local needs, but can typically be met by attendance at Supervisor Safety Training.

14.1.1.4. General Safety Education and Training Courses are listed in paragraph **14.3** Supervisors/instructors will document employee training. **(T-2)** Documentation may be accomplished using the AF Form 1286, *Safety Education/Training Roster*, or equivalent product.

14.1.2. Mandatory Items. The Job Safety Training Outline will be developed and used by supervisors to instruct all employees on work place specific hazards upon initial assignment and when work conditions or tasks change. The items below are mandatory, minimum topics the supervisor must ensure their employees receive training on prior to performing tasks in the work center. Topics addressed by other sources can be directly referenced in the JSTO to prevent redundancy and still adequately cover the required topics. Document training as specified in paragraph **1.6.28.7.1** Deployed and installation commanders may dictate more stringent requirements. **(T-1)**

14.1.2.1. Describe hazards of the job that apply to their work place. **(T-1)**

14.1.2.1.1. Specific hazards such as crushing hazards, burn hazards, chemical exposure, ladder use and falls, etc.

14.1.2.1.2. Hazards in the work environment such as flight line issues, weather hazards, loud noises in the shop, etc.

14.1.2.1.3. Applicable safety guidance such as TOs, job guides, JHAs, manufacturer's instructions, etc.

14.1.2.1.4. Describe hierarchal controls used to reduce hazard potential of these work place hazards IAW the following concepts (Refer to AFMAN 48-146 and AFPAM 90-803 for additional and detailed guidance):

14.1.2.1.4.1. Elimination. **(T-1)**

14.1.2.1.4.2. Engineering controls. **(T-1)**

14.1.2.1.4.3. Substitution.**(T-1)**

14.1.2.1.4.4. Administrative controls. **(T-1)**

14.1.2.2. Required use of PPE as determined by a JHA, requirements directed by TO, job order or instruction, recommendations from the safety office and BE.

14.1.2.2.1. Training must include donning, doffing, cleaning, maintaining, storing and disposal of PPE.

14.1.2.2.2. Personnel who wear contact lens or have medical conditions or take medications that may affect the use or wear of PPE will be reminded that they must notify their supervisor immediately. (See paragraph **1.6.29.1**).

14.1.2.3. Emergency action and fire prevention plans applicable to the work place; refer to emergency management plans for additional information. Location and use of emergency and fire protection equipment (i.e. alarms, AEDs and extinguishers) will also be addressed. **(T-1)**

14.1.2.4. Requirements for reporting unsafe equipment, conditions or procedures to supervisor immediately. Procedures must include notification to employees that reporting unsafe conditions or work related injury or illnesses can be reported without fear of retaliation. **(T-0)**

14.1.2.4.1. Purpose and location of AF Form 457, *USAF Hazard Report*. **(T-1)**

14.1.2.4.2. Purpose and means to access the ASAP process. **(T-1)**

14.1.2.5. Requirements and procedures for reporting mishaps, occupational injury, occupational illness, and OSHA recordable events such as: minimum stress and strain, terrorist acts, and work place violence without fear of coercion, discrimination or reprisal. **(T-1)**

14.1.2.5.1. Address specific requirements for on- and off-duty regular Air Force employees and on-duty only for civilians.

14.1.2.5.2. Location of medical facilities and procedures for obtaining treatment. **(T-1)**

14.1.2.5.3. Emergency procedures which apply to the work center:

14.1.2.5.4. Means to summon emergency service, i.e. 911, on-base number for cell phones, etc.

14.1.2.5.5. Evacuation routes and meet-up points.

14.1.2.5.6. Shelter in place locations.

14.1.2.5.7. Active shooter response methods.

14.1.2.6. Purpose and location of the CA-10, *What a Federal Employee Should do When Injured at Work* and Form LS-201, *Notice of Employee's Injury or Death* (Non-Appropriated Funds), if applicable. **(T-1)**

14.1.2.7. Requirements of Air Force Traffic Safety Program (Reference: AFI 91-207). Include mandatory use of seat belts and helmets, speed limits, local traffic hazards, spotters while backing and vehicle training requirements. Additionally, brief prohibition/restrictions on use of electronic devices while operating vehicles on- or off-base and discuss motorcycle safety training requirements before riding a motorcycle. **(T-1)**

14.1.2.8. Location and content of Air Force Visual Aid (AFVA) 91-209, *Air Force Occupational Safety and Health Program*. **(T-1)**

14.1.2.9. AFSMS Responsibilities, discuss how leaders, supervisors and airmen will participate in the unit safety management system and work towards continual improvement. (See paragraph **13.1**)

14.1.3. Job Specific Training Items. Supervisors will provide specific training based on the program requirements of the work place, provide application-level training, and document prior to employee performing task. If the Career Field Education Training Plan (CFETP) covers a particular training program, then no additional documentation beyond the CFETP is required. **Note:** Subjects listed below may not be mandatory for every job, but are dependent upon the type job/tasks individuals will be performing. Items listed below may not be all inclusive, refer to specific program requirements. **(T-2)**

14.1.3.1. Hazardous Energy Control. Reference: 29 CFR §1910.147 and AFMAN 91-203, Chapter 21, *Hazardous Energy Control.* **(T-2)**

14.1.3.2. Hazard Communication. Reference: AFI 90-821, *Hazard Communication*, and 29 CFR § 1910.1200. **(T-2)**

14.1.3.3. Bloodborne Pathogens. Reference: 29 CFR § 1910.1030. **(T-2)**

14.1.3.4. Hearing Conservation. Reference: AFI 48-127, *Occupational Noise and Hearing Conservation Program*. **(T-2)**

14.1.3.5. Confined Space Program (Entrant, Attendant, Supervisor, Monitor and Rescue Team). Reference: AFMAN 91-203, Chapter 23, *Confined Spaces*, and 29 CFR § 1910.146. **(T-2)**

14.1.3.6. Manual and Powered Hoists. Reference: AFMAN 91-203, Chapter 35, *Material Handling Equipment.* **(T-2)**

14.1.3.7. Respiratory Protection Program. Use AF Form 2767, *Occupational Health Training and Protective Equipment Fit Testing (LRA)*. Reference: AFI 48-137, *Respiratory Protection Program*. **(T-2)**

14.1.3.8. Vehicle Mounted Elevated Work Platforms, Self-Propelled and Manual Platforms. Reference: AFMAN 91-203, Chapter 16, *Mobile Elevating Work Platforms.* **(T-2)**

14.1.3.9. Fall Arrest System(s). Reference: AFMAN 91-203, Chapter 13, *Fall Protection,* 29 CFR 1910.66 and 29 CFR 1926.503. **(T-2)**

14.1.3.10. Forklift (Material Handling Equipment). Reference: AFMAN 91-203, Chapter 35, and 29 CFR 1910.178. **(T-2)**

14.1.3.11. Explosives Safety Training. Reference: AFMAN 91-201, *Explosives Safety Standards,* and this instruction. **(T-2)**

14.1.3.12. Pole/Tower Climbing. Reference: AFMAN 91-203, Chapter 30, *Communication Cable, Antenna and Communication Systems*. **(T-2)**

14.1.3.13. Cardiopulmonary Resuscitation (CPR) Training. Reference: AFMAN 91-203, Chapter 1, *Introduction.* **(T-2)**

14.1.3.14. Flight Line Driving. Reference: AFMAN 91-203, Chapter 24, *Aircraft Flight Line – Ground Operations and Activities,* and other governing directives. **(T-2)**

14.1.3.15. Fetal Protection Program. Job Specific. Reference: AFMAN 48-146, *Occupational & Environmental Health Program Management.* **Note:** Air Force Reserve – AFRCI 41-104, *Pregnancy of Air Force Reserve Personnel.* **(T-2)**

14.1.3.16. Medical Surveillance Examination (Scheduling, Administration, Reporting and Follow-up). Reference: AFI 48-145, *Occupational and Environmental Health Program*. **(T-2)**

14.1.3.17. Electromagnetic Field Training (EMF). Reference: AFI 48-109, *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health Program*. **(T-0)**

14.1.3.18. Laser Safety Training. Reference: AFI 48-139, *Laser and Optical Radiation Protection Program*. **(T-0)**

14.1.3.19. As Low As Reasonably Achievable (ALARA) Ionizing Radiation Training. Reference: AFI 48-148, *Ionizing Radiation Protection.* **(T-2)**

14.1.4. Documentation of Training. Document training as specified in paragraph **1.6.28.7.1** **(T-0)**

14.1.5. Maintenance and Disposition of Training Documentation Product. Maintain as prescribed by the records disposition schedule (**https://www.my.af.mil/afrims/afrims/afrims/rims.cfm**), Table & Rule: T 91 - 04 R 24.00 or T 91 - 04 R 25.00. Supervisors will maintain the training documentation as prescribed in paragraph **1.6.22.5** When an individual deploys/transfers to another Air Force position/location, the training documentation will be transferred physically or electronically by the old supervisor to the individual who will provided the records to the new supervisor upon arrival to deployed location or new base. The new supervisor will review the training documentation product, transfer current training completion dates as necessary and initial Hazardous Communication (HAZCOM) date and other one-time training to a new training documentation product if necessary and retain the old product IAW the Air Force Records

Disposition Schedule. The supervisor will provide a copy to personnel who separate or retire and destroy the training documentation product after one year. **(T-3)**

14.2. Continuing Education and Training Courses.

Table 14.1. Continuing Career Safety Professional Development (Recommended Safety Courses).

Course Subjects – Topics
Occupational Safety and Health Standards for the General Industry
Occupational Safety and Health for Other Federal Agencies
Introduction to industrial Hygiene for Safety Personnel
Principles of Ergonomics Applied to Work-related Musculoskeletal Disorders
National Fire Protection Association (NFPA) Life Safety
National Electric Code 9NEC) Electrical Standards
Collateral Duty Course for other Federal Agencies
Control of Hazardous Energy (Lockout – Tagout)
Machinery and Machine Guarding Standards
Hazard Evaluation and Risk Assessment
Permit-Required Confined Space Entry
OSHA Recordkeeping and Inspections
Bloodborne Pathogens Exposure Control
Environmental Compliance Assessment
Disaster Site Worker Train-the-Trainer
Evacuation and Emergency Planning
Hazardous Waste Management
Scaffolding, Cranes and Rigging
Excavation and Trenching
Traffic Control Technician
Health Hazard Awareness
Respiratory Protection
Fall Arrest Systems
Voluntary Protection Programs
Risk Management
Advanced Fault Tree Analysis
Software System Safety Analysis
System Safety/Reliability Analysis Course
System Safety Short Courses
Laser/Directed Energy Safety
Hazard Identification and Documentation
Hazard Tracking and Reporting
Risk Assessment Review & Acceptance Process
System Safety Groups
Space Safety Management
Weapon/Explosive Integration onto Weapon Systems
Other (may include management, writing and other courses designed to improve safety professional management and/or technical skills)

Table 14.2. Continuing Career Safety Professional Development (AFSEC Courses Awarding Continuing Education Units).

Course	CEUs
Aircraft Mishap Investigation Course (AMIC)	10.5
Aviation Safety Program Management (ASPM)	3.5
Mishap Investigation Non-Aviation (MINA)	7.0
Space Mishap Investigation Course (SMIC)	7.0
Safety Managers Course (SMC)	3.5
Introduction to Mishap Investigation (IMI)	3.5
Risk Management Application and Integration (RM A&I)	2.1
Board President Course (BPC)	2.1
Chief of Safety	2.8
Air Reserve Component Chief of Safety (ARCCoS)	3.3
ACC Occupational Safety Program Management Course (OSPM))	3.3
Human Factors (HF)	2.0
Ammo-47 Air Force Electrical Explosive Safety (44E-F37/645-F21 [MC])	2.9

14.3. Safety Education and Training. Air Force Catalog (AFCAT), *USAF Formal Schools* found at the following website **https://etca.randolph.af.mil** (formerly AFCAT 36-2223), outlines specific safety-related courses (those listed below with a number designation). Refer to the AFCAT for full course descriptions and prerequisites. Training in System Safety (CLE 009) is available from Defense Acquisition University (**http://www.dau.mil**). Organizations responsible for course management are indicated next to each course.

Table 14.3. Mishap Investigation.

Course Name	AFCAT Number	Owning Organization
Safety and Accident Investigation Board President Course (BPC)	AFSC810	AFSEC
Aircraft Mishap Investigation Course (AMIC)	WCIP05A	AFSEC
Mishap Investigation Non-Aviation (MINA) Course	WCIP059	AFSEC
Aircraft Mishap Investigation and Prevention (AMIP) Clinical Psychologist	B3OZY42P3 003	AFMC
Aircraft Mishap Investigation and Prevention (AMIP) Aerospace Physiologist	B3OZY43A 003	AFMC
Aircraft Mishap Investigation and Prevention (AMIP) USAF Medical Investigator (Flight Surgeon)	B3OZY48G3 003	AFMC
Aircraft Mishap Investigation and Prevention (AMIP) Non-USAF Medical Investigator (Flight Surgeon or other physician)	B3OZY48G3 010	AFMC
Life Sciences Equipment Investigation Course (LSEIC)	J3AZR1P071 0L1A	AETC

Table 14.4. Unit Safety Representative (USR).

Course Name	Owning Organization
Developed by AFSEC/SEG or MAJCOM/DRU/FOA	AFSEC

Supplemented with MAJCOM/DRU/FOA/local requirements	MAJCOM/DRU/FOA

Table 14.5. Aviation.

Course Name	AFCAT Number	Owning Organization
Flight Safety NCO (FSNCO)	L3AZR1S071-0S5A	AETC
Security Assistance Training Program	WCIP05U	AFSEC
Safety Office Course (IFSO)		
Air Combat Command (ACC) Flight Safety Program Management Course	3J5ACC1XXXX 000	ACC
DCMA Aviation Safety Officer Course, ASO		DCMA
Air Reserve Component Chief of Safety Course ARCCOS		
Aviation Safety Program Manager's Course		

Table 14.6. Occupational.

Course Name	AFCAT Number	Owning Organization
Safety Apprentice	L3ALR1S031 0S2B	AETC
Safety Craftsman	L3ACR1S071 0S2B	AETC
OSHA Training Institute (OTI		AFSEC
National Safety Council (NSC) Safety Training Institute (Refer to OSHA Training Institute catalog)		AFSEC
Advanced Occupational Safety (Refer to NSC Safety Training Institute course catalog)		AFSEC
Radiation Safety Officer Course	B6OZW43EXA-0A1A	
ACC Occupational Safety Program Management Course	3J5ACC1S0X1 000	ACC

Table 14.7. Weapons.

Course Name	AFCAT Number	Owning Organization
Weapons Safety Management Course	L3AZR2W071 0C2A	AETC
ACC Weapons Safety Program Management Course	3J5ACC2W0X1 000	ACC
Lightning Protection for Air Force Facilities (AMMO-47 OS)	J5AZB3E051 00AA	

Table 14.8. Space.

Course Name	Owning Organization

Space System Safety Course	AFSPC/SMC
Space Safety Course	AFSEC
Space Mishap Investigation Course	AFSEC

Table 14.9. System Safety.

Course Name	Owning Organization
NAVY WISE Course	AFSPC/AFMC
USC Viterbi School of Engineering (System Safety Certificate and courses)	AFSEC

Table 14.10. Management.

Course Name	AFCAT Number	Owning Organization
Chief of Safety (COS) Course	WCIP05B	AFSEC
Safety Manager Course (SMC)	WCIP05D	AFSEC

Table 14.11. Risk Management (RM).

Course Name	AFCAT Number	Owning Organization
AF RM Fundamentals Course	ADLS (under Misc. Courses)	AFSEC
AF RM Application and Integration Course (RM A&I) – on sight	WCIP 05E PDS Code WEI	AFSEC

Table 14.12. Other.

Course Name	AFCAT Number	Owning Organization
Operational Safety, Suitability and Effectiveness (OSS & E)	WSYS155	AFIT
Environmental, Safety and Occupational Health (ESOH) Compliance Assessments	WENV020	AFIT
Supervisor Safety Training Course (SST)	ZZ13212	AFSEC
ACC Aircrew Flight Equipment Program Manager's Course	3J5ACC1P0X1 000	ACC

14.4. 1S0X1 Retrainee Evaluation Process. The local Occupational Safety Manager (OSM) or designated representative will act as initial Evaluating Agent for retraining applicants. **(T-3)**

14.4.1. The Evaluating Agent will:

14.4.1.1. Ask the applicant's immediate supervisor to appraise his or her work performance, attitude and overall character, and review the applicant's last 3-5 enlisted performance reports. **(T-3)**

14.4.1.2. Provide applicant a briefing on Safety programs and responsibilities. **(T-3)** Discuss the safety career field and answer any questions. Determine if applicant has problems which would preclude working nights, holidays, standby, TDY, overseas

assignments or deployments. Also, problems with prolonged standing or walking or other medical problems which would affect work performance.

14.4.1.3. Establish and document an observation period for all applicants under consideration for retraining. **(T-3)** The applicant must complete a 10 duty-day assessment period with the local Safety office before the Evaluating Agent can make a recommendation. **(T-3) Note:** Exception to the 10-duty day assessment period will be approved by AFSEC/CFM.

14.4.1.4. Provide meaningful, structured activities which assist in assessing the applicant's suitability for the Safety career field. **(T-3)** The activities will consist of:

14.4.1.4.1. An assessment of the applicant's communication skills and his/her abilities to write and speak clearly and distinctly.

14.4.1.4.1.1. Applicant will write a memorandum stating their reasons for wanting to retrain into the career field. **(T-3)** Memorandum will include strengths, areas for improvement and what the applicant can contribute to improve the safety program. **(T-3)**

14.4.1.4.1.2. Applicant will instruct and lead some portion of a safety class or meeting. **(T-3)**

14.4.1.4.2. Introduction to inspection/spot inspection process. Applicant will review annual reports, conduct follow up for the open write-ups and conduct spot inspections. **(T-3)**

14.4.1.4.3. Familiarization to flightline/maintenance/industrial areas. Applicant will visit flightline/maintenance/industrial areas as deemed appropriate by the Evaluating agent. **(T-3) Note:** This may be incorporated into paragraph **14.4.1.4.2**

14.4.1.4.4. Introduction to mishap investigation. Applicant will partake in the investigation and processing of a mishap. **(T-3)** Preferably a real mishap, but a training scenario may be used. This includes an AFSAS familiarization session, reviewing mishap findings to establish causal factors and a mishap summary/out-brief to the Chief of Safety. **Note:** This activity will include briefing applicant on what to expect at a mishap scene. **(T-3)**

14.4.1.4.5. Introduction to Hazard Abatement Program. Applicant will assign a RAC to a hazard (actual or simulated) based on an assessment of the mishap potential and its severity. **(T-3)** Applicant will also process AF Forms 457 and 1118. **(T-3)**

14.4.2. At the end of the evaluation period, the Evaluating Agent will provide the servicing FSS with a memorandum summarizing the following areas based on research and structured activities:

14.4.2.1. Approval/Disapproval of applicant's request for retraining. **(T-3)**

14.4.2.2. Assessment of applicant's structured activities. **(T-3)**

14.4.2.3. Assessment of applicant's communication skills, both written and verbal. **(T-3)**

14.4.2.4. Overall assessment of the appearance, moral standards, military conduct and bearing. **(T-3).**

Figure 14.1. 1S0 Safety Retraining Memorandum (Example).

MEMORANDUM FOR

FROM:

SUBJECT: 1S0 Safety Retraining Memorandum

1. I approve/disapprove

2. Applicant:

(Applicant's Rank and name) request for retraining.
a. (Did/did not) complete the 10 duty-day assessment period.
b. (Has/does not have) ability to communicate: write, and speak clearly and distinctly.
c. (Has/does not have) ability to meet the needs of the Safety career field.
d. (Has/does not have) appearance, moral standards, military conduct and bearing to meet the needs of the Safety career field.

Explain:

3. I interviewed applicant's immediate supervisor and foresee no problems OR have reason for concern. Explain:
4. Applicant received a briefing on Safety programs and responsibilities and has/has no problems which would preclude working nights, holidays, standby, TDY, overseas assignments or deployments.
Explain:
5. If you have questions please contact me at DSN: xxx-xxxx.

SIGNATURE BLOCK

14.5. Supervisor Safety Training. This course trains supervisors in management skills needed to implement safety policies and programs. It develops skills to recognize, control, report and eliminate hazards. MAJCOMs/FOAs/DRUs and installations with unique requirements will supplement this training with those requirements. **(T-0)** This two part course includes a Computer Based Training found on ADLS, and a classroom portion conducted by the safety office.

14.5.1. Personnel required to attend:

14.5.1.1. Noncommissioned officers and Senior Airmen when first assigned a supervisory position. **(T-0)**

14.5.1.2. Commissioned officers when first assigned as a supervisor. **(T-0)**

14.5.1.3. Civilian personnel (DAF, NAF, foreign national) upon initial assignment to a supervisory position. **(T-0)**

14.5.1.4. Any supervisor needing refresher training or who demonstrates a lack of safety knowledge. **(T-0)**

14.5.2. Administration.

14.5.2.1. Unit commanders ensure eligible personnel are identified and course scheduling is arranged with the installation occupational safety office.

14.5.2.2. The safety staff allocates quotas, giving priority to newly assigned supervisory personnel.

14.5.2.3. Prior to attending the classroom portion training held by the safety office, attendees must complete the computer-based training (CBT) located on ADLS. **(T-1)** The student will ensure a copy of the CBT certificate is provided to the safety office prior to attending the face-to-face course. **(T-2)**

14.5.2.4. Safety offices will use the AF Form 1286, *Safety Education/Training Class Roster*, or another equivalent product for attendee sign-in. **(T-2)**

14.5.3. Documenting Training.

14.5.3.1. Safety staffs will provide confirmation of training upon completion of the course to all attendees. This may include a copy of the classroom roster, email product, certificate, etc.

14.5.3.2. Safety staffs will send training rosters or equivalent product to unit training managers or appropriate installation personnel data specialists to documented in the Military Personnel Data System.

14.5.3.3. Supervisors of military personnel will ensure documentation IAW paragraphs **1.6.28.7.1** and **1.6.28.7.2** **(T-2)**

14.5.3.4. Supervisors of civilian personnel will document this training in the employee's AF Form 971, Supervisor's Employee Brief, or equivalent product. **(T-2)**

14.5.3.5. Supervisors of military and civilian personnel will ensure training completion dates are transcribed to new documentation tool upon reassignment to a new duty location or station.

Chapter 15

MISCELLANEOUS SAFETY INFORMATION

15.1. Instructions for Completing AF Form 1118, *Notice of Hazard.*

15.1.1. AF Form 1118. Qualified occupational safety, fire protection and health (BE, PH, flight surgeon and/or occupational medicine physician) officials are the sole issuing authorities for AF Form 1118.

15.1.2. Control Number. The control number for the AF Form 1118 will be the agency code (S, F, H), date of hazard identification and sequential number, e.g., S-20061201-1. The numbering system will coincide with the corresponding Hazard Abatement Plan (AF Form 3).

15.1.3. Location. Note the building number, room number and function involved where the hazard is located, and nomenclature of the hazardous item or procedure, e.g., Building 18, Room 217, CE Carpenter Shop, Table Saw.

15.1.4. Hazardous Condition. Describe in detail the nature of the hazard, including a reference to the standard or requirement violated, if any. **(T-2)**

15.1.5. Risk Assessment Code. List RAC, followed by RAC description, e.g., "1 (Critical/Imminent Danger)." **(T-2)**

15.1.6. Interim Control Measures. Identify temporary measures needed to reduce the degree of risk associated with the hazard to an "acceptable degree" until permanent corrective actions are implemented. **(T-2)** Assigned RAC will remain until completely abated even though interim control measures are in effect.

15.1.7. Permanent Corrective Action. List the action that will permanently eliminate the identified hazard. Include associated document number, e.g., install new exhaust system; CE work order and project number. **(T-2)**

15.1.8. Contact Point. Name, grade, office symbol and telephone number of individual responsible for elimination of the hazard.

15.1.9. Estimated Completion Date. Self-explanatory.

15.2. Instructions for Completing AF Form 3, *Hazard Abatement Plan.*

15.2.1. The AF Form 3 is for an identified RAC 1, 2 or 3 hazard requiring more than 30 calendar days to abate. The form then becomes part of the installation's formal master hazard abatement plan. The AF Form 3 may be used for RAC 4 or 5 hazards or deficiencies. Electronic systems that collect identical data and can produce a hard copy of AF Form 3 may be used.

15.2.2. Prepare a separate AF Form 3 for each individual hazard. **(T-2)**

15.2.3. The commander or functional manager ensures AF Form 3, Parts I and II, are completed in as much detail as possible and then sent to the appropriate installation safety, fire protection or health office:

15.2.3.1. Part I—Hazard Information.

15.2.3.1.1. Item 1 – Type of Hazard. Select the type hazard from the drop-down menu. **(T-2)** Indicate whether the hazard is part of a facility, property, traffic, etc. **(T-2)**

15.2.3.1.2. Item 2 – Category. Select appropriate category from the drop-down menu: Safety, Fire or Health. **(T-2)**

15.2.3.1.3. Item 3 – Control Number. The control number will coincide with the AF Form 3 issued by the installation safety office, leave blank unless provided by the safety office.

15.2.3.1.4. Item 4 – Date. Use the drop-down calendar to select the date this form was initiated. **(T-2)**

15.2.3.1.5. Item 5 – Date Hazard Discovered. Use the drop-down calendar to select the date this hazard was discovered. **(T-2)**

15.2.3.1.6. Item 6 – Risk Assessment Code (RAC). Use the drop –down menu and select appropriate RAC (i.e., 1 (I, A), 3 (II, C), etc.) as provided by safety, fire or health officials. **(T-2)**

15.2.3.1.7. Item 7 – Discovery Method. Use the drop-down menu to select method indicating how the hazard was originally identified. **(T-2)**

15.2.3.1.8. Item 8 – Exposure. Enter the average number of personnel exposed to the hazard daily. **(T-2)**

15.2.3.1.9. Item 9 – Description of Hazard. Provide a word description of the hazard to illustrate its potential impact if not abated. **(T-2)** This includes the condition, procedure or practice that creates a potential for producing death, injury, illness, fire, property, equipment or environmental damage.

15.2.3.1.10. Item 10 – Organization. List the organization responsible for the hazard abatement. **(T-2)**

15.2.3.1.11. Item 11 – Office Symbol. Self-explanatory.

15.2.3.1.12. Item 12 – Facility Number. Enter facility number, leave blank if not in a facility. **(T-2)**

15.2.3.1.13. Item 13 – Specific Location/Description. Provide additional descriptor, i.e., NE corner, etc. **(T-2)**

15.2.3.1.14. Item 14 – Functional Manager/POC Name. Last, First, Middle Initial. See **Attachment 1, *Terms,*** for definition.

15.2.3.1.15. Item 15 – Grade/Rank. Enter the appropriate Grade/Rank. **(T-2)**

15.2.3.1.16. Item 16 – Duty Phone.

15.2.3.1.17. Item 17 – Signature. Select electronic signature.

15.2.3.2. Part II—Abatement Information.

15.2.3.2.1. Item 18 – Interim Control Measures. List all temporary measures taken to reduce the risk associated with the hazard pending completion of permanent abatement action (i.e., issuance of specific PPE, termination of operations, specific work-around procedures, etc.). **(T-2)**

15.2.3.2.2. Item 19 – Residual RAC Level. Select the Residual RAC Level after Interim Control Measures are applied to the hazard. **(T-2) Note:** Interim controls do not reduce original RAC level. The Residual RAC level must be a RAC 4, 5 or lower.

15.2.3.2.3. Item 20 – Description of Permanent Abatement Action. Provide a description of the permanent abatement action taken or programmed to eliminate or reduce the hazard. **(T-2)**

15.2.3.2.4. Item 21 – Method of Abatement. Select from the drop-down menu to method used to abate the hazard, e.g., CE Work Order, Local Purchase, military construction (MILCON) project, etc. **(T-2)**

15.2.3.2.5. Item 22 – Project/Work Order number. Self-explanatory.

15.2.3.2.6. Item 23 – Status of Project/Work Order #. Using the drop-down menu, enter the status of the abatement project, i.e., awaiting materials, under construction, in design, in review, unfunded, etc. **(T-2)**

15.2.3.2.7. Item 24 – Project Cost. Indicate total cost associated with project identified in Item 22. **(T-2)** If actual costs are not known, use best available estimate.

15.2.3.2.8. Item 25 – Abatement Cost (if different from project cost). If the cost to abate the hazard is not the total cost of the project, enter only the cost associated with correction of the hazard. **(T-2)** For example, a $500,000 facility renovation project will correct hazardous electrical wiring estimated to cost $25,000. Item 24 would show $500,000 and Item 25 would show $25,000. If actual costs are not known, use best available estimate.

15.2.3.2.9. Item 26 – Estimated Date of Completion. Use the drop-down calendar to select the projected date of completion. **(T-2)**

15.2.3.3. Part III—For Safety/Fire/Health Use:

15.2.3.3.1. Item 27 – Severity. Use **Table 13.2**

15.2.3.3.2. Item 28 – Probability. Use **Table 13.2**

15.2.3.3.3. Item 29 – Multiplier. Use **Table 13.2**

15.2.3.3.4. Item 30 – Exposure. Same as Item 8.

15.2.3.3.5. Item 31 – Cost. Abatement Cost. Same as Item 25.

15.2.3.3.6. Item 32 – RAC. Same as Item 6.

15.2.3.3.7. Item 33 – Cost Effectiveness Index (CEI). See paragraph **13.8.1.5**

15.2.3.3.8. Item 34 – Abatement Priority Number (APN). See paragraph **13.8.2** and **Table 13.3**

15.2.3.4. Part IV—Semi-Annual Review Records:

15.2.3.4.1. Item 35 – Status of Project/Work Order #. Use drop-down to select the current status of the project (i.e., awaiting materials, under construction, in design, in review, unfunded, etc.). **(T-2)**

15.2.3.4.2. Item 36 – Comments Regarding Progress. Enter any comments regarding progress of abatement actions. **(T-2)**

15.2.3.4.3. Item 37 – Date.

15.2.3.4.4. Item 38 – Commander/Functional Manager Name. Last, First, Middle Initial.

15.2.3.4.5. Item 39 - Grade/Rank. Enter the appropriate Grade/Rank. **(T-2)**

15.2.3.4.6. Item 40 – Duty Phone.

15.2.3.4.7. Item 41 – Signature. Select electronic signature. **(T-2)**

15.2.3.4.8. Item 42 – Other Related Notes. Use this area to add any additional comments regarding the status of the hazard abatement process.

15.2.3.5. Part V—Hazard Closure.

15.2.3.5.1. Item 43 – Hazard Closed and Verified By: Enter name of qualified safety, fire or health official that verified hazard is fully abated. **(T-2)** Last, First, Middle Initial and Office Symbol.

15.2.3.5.2. Item 44 – Grade/Rank. Enter the appropriate Grade/Rank. **(T-2)**

15.2.3.5.3. Item 45 – Signature. Select electronic signature.

15.2.3.5.4. Item 46 – Date Hazard Fully Abated. Use drop-down calendar to select completion date. **(T-2)**

15.3. Pre-Departure Travel Safety (Examples Only). The Pre-Departure Travel Safety Program is a recommended management tool for commanders and supervisors. It helps military and civilian employees on orders, especially those under the age of 26, reduce the potential for a traffic mishap by identifying and mitigating risks involving travel by private motor vehicle for leave, PCS and temporary duty assignments.

15.3.1. Overview. Commanders, managers and supervisors will help guide and mentor employees in applying personal RM when planning for a trip. **(T-3)** Consider the following factors to guide the discussion on assessing risk and identifying mitigating strategies, but also consider and address other factors based on the unique nature of each situation. This interactive briefing may be documented on AF Form 4392, *Pre-Departure Safety Briefing Form.* Another tool for commanders and supervisors to consider is use of the Travel Risk Planning System (TRiPS) program to assist in travel planning for all personnel. TRiPS is accessed through the Army Safety portal (**https://trips.safety.army.mil/**).

15.3.1.1. Urge the driver to carefully and thoroughly plan the trip, allowing time for rest prior to departure and to take a break at least every two hours.

15.3.1.2. Travelers are not to drive more than 10 hours during any 24-hour period. Motorcyclists are highly encouraged to travel fewer hours. Highly recommend that travelers get a good night's sleep (7-8 hours) while traveling.

15.3.1.3. Airmen must ensure they have sufficient funds available to cover expenses (a shortage of funds often leads to exhausting, marathon driving). **(T-3)**

15.3.1.4. Travelers must check the weather forecast and road conditions for the intended route of travel. **(T-3)**

15.3.1.5. Discourage driving during late night hours. Remind the traveler that there is a greater chance to encounter impaired (intoxicated, fatigued) drivers on the road at night than during the day.

15.3.1.6. Stress the value of occupant restraint devices (mandatory for military personnel), including child restraints and the use of helmets and personal protective equipment by motorcyclists; review the hazard of reduced visibility due to factors such as darkness, weather, sun glare; and touch on the issue of being alert for road hazards such as animals crossing the roadway, stalled or slow-moving vehicles, and so forth.

15.3.1.7. Stress the importance of vehicle condition — vehicle defects also contribute to mishaps.

15.3.1.8. Discuss the main causes of injury and death by vehicle mishaps in the Air Force, which include speeding or excessive speed for conditions, fatigue, inattention or distraction, not wearing seatbelts and the effects of medication and alcohol.

15.3.2. Additional Information. Advise the member to contact their unit commander, first sergeant, flight commander, immediate supervisor or command post in the event of a mishap or if an emergency situation arises. Ensure the individual is provided the phone numbers of the points of contact.

15.4. Air Force Off-Duty High-Risk Activities Program. The Off-duty High Risk Activity (HRA) Program is a recommended management tool for commanders and supervisors. The intent of the program is to ensure participants are familiar with the hazards and injury potential associated with their particular activity. This program is intended for military personnel only.

15.4.1. High-Risk Activities. These are activities having a higher potential for personal injury due to the level of competition, speed, risk or skills needed and requiring greater agility, stamina and dexterity. Some examples of high-risk activities are flying civil aircraft, hang gliding, skydiving, mixed martial arts (MMA) fighting, parasailing, white-water rafting, motorcycle and auto racing, scuba diving, bungee jumping, bronco and bull riding, and extreme sports or any activity identified by the commander. **Note:** MAJCOM/FOA/DRU can determine within the command what are considered high risk activities.

15.4.2. Commander/Supervisor Responsibility. Commanders or supervisors will ensure all personnel are briefed about the HRA program regardless of their participation in high-risk activities. **(T-3).** Each individual should be surveyed and if it is determined they are actively engaged or about to engage in an HRA they should meet one on one with their commander or supervisor. Ideally implemented, an HRA interview is not a briefing. It is for the purpose determining the mental and physical readiness, and situational awareness preparedness of participants before the HRA occurs. The interviewer can discuss with the interviewee the risks of the activities and ascertain some idea of the likelihood that the participant can enjoy the activity without an unacceptable level of risk. Through this process the interviewer can determine such things as level of experience, knowledge of PPE requirements, physical safety aspects of the area of participation, level of supervision or oversight by qualified professional staffs or officials, rules or recommended practices of professional organizations, and so on. It is also a chance to discuss the mental and physical preparedness of the participant. If

interviewers determine participants are not adequately trained or are inexperienced, they should encourage participants to seek additional training through a nationally recognized institute before participating in the activity.

15.4.3. Individual Responsibility. Individuals planning to engage in high-risk activities, such as those described in paragraph **15.4.1,** will be encouraged to inform his or her immediate supervisor, and schedule an interview with their supervisor, squadron commander or designee. The individual engaging in a high-risk activity is responsible for applying sound RM practices to avoid jeopardizing life or limbs and their ability to perform their Air Force duties.

15.4.4. Documentation. AF Form 4391, *High-Risk Activities Worksheet,* may be used to document the briefing, completed by the squadron commander, individual's supervisor, safety officer or training manager.

JOHN T. RAUCH JR.
Major General, USAF
Chief of Safety

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFH 63-1402, *Aircraft Information Program,* 19 March 2001

AFI 10-601, *Operational Capability Requirements Development,* 6 November 2013

AFI 10-2501, *Air Force Emergency Management Program,* 19 April 2016

AFI 11-202V2, *Aircrew Standardization/Evaluation Program,* 6 December 2018

AFI 11-215, *Flight Manuals Program,* 25 March 2019

AFI 13-204V2, *Airfield Operations Standardization and Evaluations,* 1 September 2010

AFI 13-204V3, *Airfield Operations Procedures and Programs,* 1 September 2010

AFI 25-201, *Intra-Service, Intra-Agency, and Inter-Agency Support Agreements Procedures,* 18 October 2013

AFI 32-1021, *Planning and Programming Military Construction (MILCON) Projects,* 25 February 2016

AFI 32-1023, *Designing and Constructing Military Construction Projects,* 19 November 2015

AFI 32-1032, *Planning and Programming Appropriated Fund Maintenance, Repair, and Construction Projects,* 24 September 2015

AFI 32-7020, *The Environmental Restoration Program,* 7 November 2014

AFI 32-7086, *Hazardous Materials Management,* 4 February 2015

AFI 32-10141, *Planning and Programming Fire Safety Deficiency Correction Projects,* 15 May 2019

AFI 33-360, *Publications and Forms Management,* 1 December 2015

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AFI 36-130, *Civilian Career and Developmental Programs,* 27 September 2019

AFI 36-401, *Civilian Training, Education, and Professional Development,* 31 May 2018

AFI 36-2101, *Classifying Military Personnel (Officer and Enlisted),* 25 June 2013

AFI 36-2651, *Air Force Training Program,* 3 January 2019

AFI 38-101, *Manpower and Organization,* 29 August 2019

AFI 44-102, *Medical Care Management,* 17 March 2015

AFI 44-119, *Medical Quality Operations,* 16 August 2011

AFI 48-101, *Aerospace Medicine Enterprise,* 8 December 2014

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5 USC § 552a, *Records Maintained on Individuals*

10 USC § 1588, *Authority to Accept Certain Voluntary Services*

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50 USC § 2401, *Establishment and Mission*

29 CFR Part 1904, Recording and Reporting Occupational Injuries and Illnesses

29 CFR Part 1960, *Basic Program Elements for Federal Employees OSHA*

29 CFR § 1960.7, *Financial Management*

29 CFR § 1960.25, *Qualifications of Safety and Health Inspectors and Agency Inspections*

29 CFR § 1960.56, *Training of Safety and Health Specials*

Prescribed Forms

AF Form 3, *Hazard Abatement Plan*

AF Form 55, *Employee Safety and Health Record*

AF Form 457, *USAF Hazard Report*

AF Form 651, *Hazardous Air Traffic Report (HATR)*

AF Form 1118, *Notice of Hazard*

AF Form 1286, *Safety Education/Training Class Roster*

AF Form 4391, *High-Risk Activities Worksheet*

AF Form 4392, *Pre-Departure Safety Briefing*

Adopted Forms

AF Form 9, *Request For Purchase*

AF Form 332, *Base Civil Engineer Work Request*

AF Form 847, *Recommendation For Change of Publication*

AF Form 860B, *Civilian Progress Review Worksheet*

AF Form 978, *Supervisor's Preliminary Mishap/Incident Report*

AF Form 979, *Danger Tag*

AF Form 1754, *Job Capability and Safety Analysis (LRA)*

AF Form 4437, *Deliberate Risk Assessment Worksheet*

AFTO Form 244, *Industrial/Support Equipment Record*

OSHA 300, *Log of Work-Related Injuries and Illness*

OSHA Form 300A, *Summary of Work-Related Injuries and Illness*

Abbreviations and Acronyms

ACAT—Acquisition Category

ACC—Air Combat Command

ADLS—Air Force Distributed Learning Service

AETC—Air Education and Training Command

AEG—Air Expeditionary Group

AEW—Air Expeditionary Wing

AFCEC—Air Force Civil Engineering Center

AFCMRS—Air Force Combined Mishap Reduction System

AFFARS—Air Force Federal Acquisition Regulation Supplement

AFFOR—Air Force Forces

AFDW—Air Force District of Washington

AFGSC—Air Force Global Strike Command

AFI—Air Force Instruction

AFIMSC—Air Force Installation Mission Support Center

AFLCMC—Air Force Life Cycle Management Center

AFLCMC/EZ—Air Force Life Cycle Management Center Airworthiness Office

AFMAN—Air Force Manual

AFMC—Air Force Materiel Command

AFMC/EN—Air Force Materiel Command Directorate of Engineering

AFMRA—Air Force Medical Readiness Agency

AFMS—Air Force Manpower Standard

AFOSH—Air Force Occupational Safety and Health

AFOTEC—Air Force Operational Test Evaluation Center

AFPAM—Air Force Pamphlet

AFPC—Air Force Personnel Center

AFPD—Air Force Policy Directive

AFRC—Air Force Reserve Command

AFSAS—Air Force Safety Automated System

AFSC—Air Force Specialty Code

AFSEC—Air Force Safety Center

AFSMS—Air Force Safety Management System

AFSOC—Air Force Special Operations Command

AFSPC—Air Force Space Command

AFSWC—Air Force Service Watch Center

AFTO—Air Force Technical Order

AMC—Air Mobility Command

AMIC—Aircraft Mishap Investigation Course

AMIP—Aircraft Mishap Investigation and Prevention

ANG—Air National Guard

AOP—Aerospace and Operational Physiologists

AOR—Area of Responsibility

APMR—Annual Program Management Review

ARC—Air Reserve Component

ARCCOS—Air Reserve Component Chief of Safety

ARPC—Air Reserve Personnel Center

AS—Allowance Standards

ASAP—Airman Safety Action Program

ASPM—Aviation Safety Program Manager

ATC—Air Traffic Control

BASH—Bird/Wildlife Aircraft Strike Hazard

BCAT—Business Acquisition Category

BE—Bioenvironmental Engineering

BSC—Biomedical Sciences Corps

CA—Conjunction Assessment

CAE—Component Acquisition Executive

CCB—Configuration Control Board

CD—Deputy Commander

CE—Civil Engineering

CDP—Child Development Program

CEU—Continuing Education Unit

CFM—Career Field Manager

CFR—Code of Federal Regulations

CMAVs—Controlled Movement Area Violations

COLA—Collision Avoidance

COMAFFOR—Commander, Air Forces

COR—Contracting Office Representative

COS—Chief of Safety

CSSM—Center System Safety Manager

CQA—Clinical Quality Assurance

CV—Vice Commander

CY—Calendar Year

DART—Days Away Restricted and/or Transfer Case

DASHO—Department of the Air Force's Designated Agency Safety and Health Officer

DDESB—Department of Defense Explosives Safety Board

DESR—Defense Explosives Safety Regulation

DET—Data Extraction Tool

DEW—Directed Energy Weapons

DFARS—DoD Federal Acquisition Regulation Supplement

DoD—Department of Defense

DoDD—Department of Defense Directive

DoDI—Department of Defense Instruction

DoE—Department of Energy

DoL—Department of Labor

DRU—Direct Reporting Unit

ECP—Engineering Change Proposal

EDT—Enlisted Development Team

EOLP—End-of-Life Plan

ESMP—Explosives Safety Management Program

ESOH—Environment, Safety and Occupational Health

ESOHC—Environment, Safety and Occupational Health Council

F—Fahrenheit

FAA—Federal Aviation Administration

FAR—Federal Acquisition Regulation

FCC—Family Child Care

FECA—Federal Employees' Compensation Act

FES—Fire and Emergency Services

FOA—Field Operating Agency

FSNCO—Flight Safety Non-Commission Officer

FSO—Flight Safety Officer

FSS—Family Support Squadron

FY—Fiscal Year

GCC—Geographic Combatant Command

GPC—Government Purchase Card

GSA—General Services Administration

HAF—Headquarters Air Force

HAP—High Accident Potential

HATR—Hazardous Air Traffic Report

HAZMAT—Hazardous Material

HERO—Hazards of Electromagnetic Radiation to Ordnance

HHQ—Higher Headquarters

HQ—Headquarters

IAW—In Accordance With

IG—Inspector General

IGI—Inspector General for Investigations

IOEMC—Installation Occupational and Environmental Medicine Consultant

ISB—Interim Safety Board

JHA—Job Hazard Analysis

JSTO—Job Safety Training Outline

JSpOC—Joint Space Operations Center

JUON—Joint Urgent Operational Need

LRS—Logistics Readiness Squadron

MACA—Midair Collision Avoidance

MAF LOG C2—Mobility Air Force Logistics Command and Control

MAJCOM—Major Command

MDS—Mission Design Series

MFOQA—Military Flight Operations Quality Assurance

MFT—Multi-Functional Team

MHAP—Master Hazard Abatement Plan

MHS—Military Health System

MILCON—Military Construction

MICT—Management Internal Control Toolset

MIL-STD—Military Standard

MINA—Mishap Investigation Non-Aviation

MOA—Memorandum of Agreement

MOU—Memorandum of Understanding

MRTFB—Major Range and Test Facility Base

MTF—Medical Treatment Facility

N/A—Not Applicable

NAF—Numbered Air Force

NASA—National Aeronautics and Space Administration

NATO—North Atlantic Treaty Organization

NIOSH—National Institute for Occupational Safety and Health

OCONUS—Outside Continental United States

OEH—Occupational and Environmental Health

OJT—On-the-Job Training

OPLAN—Operational Plan

OPM—Office of Personnel Management

OPR—Office of Primary Responsibility

ORB—Operational Review Board

ORP—Operations Review Panel

OSA—Organizational Safety Assessments

OSHA—Occupational Safety and Health Administration

OSM—Occupational Safety Manager

PACAF—Pacific Air Force

PE—Program Evaluation

PEO—Program Executive Officer

PESHE—Programmatic, Environment, Safety and Occupational Health Evaluation

PH—Public Health

PM—Program Manager

PPE—Personal Protective Equipment

RAC—Risk Assessment Code

RCC—Range Commanders Council

RDA—Risk Decision Authority

RM—Risk Management

RPA—Remotely Piloted Aircraft

RRR—Rapid Response Report

SAE—Service Acquisition Executive

SAF—Secretary of the Air Force

SART—Satellite Anomaly Resolution Team

SAV—Staff Assistance Visit

SDAR—Space Debris Assessment Report

SEI—Special Experience Identifier

SE—Chief of Safety

SEF—Flight Safety Division

SEG—Occupational Safety Division

SEI—Special Experience Identifier

SEK—System Safety Branch

SES—System Safety Branch

SEW—Weapons Safety Division

SF—Security Forces

SGP—Chief of Aerospace Medicine

SIB—Safety Investigation Board

SMC—Space and Missile System Center

SMC/EN—Space Missile Center Directorate of Engineering

SME—Subject Matter Expert

SMS—Safety Management System

SNCO—Senior Non-Commissioned Officer

SOH—Safety and Occupational Health

SPE—Safety Program Evaluation

SPO—System Program Office

SRA—Safety Risk Assessment

SSC—Space Safety Council

SSE—System Safety Engineer

SSG—System Safety Group

SSM—System Safety Manager

SST—Supervisor Safety Training

SSWG—System Safety Working Group

STANAG—Standardization Agreement

TCTO—Time Compliance Technical Order

TDY—Temporary Duty

TEO—Technology Executive Officer

TO—Technical Order

TRIR—Total Recordable Incident Rate

UON—Urgent Operational Need

UAS—Unmanned Aerial System

US—United States

USR—Unit Safety Representative

USAF—United States Air Force

USAFA—United States Air Force Academy

USAFE—United States Air Force Europe

WSM—Weapons Safety Manager

WWW—World-Wide Web

Terms

Acquisition Organization—The government organization responsible for developing, acquiring, fielding, and sustaining either hardware or a service (e.g., launch services). For most Air Force

space systems and launches, the Space and Missiles Systems Center (SMC) will usually perform this function.

Active Satellite/Active Spacecraft—Orbiting systems that serve a useful purpose or could potentially serve a useful purpose (e.g., fully mission capable, partially mission capable, on-orbit spares, in test/checkout).

Airmen—All-encompassing term used to indicate all Department of the Air Force members, both uniformed military and Department of Defense civilian employees working for USAF.

Air Force Occupational Safety and Health (AFOSH)—An overarching term for the Air Force Occupational Safety and Health Program.

AFSEC/SEG Occupational Safety Emphasis Items—List developed annually by AFSEC/SEG identifying high interest inspection items based on a five year review of on-duty mishaps.

Air Force Safety Management System (AFSMS)—It is the framework upon which the USAF mishap prevention program is built. Provides organizations with an effective framework for continual improvement of safety performance. It enables organizations ability to minimize risks and reduce the occurrence and cost of injuries, illnesses, fatalities, and property damage. The system requires goal setting, planning, executing, and measuring performance to be successful.

Air Reserve Component (ARC)—Used when referring to both AFRC and ANG as one entity.

Annual Safety Inspection—Method to identify workplace/facility hazards used by safety staffs at the wing and below level. These are conducted by qualified safety personnel annually on all workplaces and facilities.

Annual Program Management Review—An examination of the mishap prevention program at all levels of execution to evaluate the safety management system and the performance of programs or elements managed within the system. The review is performed by senior leadership and safety professionals to ensure the system continues to be suitable, adequate and effective for its intended purposes, and for making decisions or authorizing actions that need to be taken by staff to ensure the continuous improvement of one or more of its programs or elements.

Anomaly—Unexpected events that may or may not result in damage, injury, or mission impact, but do not reach the level of a reportable mishap.

Anomaly Resolution Process—Any process used to resolve a spacecraft anomaly. Typically conducted by the operating/testing organization (squadron or equivalent level).

Apogee—The point of a satellite's greatest distance from the center of the Earth, where the satellite's velocity is lowest. The apogee altitude is the distance of the apogee point above the surface of the Earth.

Area of Responsibility (AOR)—Theater of operations for Combatant Command missions and operations such as US Central Command (USCENTCOM), US Northern Command (USNORTHCOM), US European Command (USEUCOM), US Pacific Command (USPACOM) or US Southern Command (USSOUTHCOM).

Cataloged Objects—Items entered in the JSpOC Satellite Catalog. Some items re-enter the Earth's atmosphere after cataloging.

Casualty—A serious injury or worse, including death, for a human. For the purposes of this standard, the Abbreviated Injury Scale Level 3 defines serious injury.

Collective Risk—The total combined risk to all individuals within a category (e.g., launch-essential personnel, general public) exposed to a particular hazard during a specific period of time or event; unless otherwise noted, the mean number of casualties predicted (Ec) to result from a given hazard. Specification of collective risk is either in "per mission" or "per year" value.

Collision Avoidance—A process designed to prevent collisions between on-orbit tracked objects or to prevent collisions between on-orbit tracked objects and launched vehicles (including spent stages)/payloads by determining and implementing courses of action through careful analysis of validated conjunction assessments and satellite health and mission requirements. The process includes establishing launch wait periods in either the launch window or spacecraft maneuvering based on validated conjunction assessments and accounts for uncertainties in spatial dispersions, arrival time of orbiting objects and/or the launch vehicle/payload, and modeling accuracy.

Commercial Launch—The term "commercial," for the purposes of the National Space Policy and this instruction, refers to space goods, services, or activities provided by private sector enterprises that bear a reasonable portion of the investment risk and responsibility for the activity, operate IAW typical market-based incentives for controlling cost and optimizing return on investment, and have the legal capacity to offer these goods or services to existing or potential nongovernmental customers.

Commodity Contract—Used for any materials, articles, supplies, goods or equipment. Refer to the Federal Acquisition Regulations for additional information.

Configuration Control—Process of approving or disapproving and coordinating changes to configuration items after formal establishment of their configuration identification.

Conjunction Assessment (CA)—A process for determining the point and time of the closest approach of two tracked orbiting objects or between a tracked orbiting object and a launched vehicle (including spent stages) or payload.

Controlled Reentry—See *Uncontrolled Reentry*. A planned reentry for which the final atmospheric penetration time is chosen through spacecraft maneuvering so as to either maximize the amount of spacecraft material that burns up in the atmosphere, limiting the potential for endangering the public, or to bring down a recoverable reentry vehicle (e.g., capsule) in a manner that does not endanger the public. This typically controls the time and place of the disposal of space objects that are at the end of their mission life or for reentry capsules.

Convening Authority—The individual who has the authority to order a safety investigation. For additional guidance, refer to AFI 91-204.

Corporate-wide Violations—Two or more substantially repeated violations occurring at different military locations.

Critical Asset—A resource requiring protection. It normally includes property/ infrastructure that is essential to protect the public health and safety, maintain the minimum operations of the range, or protect the national security or foreign policy interests of the United States.

Critical/Imminent Danger—Conditions or practices in a workplace which could reasonably be expected to cause death or severe physical harm immediately or before such dangers can be

eliminated through normal abatement procedures. RAC 1 hazards are classified as critical/imminent danger.

Days Away, Restricted, and/or Transfer Case Incidence Rate—The rate of all civilian injuries and illnesses resulting in days away from work, restricted work activity, and/or job transfer. This rate is calculated for a work site for a specified period of time (usually one year).

Debris—Any non-maneuverable/non-operational orbital space system or component. This includes dead satellites and their associated components, spent launch vehicle components, and objects in orbit around the Earth created by humans but no longer serve any useful purpose. Debris includes explosion and collision fragments, slag (including dust) from solid rocket motors, surface degradation products such as paint flakes, coolant released by nuclear powered satellites, and objects released due to the impact of micrometeoroids or small debris with spacecraft.

Debris Generation—Release of objects from a spacecraft into the space environment. This generally occurs in an unpredictable and uncontrolled manner. Debris generation may be the result of a collision or an occurrence within the spacecraft.

Delta V (ΔV)—The change in the velocity vector caused by thrust measured in units of meters per second. Used as a measure of required energy (i.e., fuel) to maneuver an orbital space system from one orbit to another.

Department of Defense Civilian Personnel—Includes Senior Executive Service (SES), General Schedule (GS), Defense Civilian Intelligence Personnel System (DCIPS) (GG) and federal wage system employees, including ARC technicians, unless in military duty status. Includes Non-Appropriated Fund employees who are not military personnel working part time; Corps of Engineers Civil Works employees; Youth Opportunity Program (YOP) and student assistance program employees; Direct-Hire Foreign-national civilians employed by the Air Force (Air Force Foreign Nationals [AFFN]) and Army-Air Force Exchange Service employees.

Department of Defense Military Personnel—These are non-Air Force US military personnel.

Department of the Air Force Military Personnel—These are regular Air Force, ARC personnel on military duty status. Includes Air Force Academy cadets; also includes Reserve Officer Training Corps (ROTC) cadets engaged in directed training activities. Includes members of other US military services serving on extended tour of duty with the Air Force or foreign-national military personnel assigned to the Air Force.

Employee—For the purpose of this instruction, the term Employee applies to all Department of Defense Civilian Personnel, Department of Defense Military Personnel, and Department of the Air Force Military Personnel. This may also include Personal Services Contractors see glossary definition.

End—Of-Life—Final stage of spacecraft lifetime. End result will be either recovery, reentry, spacecraft disposal (passivation), or catastrophic loss (due to on-board explosion/failure or collision with another object).

Event—See AFI 91-204 when related to a mishap or hazard.

Exemption—Grants permanent relief from a requirement.

Failure Modes—How a system or component might fail.

Federal Aviation Administration (FAA)-Licensed Launch—Any launch issued a launch license by FAA Office of Commercial Space Transportation.

Fire Hazard—A condition which can cause a fire to occur, or, if left unchecked, cause a fire to grow. The distinction between fire hazard and fire safety deficiency (FSD) is important because the documentation, reporting, and correction procedures differ for each. Only fire hazards are included in the Master Hazard Abatement Plan and FSDs are managed IAW AFI 32-10141.

Fire Safety Deficiency (FSD)—A condition which reduces fire safety below an acceptable level, including noncompliance with standards, but by itself cannot cause a fire to occur. See *Occupational Deficiency*.

Flexible Culture—One of the four sub-cultures that make up an Informed Culture. A Flexible Culture is a collection of behaviors and beliefs that acknowledge the inevitability of human error and unsafe conditions and which allow quick and smooth reactions to address hazards before mishaps result.

Flight Safety Manager—A civilian assigned to perform Flight Safety Officer duties.

Formal Inspection Report—A report with a particular prescribed format.

Full-time—Individuals in primary duty safety positions. See definition for safety and health officials. Does not include additional duty safety personnel such as USRs and Squadron Assigned Flight Safety Officers.

Functional Managers—The senior operating official at all levels exercising managerial control of an activity or operation. This individual usually can acquire and commit resources for the abatement of occupational safety and health hazards.

Geographically Separated Unit—Any Air Force unit that is geographically separated beyond a reasonable commuting distance from its servicing military personnel flight.

Hazard—Any real or potential condition that can cause injury, illness, or death to personnel or damage to or loss of equipment or property, mission degradation.

Hazard/Deficiency Abatement—Eliminating or permanently reducing a hazard by complying with applicable safety requirements or taking equivalent protective measures.

Hazard/Deficiency Severity—An assessment of the expected consequences if a hazard, if left unabated, results in a mishap. The Air Force defines severity by the degree of injury, illness, or resource damage that can result from a specific mishap.

Hazard Reporting—A process, by which any person assigned, attached or under contract to the Air Force, may report a hazard. This includes any event or condition that affects aviation, occupational, weapons or space safety.

High Interest Areas—These areas have the greatest risk to life or property damage, experienced repeated mishaps, or in the judgment of the safety office, require added oversight. They can also be work areas or operations that need additional attention or inspections because of increased mishap potential due to the nature of work performed, physical conditions or type of materials handled.

High—Risk Activities—These are activities having a higher potential for personnel injury due to the level of competition, speed, risk, or skills needed and requiring greater agility, stamina and

dexterity. Some examples of high-risk activities are flying civil aircraft, hang gliding, skydiving, parasailing, white-water rafting, motorcycling and auto racing, scuba diving, bungee jumping and bronco and bull riding. **Note:** MAJCOM/FOA/DRU determine within the command what are considered high risk activities.

Hosted Payloads—A module attached to a satellite with communications circuitry that operates independently of the main spacecraft utilizing available power, mass and space on the satellite.

Human Space Flight—Objects in orbit which support human life or have the capability to support human life, and objects in orbit intended to rendezvous, dock with such objects.

Informed Culture—A term used to describe the optimal state of an organization's safety culture, in which each individual sees his or her role as a fundamental part of the organization's commitment to safety and achievement of organizational safety goals. Four prerequisite sub-cultures help create an Informed Culture: a Just Culture, a Reporting Culture, a Learning Culture and a Flexible Culture.

Inspections—The process of determining compliance with safety and health standards through physical surveys of workplaces, operations, and facilities.

Interim Control Measure—Temporary action taken to reduce the degree of risk associated with a hazard pending completion of an abatement project.

Job Hazard Analysis—A technique focusing on job tasks as a way to identify hazards before they occur. It focuses on the relationship between the employee, the task, the tools, and the work environment.

Job Safety Training Outline (JSTO)—An outline of mandatory safety training items supervisors use when conducting work center safety training for their specific work areas. See paragraph **14.1.**

Just Culture—One of the four sub-cultures that make up an Informed Culture. A Just Culture is an organizational environment where front line operators or others are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training, but where gross negligence, willful violations and destructive acts are not tolerated. Just Culture focuses on improving system designs and employee procedures to include: better system operations; creating redundant safety systems to trap or mitigate errors; pre-identifying high-risk operations; and leadership actions designed to limit at-risk behaviors.

Launch Essential Personnel—The minimum number of persons necessary to successfully and safely complete an operation and whose absence would jeopardize the completion of the operation. This includes persons required to perform emergency actions according to authorized directives, persons specifically authorized by the Wing Commander/System Program Office(SPO) Director to perform scheduled activities, and persons in training. The number of mission-essential personnel allowed within Safety Clearance Zones or Hazardous Launch Areas is determined by the Wing Commander/SPO Director and the Range User with Range Safety concurrence.

Launch Mishap—See *Orbital Mishap* and *Pre-Launch*. Mishaps that occur between the initial ignition of any stage of the rocket and up until the final piece of launch hardware separates from the spacecraft. This includes payloads not launched into the intended orbit.

Launch Operation—Operations occurring in the terminal countdown through sub-orbital flight or orbital insertion.

Launch Operator—A person or entity that conducts or proposes to conduct the launch of a launch vehicle for the purpose of inserting a spacecraft into orbit or delivering a payload to a specified ballistic location.

Launch Vehicle—Any means of transportation used to place an object into Earth orbit or deep space, including ballistic missiles.

Launch Vehicle Components—All the parts of a launch vehicle except payload(s), to include upper stages and any apogee kick motors that separate from the spacecraft after operation.

Launch Window—A period of time during which the flight of a launch vehicle may be initiated to meet mission requirements.

Launching Agency—The range user at Air Force ranges or equivalent organization at other locations.

Learning Culture—One of the four sub-cultures that make up an Informed Culture. A Learning Culture exists when an organization has the willingness and ability to implement proper recommendations from safety information that is produced through continuous risk assessment of hazards.

Lift—Off—For the purposes of flight safety analyses, lift-off occurs during a launch countdown with any motion of the launch vehicle with respect to the launch platform (which includes a carrier aircraft), including any intentional or unintentional separation from the launch platform.

Losses—A term to describe personnel injuries, fatalities, system degradation, or destruction when describing mishap outcome.

Major Command—For the purpose of mishap prevention (MAJCOM) includes Air Force District of Washington (AFDW), ACC, AETC, AFMC, AFOTEC, AFRC, AFSPC, Air Force Global Strike Command (AFGSC), Air Force Special Operations Command (AFSOC), Air Mobility Command (AMC), ANG, Pacific Air Force (PACAF), United States Air Force Academy (USAFA) and United States Air Force Europe (USAFE).

Meteoroids—A solid object moving in interplanetary space, of a size considerably smaller than an asteroid and considerably larger than an atom or molecule (e.g., meteoroid material associated with asteroid breakup or material released from comets).

Minor Deficiencies—Any validated deficiencies that do not meet the definition of a Critical or Significant deficiency, but requires corrective action.

Mishap—An unplanned occurrence, or series of occurrences, that results in damage to Department of Defense (DoD) property; occupational illness to DoD personnel; injury to on- or off-duty DoD military personnel; injury to on-duty DoD civilian personnel; or damage to public or private property, or injury or illness to non-DoD personnel, caused by DoD activities. Mishaps are classified by total direct mishap cost and the severity of injury/occupational illness.

Missile—A rocket-propelled or jet-propelled expendable vehicle used to deliver a warhead. It may use a ballistic trajectory or fly under active guidance and control.

Mission Assurance—A process to protect or ensure the continued function and resilience of capabilities and assets – including personnel, equipment, facilities, networks, information and information systems, infrastructure, and supply chains – critical to the execution of DoD mission-essential functions in any operating environment or condition.

MTF Covered Entities—Medical professionals within the MTF who are responsible for and ensure any health information in connection with medication transactions (the three categories of HIPAA Covered Entities [health plans, health care clearinghouses and health care providers]) are electronically transmitted. These procedures must meet Medical Health System adopted standards.

Multi-Functional Team (MFT)—As defined 63- and 64-series guidance publications, MFT is a team of stakeholders responsible for a Service's acquisition. It includes not only representatives of the technical and procurement communities, but also stakeholders of the Service's acquisition and the contractors who provide the services. The team may consist of subgroup(s) responsible for routine contract actions. The team could be a Business Requirements Advisory Group, Mission Area Acquisition Team, Integrated Product Team, working group, an A-76 Integrated Product Team or Steering Group, etc.

National Consensus Standards—Standards published by recognized standards organizations such as the American National Standards Institute, National Fire Protection Association, American Conference of Governmental Industrial Hygienists, Compressed Gas Association, and National Institute for Occupational Safety and Health. National consensus standards adopted by OSHA are part of OSHA standards.

Neighboring Operations Personnel—See *Launch Essential Personnel*. Individuals required to perform safety, security, or operationally critical tasks but not associated with the specific/current operation or launch under consideration.

Non-Compliance—A noticeable or marked departure from requirements, standards, or procedures.

Nonmilitary Unique—The term nonmilitary-unique refers to military and civilian workplaces, operations, equipment and systems that are generally comparable to those of the private sector. Examples include facilities involved and work performed in the repair and overhaul of weapons, aircraft or vehicles (except for equipment trials); construction; supply services; civil engineer or public works; medical services; and office work.

Notice of Hazard—A written warning of a condition, procedure, or practice which constitutes a hazard. As used in the context of this instruction, "Notice of Hazard" refers to AF Form 1118.

Occupational Deficiency—Conditions, procedures and practices not compliant with OSHA or AFOSH requirements, but do not, in themselves, create a potential for producing an occupational injury or illness mishap. Deficiencies may, however, create a potential for secondary injuries or illnesses or may contribute to the severity of an injury or illness that has already occurred. Examples include, but are not limited to, program management items or the absence of an eyewash station. A clear distinction between hazards and deficiencies may not always be possible; therefore, the judgment and experience of qualified safety, fire protection and health personnel must be relied upon.

Occupational Hazard—Conditions, procedures, and practices directly related to the workplace that can create a potential for producing occupational injuries, property or equipment damage, mission degradation, damage to the environment, or illnesses.

Occupational Illness—Any reported condition that does not meet the definition of injury. Any abnormal physical condition or disorder, other than one resulting from an occupational injury, resulting in adverse consequences and caused by occupational factors associated with

employment. Includes all confirmed cases of acute and chronic illnesses or diseases caused by inhalation, absorption, ingestion or direct contact with suspect substances.

Operational Review Panel (ORP)—The panel, established in the AFI 10- series of instructions, chaired by the responsible commander that approves system modifications, training, procedures, and database changes to operational equipment.

Operational Review Board—Established in the AFI 10-series of instructions, the responsible commander that reviews problems in operations of systems chairs this board.

Operational Effectiveness—The overall degree of mission accomplishment of a system when used by representative personnel in the environment planned or expected for the operational employment of the system. Can also be referred to as *mission effectiveness.*

Orbital Insertion—The point in time when an object or vehicle achieves sufficient altitude and velocity to complete at least one orbit of the Earth. This occurs when the object or vehicle achieves a minimum 130 km perigee based on a computation that accounts for drag.

Orbital Space Systems—Term used to describe the hardware and activities associated with the design, development, testing and operation of any man-made object to achieve an altitude and velocity sufficient to complete one revolution of the Earth. The lower the altitude, the shorter the orbital period.

Passivation—The process of removing stored energy that could result in an explosion or deflagration from a space system at end-of-life. This includes electrical, mechanical, chemical, or nuclear energy.

Payload—See *Satellite* or *Spacecraft*. Refers either to the object(s) carried by a launch vehicle or the mission-performing portions of a satellite/spacecraft (e.g., the main communications package on a communications satellite). This AFI will not collectively reference a satellite/spacecraft as a "payload" following separation from the launch vehicle.

Perigee—The point in the orbit nearest to the center of the Earth, and where the satellite's velocity is greatest. The perigee altitude is the distance of the perigee point above the surface of the Earth.

Personal Services Contractors—Characterized by the employer-employee relationship between the government and the contractor's personnel (e.g. medical contractors). The Government exercises relatively continuous supervision and control over the contractor personnel performing the contract. Verify with contracting officials of the work status of the contract employee.

Performance Appraisal—A systematic comparison of an employee's performance of duties and responsibilities with performance standards.

Pre-Launch—Space related activities occurring during early acquisition stages, ground handling, processing, and transportation operations just prior to ignition (lift-off) actions.

Post-Mission—Describes the time period after a spacecraft completes its mission and culminates with final passivation and disposal activities.

Privileged Safety Information—Information that is reflective of a deliberative process in the safety investigation or given to a safety investigator pursuant to a promise of confidentiality, which the safety privilege protects from being released outside safety channels or from being used for any purpose except mishap prevention. It includes products such as draft and final findings, evaluations, opinions, preliminary discussions, conclusions, mishap causes, recommendations,

analyses, and other material that would reveal the deliberations of safety investigators, including reviews and endorsements. It also includes information given to a safety investigator pursuant to a promise of confidentiality and any information derived from that information or direct or indirect references to that information.

Program Manager (PM)—The designated individual with responsibility for and authority to accomplish program objectives for development, production, and sustainment to meet the user's operational needs. The PM shall be accountable for credible cost, schedule, and performance reporting to the Milestone Decision Authority.

Public—See *Critical Operations Personnel*, *Launch Essential Personnel* and *Neighboring Operations Personnel*. All persons not in either the Launch Essential Personnel or Neighboring Operations Personnel categories.

Public Safety—Safety involving risks to the general public of the US or foreign countries and/or their property (both on- and off-base); includes the safety of people and property not involved in supporting a launch as well as those within the boundary of a launch site.

Quality Assurance Personnel—Individuals designated to perform quality assessment functions, and manage performance IAW the Performance Plan. They serve as on-site technical managers assessing contractor performance against contract performance standards. Personnel in this area have many titles, such as Quality Assurance Evaluator, Quality Assurance Specialist, Functional Area Evaluators and Contracting Officer Technical Representative.

Quality Assurance Program Coordinator (QAPC)—Mission support group or AFMC/AFSPC Center-level individual, normally from the contracting activity, selected to coordinate and manage the Performance Management Assessment Program (Quality Assurance Program).

Qualified Safety, Fire Protection, Bioenvironmental Engineering and Health Officials—Air Force civilian and military personnel assigned to full-time positions for the respective disciplines. Air Force civilian personnel who meet the Office of Personnel Management standards for safety and occupational health manager or specialist, safety engineering technician, safety engineer, fire protection engineer or specialist, medical officer, health physicist, industrial hygienist, occupational health nurse or environmental health technician job qualification standards. Safety, fire protection, and health personnel with experience or up-to-date training in occupational safety, fire protection, and health hazard recognition and evaluation are considered as meeting the qualifications of safety, fire protection, and health inspectors. Air Force military personnel, who possess a safety, fire protection, Bioenvironmental Engineering, aerospace medicine, or medicine Air Force Specialty Code (AFSC). Government civilian employees are considered fully qualified IAW 29 CFR Part 1960 and military at the AFSC 7-level or can be a 5-level if task certified. (See 29 CFR § 1960.25).

Radioactive Material—Materials that generate, or are capable of generating, ionizing radiation including naturally occurring radioactive materials, by-product materials, source materials, special nuclear materials, fission products, materials containing induced or deposited radioactivity, and nuclear reactors.

Range User—Any individual or organization that conducts or supports any activity on resources (land, sea, or air) owned or controlled by an Air Force range. This includes such organizations as the DoD, US government agencies, civilian launch operators, foreign government agencies, and

other foreign entities that use Air Force range facilities and test equipment; conduct pre-launch and launch operations; and/or require on-orbit or other related support.

Rapid Response Report (RRR)—A form used to provide data to OSHA Investigators during civilian-related mishaps with injures. OSHA Investigators may request mishap data, the RRR completed either by the USR or Supervisor will meet this requirement.

Reentry—The event occurring when a spacecraft or other man-made object comes back into Earth's dense atmosphere from higher altitudes.

Reporting Culture—One of the four sub-cultures that make up an Informed Culture. A Reporting Culture thrives in a climate where leaders encourage both hazard reporting for appropriate staff action and error reporting for Airmen passing along lessons learned. As events are reported, hazards and errors are documented and messaged, resulting in safety performance improvement.

Risk—See *Collective risk*. The probability and severity of loss or adverse impact from exposure to various hazards.

Risk Analysis—The analysis of systems (hardware, software, firmware, and procedures) to determine potential hazards that could result in loss of personnel, injury to personnel, loss or degradation of the system, or loss of life or injury to the public.

Risk Management—The application of a systematic process or thinking to detect, assess, and control risk to enhance total organizational performance.

Safe/Safing—Placing an object in a condition that limits the possibility of new or further system or component failures.

Safe Haven—Designated area to which noncombatants of the United States Government's responsibility, and commercial vehicles and material, may evacuate during a domestic or other valid emergency. Temporary storage provided Department of Energy classified shipment transporters at Department of Defense workplaces to assure the safety and security of nuclear material and/or non-nuclear classified material. Also includes parking for commercial vehicles containing Class A or Class B explosives.

Safety—The programs, RM activities, and organizational and cultural values dedicated to preventing injuries and accidental loss of human and material resources, and to protecting the environment from the damaging effects of DoD mishaps.

Safety Assessment—Method of appraising the effectiveness of mishap prevention program management used by wing safety staffs to evaluate each standalone group and squadron safety program conformance and effectiveness within the safety management system (SMS). Like program evaluations, assessments address the areas of commander and supervisory support, compliance with program directives, and the effectiveness of mishap prevention program. Assessments may be conducted in conjunction with the required annual safety inspection.

Safety Evaluation—Method of appraising the effectiveness of mishap prevention program management used by AFSEC to evaluate MAJCOM and DRU safety program conformance and effectiveness within the SMS. Also used for FOAs with assigned safety staffs. Addresses the areas of commander supervisory support, compliance with program directives and the effectiveness of the mishap prevention program.

Safety Program Evaluation—Method of appraising the effectiveness of mishap prevention program management used by MAJCOM/DRU/FOA safety staffs to evaluate wing, NAF and Center safety program conformance and effectiveness within the SMS. Also used for FOAs with assigned safety staffs. Addresses the areas of commander supervisory support, compliance with program directives and the effectiveness of the mishap prevention program.

Satellite—See *Payload* or *Spacecraft*. An object that orbits another object known as a central body. Commonly, this term refers to Non-Human Spaceflight spacecraft in orbit around the Earth.

Satellite Control Authority—The authority to plan, schedule, and perform satellite commanding.

Separation—Occurs when the last launch vehicle component (to include non-integrated apogee kick motors) physically separates from the spacecraft. Final separation occurs when both physical separation and any tethers detach from the spacecraft.

Service Contract—A contract that directly engages the time and effort of a contractor whose primary purpose is to perform an identifiable task rather than to furnish an end item of supply. This contract may be either a non-personal or personal contract. It can also cover services performed by either professional or unprofessional personnel whether on an individual or organizational basis.

Significant Deficiencies—Any validated deficiencies that have or could have negative mission impact.

Slag—Solid material in solid rocket motor exhaust.

Spacecraft—A man-made object either that orbits a central body (planet or star) or is in an escape trajectory (eccentricity > 1) from that central body. This can include both Earth-orbiting and interplanetary spacecraft.

Spacecraft—See *Satellite* and *Payload*. An object designed to perform some function in space. This includes satellites and Human Space Flight objects in space. This term can also refer to the object while it is still on the ground. This does NOT include launch vehicle components separated from the spacecraft.

Space And Missile Systems Center (SMC)—A direct reporting unit to AFSPC that develops and acquires space launch vehicles, spacecraft, and range systems for the Air Force.

Space Control—Operations to ensure freedom of action in space for the United States, its allies, and when directed, deny an adversary freedom of action in space.

Space Debris—See *Meteoroids* and *Orbital Debris*. General class of debris, including both meteoroids and orbital debris.

Space Mishap—Any unplanned event involving space systems that results in personnel injury, system damage/destruction, or mission capability loss/delay. For reporting purposes, it also includes near misses, close calls, and HAP events.

Space Object—Any object above the Earth's atmosphere (e.g., spacecraft, debris, natural phenomena).

Space Safety—A dynamic process designed to improve operational effectiveness by managing/preventing close calls (events), reducing mishaps, and supporting mission assurance throughout the life cycle of a space system.

Space Safety Manager—Personnel assigned to a Space Mishap Prevention or Mishap Investigation role.

Space Systems—All the devices and organizations forming the space network. These consist of: launch vehicles; launch ranges; launch and range support equipment and systems; spacecraft; ground and airborne stations; and data links among spacecraft, mission, and user terminals. Space systems refer to the equipment required for space operations, comprised of nodes and links. There are three types of nodes: space, airborne, and terrestrial. Space nodes include satellites, space stations, or reusable space transportation systems. Airborne nodes are primarily aircraft weapon systems that leverage space capabilities. Terrestrial nodes include any land or sea equipment that receives, processes, or uses data derived from space capabilities. Information conduits called links tie these nodes together. There are two classification types of these links: control and mission. Space operators use control links to operate Space systems. Space systems disseminate data on mission links, which enable force multiplication.

Space Vehicles—Devices designed for orbit about the Earth or into a trajectory toward another celestial body. This definition differentiates between vehicles that remain in space (included) and vehicles that are suborbital (excluded).

Spot Inspection—These inspections are no-notice inspections to check the day-to-day safety and health of an organization, work center, facility, etc.

Standards—Safety and health standards (including emergency temporary standards) issued under the Occupational Safety and Health Act of 1970 (Title 29, U.S.C., Sections 651-678). This includes national consensus standards adopted by OSHA by reference.

Suborbital—object trajectory that does not complete a complete orbit.

System Safety—The application of engineering and management principles, criteria, and techniques throughout all phases of the system life-cycle to optimize safety within the constraints of operational effectiveness, time, and cost.

System Safety Engineer (SSE)—An individual meeting the qualifications for, and assigned to, the Office of Personnel Management 0803 Safety Engineering Series (or equivalent), or military AFSC of either 62-series Developmental Engineer or 61-series Scientist. An SSE may be assigned as a System Safety Manager (SSM).

System Safety Groups (SSGs)—The organized committee of system safety stakeholders that augment the program office system safety function; it is not a substitute or replacement. While many SSG members are not assigned to the Program Office, they advise the system program manager or single manager on safety matters. They act as an integrated product team for system safety. The members assist the program office in identifying risks, assessing these risks, and recommending solutions to these risks. The SSG includes safety experts associated with the particular weapon system.

System Safety Manager—The individual appointed by the Program Manager as the program focal point for the System Safety Program.

System Safety Working Groups (SSWGs)—Are a subset of System Safety Groups (SSGs). SSWGs are usually formed when a full SSG wants to research a problem without tying-up the full membership. The SSG will generally form an SSWG to work a problem separately and report back to the SSG. An SSWG augments an SSG; it's not a substitute.

Team Concept—A diverse group of individuals working together with complementary skills who are committed to a common purpose, have group goals, take an approach for which they are mutually accountable.

TRiPS—(Travel Risk Planning System)—TRiPS program assists in travel planning. TRiPS is accessed through the Air Force portal (**https://trips.safety.army.mil/**).

Total Recordable Incident Rate (TRIR)—A number that represents the total recordable civilian injuries and illnesses per 100 full-time employees, calculated for a worksite for a specified period of time (usually one year).

Uncontrolled Reentry—See *Controlled Reentry*. A random reentry in which the spacecraft/object reenters the atmosphere where an operator cannot sufficiently determine or influence the surface impact point prior to reentry. This is the typical reentry method for debris and spacecraft in decay orbits where the final reentry point and time is underdetermined due to uncertainty in atmospheric density conditions due to the extended time period between disposal and reentry.

Unique Space Support Equipment—Systems, equipment, and facilities required for supporting other space systems. Includes launch and orbital space support systems.

Uniquely Military Equipment, Systems and Operations—Defined in 29 CFR § 1960.2(i) and further refined in DoDI 6055.01, Enclosure 3, paragraph 2.

Unit Safety Representative—General term for a person assigned to a unit who is responsible for the additional duty safety responsibilities. May be a representative of flight, occupational or weapons, and may include a more specific title such as Additional Duty Weapons Safety Representative or Squadron Assigned Flight Safety Officer, etc.

United States—The several States, the District of Columbia, the Commonwealths of Puerto Rico and the Northern Marina Islands, American Samoa, Guam, Midway and Wake Islands, the United States Virgin Islands, any other territory or possession of the United States, and associated navigable waters, contiguous zones, and ocean waters of which the natural resources are under the exclusive management authority of the United States.

Upper Stage—Typically, the last portion of a launch vehicle used to deliver a spacecraft into orbit. Some spacecraft may also have an apogee kick solid-rocket motor or other propulsion system, to include mono or bi-propellant chemical rocket engine thrusters, electric, or ionic propulsion thrusters.

Urgent Action Notice—Significant event notifications sent out by the Air Force Service Watch Center (AFSWC). These notifications are also called AFSWC notifications.

Variance—An approved temporary change (not to exceed 5 years) to a procedure, criterion, or rule prescribed in safety standards which provides the same degree of protection to personnel.

Wing Commander/System Program Office (SPO) Director—Commander/Director of a wing/office that acquires, operates, or supports Space Systems.

Workplace—The physical location where work is performed for the Air Force by Air Force personnel or where Air Force operations take place.

BY ORDER OF THE SECRETARY OF THE AIR FORCE

DEPARTMENT OF THE AIR FORCE MANUAL 91-203

25 MARCH 2022

Safety

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This manual implements Air Force Policy Directive (AFPD) 91-2, *Safety Programs,* and parts of Title 29 Code of Federal Regulations (CFR), Chapter XVII, *Occupation Safety and Health Administration (OSHA), Department of Labor (DoL),* This manual defines the Air Force's minimum safety, fire protection and occupational health standards, including additional requirements not addressed by the OSHA standards. This manual applies to individuals at all levels who are uniformed members or civilian employees of the Regular Air Force, Air Force Reserve (AFR), the Air National Guard (ANG), the United States (US) Space Force, the Civil Air Patrol, and those who are contractually obligated to comply with Department of the Air Force (DAF) publications. This manual requires the collection and/or maintenance of information protected by the Privacy Act of 1974 authorized by Department of Defense Instruction (DoDI) 5400.11, *DoD Privacy and Civil Liberties Programs.* The applicable SORNs F024 AF IL C, *Motor Vehicle Operator's Records,* and F031 AF SP L, *Traffic Accident and Violation Reports,* are available at **https://dpclo.defense.gov/Privacy/SORNs.aspx**. Ensure all records generated as a result of processes prescribed in this publication adhere to AFI 33-322, *Records Management and Information Governance Program,* and are disposed in accordance with Air Force Records Disposition Schedule, which is located in the Air Force Records Information Management System. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication;* route AF Forms 847 from the field through the appropriate functional chain of command. Refer to Air Force Instruction (AFI) 91-202, *The US Air Force Mishap Prevention Program,* for guidance on submitting requests for variance to requirements of this publication. Report conflicts in guidance between this publication, federal standards or other DAF directives through Major Command

(MAJCOM), Field Command (FLDCOM), Direct Reporting Unit (DRU) or Field Operating Agency (FOA) occupational safety offices to Headquarters Air Force Safety Center, Occupational Safety Division, Standards and Policy Branch (HQ AFSEC/SEGS), 9700 G Avenue SE, Kirtland AFB NM 87117-5670. This manual may be supplemented at any level, but to ensure standardization, any organization supplementing this manual must send the implementing publication to AFSEC/SEG for review and coordination before publishing. The authorities to waive wing/delta/unit-level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See DAFI 33-360, *Publications and Forms Management*, for a description of the authorities associated to the Tier waiver approval authority. For non-tiered compliance items, the requestor's commander is the approval authority. Submit requests for waivers through the chain of command to the appropriate Tier/Waiver approval authority, or alternately, to HQ AFSEC/SEG for variances/exemptions to non-tiered compliance items. The requesting office must send a copy of all approved waivers to the OPR of the Higher Headquarters publication being waived (see DAFI 33-360, paragraph 1.9.4.3.4) within 30 days of approval. Sending an email to the waived publication OPR that includes a completed AF Form 679, *Air Force Publication Compliance Item Waiver Request/Approval*, or equivalent, will suffice. Requirements in this publication are mandatory, unless otherwise indicated. Not included are safety, fire prevention and occupational health requirements addressed in specific equipment technical orders (TOs). Compliance with the attachments in this publication is mandatory. The use of the name or mark of any specific manufacturer, commercial product, commodity or service in this publication does not imply endorsement by the DAF.

SUMMARY OF CHANGES

This document is substantially revised and must be completely reviewed. Major changes include reducing the size of the standard by referring the reader to OSHA safety standards and other consensus standards that were previously repeated. Chapters with similar information were combined to reduce redundancy and streamline requirements; a substantial amount of figures and tables were removed, and where appropriate, referenced to the original source; and language for administrative devices, that includes locks and tags not used for hazardous energy control have been moved to **Chapter 17.** Other changes include implementing required changes to fall protection procedures mandated by the Air Force Audit Agency, clarifying process safety management requirements, eliminating the requirement to use specific National Stock Numbers for specific equipment and personal protective equipment, clarifying fire protection and prevention requirements, and a rewrite of **Chapter 9.**

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Chapter 1

INTRODUCTION

1.1. Objective.

1.1.1. OSHA safety guidance published in the DoL 29 CFR series provides employees a safe and healthful workplace. OSHA dictates what must be accomplished in the workplace, but in some cases, not necessarily how it will be accomplished, or by whom. Refer to AFSEC Occupational Safety SharePoint® site for Introduction to OSHA Standards training information located at **https://cs2.eis.af.mil/sites/10178/Pages/SEGHomeV2.aspx.**

1.1.2. Commanders are responsible for the safety of their facilities and personnel, including the correction of all identified hazards and deficiencies in their workplaces. This publication compliments AFI 91-202, *The US Air Force Mishap Prevention Program,* and assigns responsibilities to individuals or functions to help commanders manage their safety and health program, ensuring they comply with OSHA and DAF guidance. This publication provides uniform guidance, which safety staffs and commanders may supplement when additional or more stringent safety, fire prevention and health criteria are required.

1.1.3. MAJCOMs/FLDCOMs may have more stringent or restrictive requirements than those contained in this publication or other Air Force Occupational Safety and Health (AFOSH) publications/standards. Therefore, all requests for interpretations or clarifications concerning these publications must be forwarded through the servicing MAJCOM/FLDCOM/DRU/FOA safety, health and/or civil engineering organization, as applicable. **Note:** With respect to references in this manual to installation medical treatment facilities, pursuant to 10 United States Code (USC) § 1073c, the Defense Health Agency, a combat support agency, will be responsible for their administration and management; the details of these responsibilities are still being worked and finalized. **(T-0)**

1.2. Roles and Responsibilities.

1.2.1. All Headquarters Air Force elements shall ensure policies and procedures are consistent with the guidance of this manual.

1.2.2. Headquarters, Air Force Safety Center (AFSEC) shall:

1.2.2.1. Formulate and execute policy. Clarify roles, responsibilities and guidance applicable to all areas of safety.

1.2.2.2. Act as approval authority for safety variances associated with T-1 and above wing/delta-level requirements in this manual.

1.2.3. MAJCOMs, FLDCOMs, DRUs and FOAs shall provide program oversight and supplement safety and health guidance, as necessary, ensure safety training is available to subordinate units. **(T-1)**

1.2.4. Commanders and Functional Managers shall:

1.2.4.1. Ensure and promote applicable occupational safety and health (OSH) guidance for workplace and operations is available to all personnel. **(T-1)**

1.2.4.2. Ensure and promote compliance with occupational safety, fire prevention and health program requirements in their areas of responsibility. **(T-1)**

1.2.4.3. Ensure a safe and healthful workplace is provided via a monthly spot-inspection program. **(T-1)**

1.2.4.4. Provide employees training in job safety, fire prevention and health, as required by:

1.2.4.4.1. OSHA directives. **(T-0)**

1.2.4.4.2. AFOSH directives. **(T-1)**

1.2.4.4.3. Air Force Policy Directives (AFPD). **(T-1)**

1.2.4.4.4. Air Force Instructions (AFI), Air Force Manuals (AFMAN) and any other associated directives. **(T-1)**

1.2.5. Supervisor. Supervisors will require workers to notify them in advance if they have a medical condition or are taking medications that could interfere with their safe performance of assigned duties. **(T-1)** Supervisors shall ensure employees are trained, using manufacturer's instructions or lesson plans, prior to the operation of any type of equipment or accomplishing assigned tasks. **(T-1)** Supervisors shall routinely evaluate employees on the proper and safe operation of all equipment and associated personal protective equipment (PPE). **(T-1)** Unsafe behaviors shall be corrected on the spot. **(T-1)** Supervisors will provide such instruction at time of initial assignment and refresher training, as required. **(T-1)** If instruction is not available, supervisors shall accomplish a job hazard analysis (JHA). **(T-1)** Additional supervisor responsibilities can be found in AFI 91-202.

1.2.6. DAF personnel (military and civilian) shall:

1.2.6.1. Comply with OSH guidance. **(T-0)**

1.2.6.2. Promptly report unsafe working conditions/activities including any safety, fire and health hazards and deficiencies to the supervisor. **(T-1)**

1.2.6.3. Promptly report injuries and illnesses to the supervisor, e.g., occupational illness and on-duty injury to DoD military and civilian personnel, and off-duty injury to DoD military personnel. **(T-1)**

1.2.6.4. Comply with PPE requirements, including its use, inspection and care; ensure required guards, interlocks and enclosures are properly used. **(T-1)**

1.2.6.5. Notify supervisors in advance if they have a medical condition or are taking medications that could interfere with their safe performance of assigned duties. **(T-1)**

1.3. Variances, Exemptions and Letters of Interpretation.

1.3.1. The affected work center shall process a request for variance or exemption when it is impossible to meet AFOSH guidance due to operational needs, mission impact or technical reasons. **(T-1)** When requesting a variance or exemption, the work center leadership must identify and implement interim control measures to reduce the degree of risk associated with the hazard in order to protect personnel, equipment and/or property. **(T-1)** The process for requesting a variance or exemption is provided in AFI 91-202.

1.3.2. Air Force letters of interpretation (LOIs) are written in response to AFOSH-related inquiries submitted from DAF personnel or units regarding specific aspects of or terminology in this manual or with OSHA standards and guidance, and applicable adopted national consensus safety guidance. AFSEC/SEG is responsible for responding to and providing clarification to meet the operational needs of the DAF. LOIs provide this response and are intended to clarify the application of established standards, policy or procedure, but they may not, in themselves, establish or revise DAF policy or procedure. The LOI specifically cites the source policy or procedure document being interpreted and include the time duration of the LOI.

1.4. How to Use This Document.

1.4.1. This publication incorporates appropriate parts of the 29 CFR §§ 1910 and 1926 standards that relate to Air Force/Space Force operations. References to other Air Force publications and national consensus standards are provided as appropriate. Air Force/Space Force activities must comply with OSHA requirements at all times, unless the military-unique exemption applies in accordance with Department of Defense Instruction (DoDI) 6055.01, *DoD Safety and Occupational Health (SOH) Program*, and AFI 91-202. **(T-0)**

1.4.2. This publication is intended for use by fire, safety and health professionals, commanders, functional managers, supervisors and employees. It provides AFOSH requirements that shall provide equal or greater protection than applicable federal regulatory standards. **(T-1)** The information in this publication is for the protection of employees, Air Force/Space Force property and equipment, and to ensure compliance with Federal law. **Note:** This publication does not apply to state employees or ANG members not in federal status. **Note:** This publication may contain criteria not fully compatible with host-nation safety criteria. In case of conflict, safety offices shall facilitate coordinated concerns through their hierarchy for resolution.

1.5. Applying Standards. Air Force and Space Force personnel must comply with all applicable safety guidance during Air Force/Space Force operations. **(T-1)** If, or when, there is conflicting guidance, use the guidance that provides the most protection for the employee until conflict resolution is attained.

1.5.1. Compliance.

1.5.1.1. This Air Force standard contains both horizontal and vertical fire, safety and health standards/requirements within the various chapters. Generally, horizontal standards/requirements apply across all industries/activities; whereas, vertical standards/requirements apply to a specific industry/activity, e.g., construction or telecommunications. There are occupational safety and health mandates contained within one chapter of this publication which could be interpreted as vertical; however, because safety rules are established based upon hazards and not just tasks, the mandate may, in fact, be applied horizontally across several occupations. **Example:** Confined space requirements in **Chapter 23** – primarily a General Industry application, but may apply to applicable portions of aircraft maintenance tasks. For this reason, broad guidance cannot be codified to address all situations. If there is doubt, contact the local safety office for guidance. Resolve locally, when possible, using risk management techniques focused on the hazard and hazard mitigation.

1.5.1.2. When AFOSH guidance or other established safety criteria does not cover a situation, use non-Air Force standards to include, but not limited to, national consensus standards, professional safety and health standards, and other Federal agency standards.

1.5.2. OSHA Requirements. DAF safety officials cannot grant exemptions to OSHA standards, only the Department of Labor has the authority to grant exemptions to OSHA standards. Refer to AFI 91-202 for additional guidance.

1.5.3. National Consensus Standards. National consensus standards referenced in this document have been adopted, in whole or in part, for DAF use and list the standard, part/document number, part/document title and date of standard, as applicable, e.g., American Society of Mechanical Engineers (ASME) B30.9, *Slings*, and National Fire Protection Association (NFPA) 70, *National Electrical Code.* Personnel needing access to American National Standards Institute (ANSI) and/or other national consensus standards can contact the installation occupational safety office for guidance and assistance.

1.5.4. Joint Base Safety Standard Compliance. DAF personnel at Joint Bases will follow safety requirements outlined in the approved support agreement(s) developed in accordance with DoDI 4000.19, *Support Agreements*, and AFI 25-201, *Intra-Service, Intra-Agency, and Inter-Agency Support Agreements Procedures.* **(T-1)** When there is conflicting guidance, use the guidance that provides the most protection. Further conflicts in safety program requirements will first be coordinated through senior leadership at the local level for resolution. **(T-1)** If resolution at the local level cannot be obtained, the unit will refer conflicts to AFSEC/SEG through the appropriate MAJCOM/FLDCOM/FOA/DRU safety office for cross-service resolution. **(T-1)**

1.6. Job Hazard Analysis (JHA). JHAs are conducted on all work processes, where appropriate, to identify potential fire, safety or health hazards, determine appropriate training and personal protective equipment (PPE), and include preventative measures in procedures to mitigate the hazards. Refer to AFI 91-202 for additional guidance.

1.7. Military-Unique and Nonmilitary-Unique Policy. The DAF shall apply AFOSH, OSHA, DoD and other non-DoD regulatory safety and health standards and guidance to military-unique workplaces, operations, equipment and systems in whole or in part, insofar as practicable. **(T-0)** DAF directive guidance is to comply with AFOSH, OSHA, DoD and other non-DoD regulatory safety and health standards and guidance as provided under federal law and in accordance with DoD policy with respect to military-unique and nonmilitary-unique workplaces, operations, equipment and systems. **(T-0)**

1.7.1. Military-Unique. The term military-unique refers to military and civilian workplaces, operations, equipment and systems unique to the national defense mission. This includes combat and operation, testing and maintenance of military-unique equipment and systems, such as military weapons, military-unique aircraft, early warning systems, military space systems, ordnance and tactical vehicles. It also includes operations such as peacekeeping missions; field maneuvers; combat training; aerospace operations; military flight and missile operations; military-unique research, development, test and evaluation activities; and actions required under national defense contingency conditions.

1.7.2. Nonmilitary-Unique. The term nonmilitary-unique refers to military and civilian workplaces, operations, equipment and systems comparable generally to those of the private

sector. Examples include facilities involved and work performed in the repair and overhaul of weapons, aircraft or vehicles (except for equipment trials); construction; supply services; civil engineer or public works; medical services; and office work. DAF shall comply with AFOSH, OSHA, DoD and other non-DoD regulatory safety and health standards and guidance with respect to nonmilitary-unique workplaces, operations, equipment and systems, regardless of whether work is performed by military or civilian personnel.

1.8. Documentation. This publication specifies use of Air Force Technical Order (AFTO) Form 95, *Significant Historical Data*, AFTO Form 244, *Industrial/Support Equipment Record*, or other appropriate inspection, maintenance and general purpose forms for documenting maintenance and inspection actions. With expanding use of automated systems for tracking these activities, requiring specific paper forms may impede use of more efficient automated processes. Therefore, use of automated systems for documenting inspections, maintenance and other activities is acceptable in place of specified AFTO Forms 95 and 244 or other appropriate inspection, maintenance and general purpose forms if they contain the same information called for by the designated form. Electronic signatures or other unique personal identifiers (not initials) are acceptable. While this publication offers an optional alternative to paper forms, MAJCOMs, FLDCOMs, Numbered Air Forces (NAFs), local procedures, Technical Orders (TOs) and other DAF guidance may continue to require use of these forms. Check the prescribing directive(s) before discontinuing use of any forms.

1.9. First Aid and Cardiopulmonary Resuscitation (CPR) Training. Initial first aid/CPR training shall be accomplished prior to assigning an individual duties where first aid/CPR are requirements of the position. **(T-1)** All employees requiring CPR training will receive refresher training before current CPR certification expires. **(T-1)** Unit CPR instructors may be trained by the local medical group or trained directly by the American Red Cross or American Heart Association. Unit CPR instructors will, in turn, train unit personnel. **(T-1)** If CPR training is not provided by the host medical facility, any instructor receiving training directly from the American Red Cross or American Heart Association will be required to maintain the requirements and pay the costs related to maintaining a certification. **(T-1)** The unit CPR instructor will ensure training includes public access defibrillator training in accordance with AFI 44-177, *Public Access Defibrillator Program.* **(T-1) Note:** Self-aid and buddy care (SABC) may be used to fulfill first aid training requirements; however, it does not cover CPR. Employees performing duties with risk of severe cuts, burns or electrocution, or perform duties in remote locations away from emergency responders will have a plan for immediate medical response pending definitive transfer and care. **(T-0) Note:** Remote location is defined as emergency care that is more than three to four minutes from the workplace.

1.10. Bloodborne Pathogen Training. Any person with routine duties where tasks and procedures involve reasonably anticipated exposure to blood or other potentially infectious materials (e.g., individual responsible for rendering medical assistance as part of their duties) must be trained and enrolled in the Bloodborne Pathogen Program in accordance with 29 CFR § 1910.1030, *Bloodborne Pathogen,* and AFI 44-108, *Infection Prevention and Control Program.* **(T-0)** A person may be required to receive separate first responder training outside of bloodborne pathogen, e.g., First Aid, CPR, SABC. For workplaces with employees that meet this job description, supervisors shall establish a written exposure control plan and conduct training in accordance with 29 CFR § 1910.1030. **(T-0)**

1.11. Process Safety Management (PSM) of Highly Hazardous Chemicals.

1.11.1. The DAF implements 29 CFR § 1910.119, *Process Safety Management of Highly Hazardous Chemicals*, requirements to prevent or minimize consequences of catastrophic releases of toxic, reactive, flammable or explosive chemicals. The criteria in 29 CFR § 1910.119 shall be used in its entirety for program implementation and application unless otherwise specified. **(T-0)** PSM may also apply to explosives and pyrotechnics. Refer to 29 CFR § 1910.119, AFI 91-202 and Defense Explosives Safety Regulation (DESR) 6055.09_AFMAN 91-201, *Explosives Safety Standards*, for additional guidance. **Note:** Also refer to MIL-STD-882E, *Department of Defense Standard Practice: System Safety*, Task 108, *Hazardous Materials Management Plans*, which is the DoD's standard governing risk assessment and safety data requirements for hazardous materials management.

1.11.2. 29 CFR § 1910.119, Appendix A, *List of Highly Hazardous Chemicals, Toxics and Reactives*, contains a list of chemicals used in the DAF, whether the chemical is in a mixture or a byproduct of a chemical process and/or reaction.

1.11.3. Responsibilities.

1.11.3.1. The installation Occupational Safety (SEG) office shall:

1.11.3.1.1. Serve as the focal point for coordinating and implementing PSM procedures, to include leading the PSM team if one is required. **(T-1)**

1.11.3.1.2. With the assistance of the Hazardous Material Management Process Team, conduct and document an assessment of the installation's chemical quantities on-hand that are listed in 29 CFR § 1910.119, Appendix A. **(T-0)**

1.11.3.1.2.1. If the chemicals on the installation do not exceed the threshold quantities listed in 29 CFR § 1910.119, Appendix A, the installation SEG will document the assessment and note that, in accordance with 29 CFR § 1910.119, Appendix A, threshold quantities, a PSM program is not required. **(T-1)** In this case, a reassessment will be accomplished and documented at a minimum of every three years from the initial assessment or sooner when new chemicals or increased quantities of chemicals listed in 29 CFR § 1910.119, Appendix A, are introduced to the installation. **(T-1)**

1.11.3.1.2.2. If the chemicals on the installation exceed the threshold quantities listed in 29 CFR § 1910.119, Appendix A, the safety office will advise the installation commander a formal PSM program and PSM team led by the installation safety office is required by this manual. **(T-0)**

1.11.3.1.3. Ensure copies of OSHA-required PSM documentation are maintained in the installation safety office for OSHA's review for the life of the process. **(T-0)**

1.11.3.1.4. Assess installation operations and advise NAF/SE, FLDCOM/SE and MAJCOM/SE of the number and type of operations that fall under the PSM program. **(T-1)**

1.11.3.2. The Installation PSM Program Team, when required, shall:

1.11.3.2.1. Include representatives from the installation occupational safety office, Bioenvironmental Engineering (BE), HMP Program OPR (also called the installation

Hazardous Material Management Process team lead), Civil Engineer (CE), Environmental Management office, Fire & Emergency Services (F&ES) Flight, Emergency Management Flight and all highly hazardous chemical users, as defined in 29 CFR § 1910.119. **(T-1)**

1.11.3.2.2. Develop and coordinate the installation plan for employee participation. **(T-0)**

1.11.3.2.3. Meet as necessary to conduct and review process hazard analyses (PHA). **(T-1)** **Note:** The PSM Program Team is not necessarily the same team that performs the PHA in 29 CFR § 1910.119(e). These PHAs will be performed by internal staff members, through a contract, or a combination of both. **(T-0)**

Chapter 2

GENERAL WORK PROCEDURES

2.1. General Information. This chapter provides general work procedures for a safe and healthful workplace, to include the wearing of jewelry, workplace safety, ergonomics and housekeeping. In accordance with AFI 91-202, the supervisor will ensure job safety training outline will evaluate and identify PPE requirements. **(T-1)** All facilities shall comply with DoD standards, UFC 3-600-01, *Fire Protection Engineering for Facilities,* DAF guidance and NFPA 101, *Life Safety Code.* **(T-0)**

2.2. Hazards. Physical hazards are the most common workplace hazards. Hazards can include working from heights; slips, trips and falls; falling objects; spills; faulty equipment; and noise hazards. Other examples of workplace hazards include:

2.2.1. Radiation. Ionizing and non-ionizing are the two basic types of radiation. 29 CFR § 1910.1096, *Ionizing Radiation,* and AFMAN 48-148, *Ionizing Radiation Protection,* list requirements for working in an area with ionizing radiation. Non-ionizing radiation includes most radio frequency energy sources, light sources and lasers. Protection levels and requirements are outlined in AFI 48-139, *Laser and Optical Radiation Protection Program,* and AFI 48-109, *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health Program.*

2.2.2. Noise. Noise can cause hearing loss and/or prevent hearing of warning signals. Hazardous noise issues are common to industrial and outside work areas such as flightlines and maintenance areas, but should be uncommon in administrative work areas. Concerns with workplace noise levels, should be evaluated. The installation Bioenvironmental Engineer (BE), or joint base equivalent, conducts occupational environmental hazard risk assessments, then recommends appropriate engineering controls, administrative actions or PPE. Refer to AFI 48-127, *Occupational Noise and Hearing Conservation Program,* and 29 CFR § 1910.95, *Hearing Conversation Program,* for additional guidance.

2.2.3. Thermal Exposure. Refer to AFI 48-151, *Thermal Injury Prevention Program,* for guidance and information on thermal injuries and their prevention/treatment.

2.2.4. Inhalation. Inhalation of hazardous materials can cause acute (irritation, allergic reaction and/or damage the lungs and respiratory tract) and/or chronic (permanent damage, disease and cancer) health effects. Inhalation hazards need to be evaluated by BE to determine if respiratory protection is required. Refer to 29 CFR § 1910.134, *Respiratory Protection,* and AFI 48-137, *Respiratory Protection Program,* for guidance and information.

2.2.5. Chemical. Chemical hazards may exist in everyday products such as cleaning supplies, pesticides and paints. It may also include vapors and fumes from welding and brazing, solvents, and flammable or combustible liquids. Refer to 29 CFR § 1910.1200, *Hazard Communication,* AFI 90-821, *Hazard Communication (HAZCOM) Program,* and **Chapter 22** of this publication.

2.3. Jewelry. Jewelry, such as rings, watches, bracelets and necklaces, that presents a potential for catching, snagging, pulling or tearing shall be evaluated, controlled and restricted from wear if it presents a hazard to the employee or operation. **(T-1)**

2.3.1. Finger Rings. Personnel engaged in work in industrial areas, performing maintenance on aircraft, vehicles, equipment or machinery will not wear rings of any material type. **(T-0)** Personnel will comply with established safety precautions to prevent personal injury. **(T-0)** Rings shall not be worn while performing the following activities (this list is not all-inclusive):

2.3.1.1. Climbing, ascending or descending activities where personnel could fall or jump from elevated surfaces. **(T-0)** This includes personnel working on elevated surfaces, e.g., ladders, scaffolds, platforms, roofs, or high reach vehicles, e.g., refuelers, wreckers, sweepers, dump trucks and stake bed trucks.

2.3.1.2. Materials handling operations, e.g., warehousing, parts handling, operating equipment, packing and crating, and attaching/detaching equipment to tow vehicles. **(T-0)**

2.3.1.3. Any type of work where personnel are exposed to moving machinery, rotating or revolving parts, or activities that could result in their hands being caught by a moving part and injured. **(T-0)**

2.3.1.4. Performing work or inspection on or near energized electrical parts where contact could result in injury or damage to equipment. **(T-0)** Articles such as jewelry, earrings, rings, hair fasteners, bracelets, key chains or metallic ID (dog) tags with metal chains shall also be removed and metal framed eyeglasses shall be secured by a band or cord to prevent them from falling into energized electrical circuits or machinery. **(T-0) Note:** This prohibition includes conductive jewelry such as necklaces, bracelets, watches, etc. These items will permit inadvertent electrical current transfer to the worker.

2.3.1.5. Performing maintenance or inspections on aircraft or ground support equipment, including civil engineering-type or transportation-type maintenance where such activity could result in injury. **(T-0)**

2.3.1.6. Performing work on or around high temperature equipment where contact with these surfaces could result in injury. **(T-0)**

2.3.2. Eyewear. Metal eyeglasses shall be secured by a band or cord to prevent them from falling into energized electrical circuits or moving industrial machinery. **(T-1) Note:** It‘s best practice to wear nonmetallic eyeglasses and neck lanyards (e.g., ID cardholders) with a breakaway safety band, lanyard or cord to prevent them from falling into energized electrical circuits or moving industrial machinery.

2.3.3. Medic-Alert. Personnel that require identification for medical issues are permitted to don non-dangling/non-hazardous medical alert items, e.g., clasps, medical cards in hard hats, identification badge holders, to warn co-workers of potential medical issues. Supervisors shall ensure such items do not create hazards during worker’s assigned tasks. **(T-0)**

2.3.4. These restrictions do not apply to administrative and support personnel assigned office duties or visiting these areas, but not performing industrial work.

2.4. Housekeeping.

2.4.1. Floors and Walking Surfaces. Keep areas where personnel walk and work free of potential tripping and slipping hazards such as tools, electrical cords, air lines and packaging materials.

Clean up spills as soon as possible and post warnings until cleanup is complete. This includes sidewalks, parking lots etc. Facility managers shall promptly report potholes and uneven surfaces to CE. **(T-0)**

2.4.1.1. Facility managers will ensure removal of snow and ice from all facilities walkways, sidewalks, handicap ramps and work areas expediently where they may create a hazard or interfere with the work. **(T-0)** If ice cannot be readily removed, sand or other approved materials shall be applied. **(T-1)** Snow and icicles above walkways shall be removed by the unit or a work request shall be submitted for areas that cannot be reached. **(T-1)**

2.4.1.2. The supervisor will ensure telephone and electrical cords are placed where they do not pose tripping hazards. If placement in foot-traffic areas is unavoidable, cords and cables shall be properly protected by molded housings, bridges or other covers approved for such use to prevent tripping. **(T-0)**

2.4.1.3. Briefcases, wastebaskets, etc., shall be placed under desks, against a wall or otherwise out of the way. **(T-1)**

2.4.1.4. Repair or replace stair and floor defects, such as loose tiles, broken steps, torn carpeting, loose or curled mats, and worn, frayed or damaged anti-slip material on stairs or inadequate lighting.

2.4.1.5. Do not position a step stool or ladder in front of a door if the door can swing and contact the stool, ladder or individual using it. Station a guard at the door if a step stool or ladder must be placed in a doorway. **(T-1)**

2.4.2. Hazardous Materials and Waste. Refer to AFMAN 32-7002, *Environmental Compliance and Pollution Prevention,* for approved hazardous waste disposal procedures and guidance. Safety Data Sheets required for each hazardous chemical, in accordance with AFI 90-821, can assist with the proper identification of waste prior to being removed for disposal, especially for wastes generated as a result of unused and/or expired hazardous chemicals. The supervisor will ensure use or storage of flammable liquids shall be kept to a minimum and not exceed the maximum allowable quantities specified in **Chapter 22. (T-1)**

2.4.3. Packing Supplies and Recycled Materials. Non-soiled excelsior (fine wood shavings), straw, shredded paper, recyclable cardboard, recyclable paper and other packing/recyclable materials shall be stored in an isolated fire-resistant area and/or container. **(T-0).** Small supplies of packing materials, which are kept in shops for immediate use, shall be stored in metal or noncombustible covered containers. **(T-1)** Remove hazardous material markings and/or placards, protruding nails, brads and staples from crates, cases, packing boxes, casks, boards and lumber to prevent injury to personnel.

2.4.4. Electric Buffing Machines. Supervisors shall ensure electric buffing machines are equipped with under-voltage/overvoltage sensing and cutoff controls. **(T-1)**

2.4.5. Stacking Materials. Refer to Air Force Joint Manual (AFJMAN) 23-210, *Joint Service Manual (JSM) For Storage and Materials Handling,* for guidance on stacking materials. When materials are stacked to a height less than 15 feet, maintain an 18-inch clearance below ceiling sprinkler deflectors. If the stack is over 15 feet in height, increase the clearance to 36 inches (when only joists, rafters, beams and roof trusses exist, without a ceiling constructed below, a

36 inches clearance will also be required. **(T-1)** Position all stacks of materials to ensure an 18-inch clearance around light or heating fixtures, or follow the manufacturer‘s instructions, regardless of height.

2.4.6. Lighting Fixtures. The supervisor will ensure tubular light fixtures (fluorescent/light-emitting diode) without self-locking tubes shall have shields, clamps or other devices installed to keep the tubes from falling out of the fixture. **(T-1)**

2.4.7. Waste disposal containers in food handling environments shall be equipped with disposable liner material and emptied not less frequently than once each working day, unless unused. Containers shall be maintained in a clean and sanitary condition and sanitized at least once monthly. **(T-1)** All other waste containers shall be cleaned, as needed. **(T-1)** Exterior garbage cans shall be securely covered when not actually being filled or emptied. **(T-1)**

2.4.8. General Safe Practices. All areas, shops, yards, buildings and mobile equipment facilities/areas shall be maintained in a clean and orderly condition. **(T-0)** Supervisors and employees are responsible for good housekeeping in or around the work area they are supervising or working.

2.4.8.1. Do not place material where it creates a hazard for employees or visitors, by falling, being a trip hazard or causing the collapse of structures. **(T-0)**

2.4.8.2. Keep aisles and passageways clear of tripping hazards. **(T-0)**

2.4.8.3. Remove nails from loose lumber or the points turned down. **(T-0)**

2.4.8.4. Properly store tools and supplies. **(T-0)**

2.4.8.5. Do not block, obstruct or disconnect switches, distribution panels and alarm supply boxes preventing ready access. **(T-0)**

2.4.8.6. Stack wire reels with strips of wood between reels. **(T-0)**

2.4.8.7. Keep noncombustible materials neat and plainly marked, and in designated cabinets. **(T-1)**

2.4.8.8. Compressed Air. Compressed air shall not be used for cleaning purposes except where reduced to less than 30 psi, and only with effective chip guarding and PPE. **(T-0)** Follow TO, manufacturer’s instruction or local procedures as applicable. Ensure the nozzle discharge tip is a diffuser type. Compressed air shall not be used to blow chips or other debris from an employee’s body or clothing. Screens, barriers or protective cones attached to air nozzles shall be used to prevent flying chips and particles from striking the eyes and skin of the operator. **(T-0)** Compressed air used for tools and equipment shall follow TO, manufacturer’s instruction or local procedures, as applicable. **(T-1) Note:** Facility compressed air or air used from an air compressor should not be used on electrical equipment as it could allow small metal chips or air condensation to accumulate causing equipment malfunction. Canned compressed air should only be used on electrical components.

2.4.8.9. Machinery and equipment shall be kept clean of excess grease, oil and excessive dust. **(T-1)** Pressure gauges and visual displays shall be kept clean, visible and serviceable at all times. **(T-1)** Drip pans and wheeled or stationary containers shall be cleaned and emptied at the end of each shift. **(T-2)**

2.4.8.10. All work surfaces and floors shall be kept free of any visible accumulation of dust or any other foreign particles, as practicable. **(T-0)**

2.5. Office Safety.

2.5.1. General Office Equipment.

2.5.1.1. Chairs.

2.5.1.1.1. The supervisor or designated representative will inspect chairs regularly for broken casters or other defects. **(T-3)** New or replacement caster chairs shall have at least five (5) legs. **(T-1) Note:** Five (5) or more legged caster chairs are more stable and ergonomically sound than four (4) legged caster chairs.

2.5.1.1.2. Do not stand on a chair to change a light bulb, retrieve overhead items or when hanging pictures/decorations, etc. Use stepstools or ladders to access anything above shoulder level.

2.5.1.1.3. Do not tilt back, lean sideways or reach behind to lift objects while seated in a chair.

2.5.1.2. File Cabinets.

2.5.1.2.1. Store heavy material in bottom drawers and load cabinets from the bottom up.

2.5.1.2.2. Close drawers when not in use.

2.5.1.2.3. Do not climb on open file drawers.

2.5.1.3. Office Shelving/Bookcases. Store heaviest objects/books on lower-level shelves.

2.5.2. Electrical Equipment.

2.5.2.1. Appliance, electrical equipment and other office machines shall comply with 29 CFR 1910.334, *Use of Equipment.* **(T-0)**

2.5.2.2. Keep access to fuse or circuit breaker boxes or electrical controls clear and

unobstructed with panel doors closed to prevent electrical flashover if a malfunction occurs. Refer to NFPA 70, *National Electrical Code,* and **Chapter 8** for additional guidance on fuse and circuit breakers in the office area.

2.5.2.3. Modular office furniture electrical systems are normally designed only to provide power to office equipment, e.g., personal computers, monitors, printers. Refer to 29 CFR § 1910, Subpart S, *Electrical,* for additional guidance. Use of appliances for personal convenience, such as refrigerators, coffee makers, microwave ovens, will be requested through the facility manager prior to use to ensure the electrical system can safely accommodate the additional load. **(T-2)** Facility managers shall contact their installation Base Civil Engineer (BCE) when assistance is needed. **(T-2)**

2.5.3. Items that could present hazards, such as knives or razors, shall not be left unprotected in desk drawers, storage cabinets, on top of counters or desktops. **(T-1)**

2.5.4. Lighting. Consult the local civil engineering facility design section when specific guidance on lighting is required. Fluorescent light bulbs contain toxic materials and shall be managed in accordance with local hazardous waste disposal criteria. **(T-0)** Supervisors shall

ensure any stroboscopic effect with moving machinery is eliminated when using fluorescent lighting fixtures. **(T-1)** Work area lighting shall be installed to eliminate glare and harsh shadows. **(T-1)** Supplementary or additional lighting shall be provided where general lighting is not sufficient. **(T-1)**

2.5.5. Heating, ventilation and air conditioning systems shall be maintained and inspected by a trained HVAC system technician in accordance with American National Standards Institute/American Society of Heating, Refrigerating and Air Conditioning Engineers (ANSI/ASHRAE) 62.1, *Ventilation for Acceptable Indoor Air Quality.* **(T-1)** Filters shall be changed as needed, but minimum of once per year. **(T-1)** Do not cover air vents or obstruct air flow from registers. **(T-1)** Do not place furniture, equipment or materials where they interfere with air movement or thermostats. **(T-1)**

2.5.6. Elevators.

2.5.6.1. A certified inspector will inspect elevators annually. **(T-0)** Elevator inspection certification shall be posted in the cab of the elevator in view of all passengers or retained by the building manager and a permanent sign posted in the cab that identifies the location of the elevator certification. **(T-0)**

2.5.6.2. Elevators shall stop level with the floor when the doors open to prevent a tripping hazard. **(T-0)** Report elevator malfunctions immediately to the unit facility manager. Employees shall not try to stop elevators by placing a hand or foot in closing doors. **(T-0)** Employees shall not use elevators during emergency evacuation. **(T-0)**

2.5.6.3. Refer to UFC 3-490-06, *Elevators,* ASME A17.1, *Safety Code for Elevators and Escalators,* and ASME A17.2, *Guide for Inspection of Elevators, Escalators and Moving Walk,* for additional guidance on elevators.

2.5.7. Facility floors, especially raised floors, shall be kept smooth, clean and free of obstructions and slippery materials. **(T-0)**

2.5.8. Raised floor spaces shall be divided in the same manner as the equipment spaces above the area they serve. **(T-0)**

2.5.9. Raised floor spaces shall contain a standard or ultra-sensitive smoke detection system as required by UFC 3-600-01.**(T-0)**

2.5.10. Raised floor systems shall be constructed of noncombustible materials. **(T-0)**

2.5.11. Floors shall not be cleaned with flammable or combustible liquids. **(T-0)** Follow the manufacturer‘s instruction and safety data sheet (SDS) guidelines when using cleaning agents for floors and facilities.

2.5.12. To prevent buildup of trash and foreign objects, sub-floors under raised floors shall be cleaned periodically, but not less than once every 60 days. **(T-1)** Sub-floors shall be inspected once each operational day to ensure no flooding or leaking is present, unless the sub-floor area is provided with an automatic water leakage detection system. **(T-1) Note:** Any change in facility or room use requires reassessment of the cleaning schedule.

2.5.13. Utility trenches shall be kept clean of foreign objects and inspected at least every 60 days. **(T-1)** If cleaning history shows a longer period between cleanings is feasible, the F&ES

Flight may allow extending the time between cleanings. **Note:** Any change in facility or room use requires reassessment of the cleaning schedule.

2.6. Ergonomics. Ergonomics attempt to fit the job to the person, rather than forcing the person to fit the job. Adapting the job to the employee helps reduce stress and eliminates many potential injuries and disorders from overuse of muscles, poor posture and repetitive motion. Ergonomic hazards occur when the body may not be positioned correctly for a work task or working conditions put a strain on the body. They may include sore muscles, improperly adjusted workstations and/or chairs, poor posture, frequent lifting, vibration, repetitive motion or awkward movement. Contact the installation BE for questions relating to ergonomics or to have an ergonomic assessment completed. Refer to OSHA website: **https://www.osha.gov/SLTC/ergonomics/controlhazards.html** and the U.S. Army Public Health Center website: **https://phc.amedd.army.mil/topics/workplacehealth/ergo/Pages/default.aspx** for additional guidance.

2.7. Roll-up Doors. Roll-up doors shall be maintained in good operating condition with door tracks free of debris and obstructions to allow smooth operation. **(T-1)** Operators shall conduct a visual inspection of door path and track-way and correct any discrepancies before operating door. **(T-1)** Individuals shall remain clear of door path while door is in motion. **(T-1)**

2.7.1. Operators ensure auxiliary service roll-up doors, to include tow vehicle exit doors, meet the following requirements:

2.7.1.1. Be able to open a minimum of 8 feet or 70 percent of maximum opening height, whichever is greater. **(T-1)**

2.7.1.2. Powered roll-up doors equipped with one touch open or close buttons shall have a crush sensor on the bottom of the door installed and operational. **(T-1) Note:** Powered roll-up doors equipped with dead man switches do not require crush sensors.

2.7.1.3. Controls for the door shall be located so there is an unobstructed view during door operation. **(T-1)**

2.7.1.4. Open and close motion shall be no faster than nine (9) inches per second. **(T-1)**

2.7.1.5. Motion alarm will sound on the closing cycle of powered roll-up doors, unless equipped with a dead-man switch. **(T-1) Note:** This requirement does not affect powered roll-up doors installed prior to January 2016. However, this requirement must be met when the doors are modified or replaced. **(T-1)**

2.7.2. Prior to entering or exiting the hangar with a vehicle through these doors, vehicle drivers will sound their horn to alert personnel. **(T-0)**

2.8. Receiving/Loading Docks. Frequently used loading docks shall be located away from principal streets and intersections. **(T-0)** Vehicles parked at docks shall not block general vehicular traffic unless control devices, such as cones, barricades or warning signs are used to redirect traffic. Loading docks shall adhere to fall protection requirements in **paragraph 7.1.5.3**. **(T-1)**

2.8.1. Dock surfaces shall be smooth and even. **(T-0)** Where necessary, aisleways shall be marked. **(T-0).** Edges of docks shall be marked with four-inch wide yellow lines when there is a chance of employees falling. **(T-0)** Markings of physical hazards shall be in accordance with

29 CFR § 1910.144, *Safety Color Code for Marking Physical Hazards*. **(T-0)** Where the potential for serious injury exists, removable railings shall be used. **(T-1)**

2.8.2. The dock shall be at least two (2) feet wider than the widest vehicle or more common material being transported. **(T-0)** Additional clearance shall be provided to permit safe turns. **(T-0)**

2.8.3. Employees shall be instructed in proper handling techniques for the equipment and materials received. **(T-0)** Supervisors shall periodically evaluate and advise employees on proper lifting techniques. **(T-1)** The installation occupational safety office shall be consulted in the planning stages of new facility design to minimize material handling hazards. **(T-1)**

2.9. Walk-in Refrigerators and Freezers. A bypass or other type device shall be installed on the door of a walk-in refrigerator or freezer to permit escape from inside if an employee is locked inside. **(T-0)** An internally activated alarm bell shall be provided and tested weekly and documented. **(T-1)** If the bell is inoperable, it shall be replaced immediately. **(T-1)** When a door can be locked from the outside, e.g., with a hasp and padlock, a permanent sign stating, "Determine No One Is Inside Before Locking Door," shall be mounted on the door's exterior. **(T-1).** The letters shall be at least three (3) inches high. **(T-1)**

2.10. Manual Material Handling. Accomplish a hazard assessment to identify risks to employees or property and methods to mitigate these hazards, prior to moving equipment or furniture. **(T-1)** Some possible exposures to mishaps include, but are not limited to:

2.10.1. Movable or detachable parts, such as doors or drawers which must be secured properly prior to moving. **(T-1)**

2.10.2. Remove doors or drawers to lighten load and to prevent shifting or falling hazards.

2.10.3. Secure cords, communication cables or other gear attached to the item to prevent tripping or snagging hazards.

2.10.4. For large or difficult to handle items, secure the load to the hand-truck or dolly with a cargo strap or other fastening device.

2.10.5. Paths of travel must be evaluated for conditions such as slopes, carpeting or other irregularities to ensure safe movement of items. **(T-1)**

2.10.6. Ensure pathways are cleared and the object being moved will fit through doorways or other required openings. **(T-1)**

2.10.7. Use more than one person if moving the load up or down slopes or stairs. **Note:** Team lifting will be used when items are considered to be too heavy for one person or when items are lifted from an awkward position or location. **(T-1)**

2.10.8. Choose the proper sized and designed dolly for the job.

2.10.9. If the use of an elevator is required, the size and weight of the item and manufacturer's loading and weight limit requirements must be considered. **(T-1)**

2.10.10. Evaluate the need for PPE.

2.10.11. Follow the guidelines in **paragraph 2.6** for additional guidance on proper lifting.

2.11. 3D Printers.

2.11.1. Conduct JHA using manufacturer's instructions and filament safety data sheet to determine hazards and proper controls. **(T-1)**

2.11.1.1. Request installation occupational safety office assistance, as needed, in development of JHA.

2.11.1.2. Request installation BE assessment of 3D printing operations to ensure proper ventilation and PPE evaluation.

2.11.2. Supervisors will develop a job safety training outline (JSTO) and provide employees with specific work place hazards and relevant protective measures. **(T-3)** Refer to AFI 91-202 for additional guidance on JSTOs.

Chapter 3

WEATHER SAFETY

3.1. Responsibilities.

3.1.1. The supporting Air Force weather organization is responsible for making initial notification of adverse or mission-limiting weather conditions to predetermined support agencies. **Note:** Adverse or mission-limiting weather conditions include strong and damaging surface winds, heavy rain, thunderstorms, hail, snow and freezing precipitation.

3.1.2. Each DAF installation shall develop local procedures to ensure key personnel and agencies involved in weather-impacted high risk activities and operations are notified according to the installation weather support documents. **(T-1)** Examples include, but are not limited to, agencies with aircraft, petroleum/oil/lubricant (POL) facilities, opened air work, recreational activities, explosive loading, aircraft maintenance and utilities work. Key personnel, in turn, shall advise all on-duty supervisors and workers to take proper precautions. **(T-1)**

3.1.3. Each installation shall employ a lightning safety program with a two-tier notification system to minimize personnel exposure to lightning hazards. **(T-0)**

3.2. Two-tier Notification System.

3.2.1. A Lightning Watch is in effect 30 minutes prior to thunderstorms being within a 5 nautical mile radius of any predetermined location or activity as forecast by the supporting Air Force weather organization. Weather personnel will not cancel a Lightning Watch if the potential for thunderstorms remain within 5 nautical miles of the installation or activity within 30 minutes. **(T-1) Note:** During a Lightning Watch, non-explosive operations or activities may continue. However, all personnel must be prepared to implement Lightning Warning procedures without delay. **(T-1)** Be alert for any lightning activity, to include thunder, and advise supervisory personnel of any observations. If lightning does not occur within 5 nautical miles radius at the valid (forecast) time of the Lightning Watch, the supporting weather organization shall reassess the Lightning Watch and amend or cancel the watch as required in accordance with AFMAN 15-129. **(T-1)**

3.2.2. A Lightning Warning is in effect when lightning occurs within a five (5) nautical miles radius of the predetermined locations and activities. Personnel in affected locations or engaged in affected activities shall cease all outside activity and seek shelter. **(T-1)** Recommended locations that provide safe shelter and locations to avoid are listed in **paragraph 3.3** Lightning warnings shall be cancelled by the weather detachment or organization that initiated the warning. **(T-1)**

3.3. General Lightning Safety for all AF Activities and Operations. Note: This includes AF-led joint bases.

3.3.1. When lightning is detected or observed within the immediate vicinity of any activity or operation, do not go outdoors or remain out unless it is absolutely necessary. Seek shelter in:

3.3.1.1. Dwellings or other buildings that are protected against lightning.

3.3.1.2. Protected underground shelters.

3.3.1.3. Large metal framed buildings.

3.3.1.4. Enclosed automobiles, buses, aircraft and other vehicles with metal tops and bodies.

3.3.2. Certain locations are extremely hazardous during thunderstorms and the following locations shall be avoided:

3.3.2.1. Hilltops and ridges. **(T-1)**

3.3.2.2. Areas on top of buildings. **(T-1)**

3.3.2.3. Open fields, athletic fields, golf courses. **(T-1)**

3.3.2.4. Parking lots, tennis/outdoor multi-purpose athletic courts. **(T-1)**

3.3.2.5. Swimming pools (indoor and outdoor), lakes and seashores. **(T-1)**

3.3.2.6. Near wire fences, power and telephone poles, clotheslines, overhead wires, towers and railroad tracks. **(T-1)**

3.3.2.7. Under isolated trees. **(T-1)**

3.3.2.8. Near electrical appliances, telephones, plumbing fixtures and metal or electrically conductive objects. **(T-1)**

3.3.2.9. Aircraft dry bays, tanks and wheel wells. **(T-1)**

3.3.3. All aircraft fuel service maintenance activities, including liquid oxygen (LOX) servicing, shall cease whenever a Lightning Warning is in effect. **(T-0) Note:** Refer to AFI 23-201, *Fuels Management,* for additional guidance.

3.3.4. Locations with nuclear munitions will request notification of lightning within 10 miles of their location in accordance with DoDM 3150.02, *DoD Nuclear Weapon System Safety Program,* from their servicing weather unit. **(T-0)** Local procedures for these advisories are documented in DESR 6055.09_AFMAN 91-201, *Explosives Safety Standards.* **(T-0)**

Chapter 4

SERVICES OPERATIONS

4.1. Purpose. This chapter covers the safety requirements for services operations, e.g., laundry, lodging and food services. Refer to AFI 34-series publications for services operations requirements such as fitness centers, sport fields, rental equipment, bowling centers, auto hobby shops, etc.

4.2. Laundry. Laundry operations in the DAF applies to installation facilities including billeting laundries and laundry facilities in shops/workplaces. Medical Treatment Facilities laundries shall meet the requirements of NFPA 99, *Health Care Facilities Code,* and Joint Commission Accreditation Manuals. **(T-0)**

4.2.1. Supervisors shall conduct monthly inspections of laundries and dry cleaning facilities for hazards or deficiencies using a checklist containing requirements of this chapter and manufacturer's instructions, as required. **(T-2)** Copies of these inspections shall be maintained on file for a rolling year. **(T-2)**

4.2.2. Facility Requirements.

4.2.2.1. Laundries and dry cleaning plants shall have separate areas designated for receiving and issue. **(T-0)**

4.2.2.2. Facilities located more than three (3) to four (4) minutes from a medical facility must provide first aid kits. **(T-0) Note:** Remote location is defined as emergency care that is more than three to four minutes from the workplace.

4.2.3. The installation Fire Emergency Services (FES) Flight shall be immediately notified of any flammable solvent spills. **(T-0)** Contact BE and/or Environmental Management office for guidance on spill procedures.

4.2.4. Machinery producing potentially hazardous noise and/or vibration levels shall be identified and control measures initiated in accordance with BE's occupational and environmental health risk assessment guidance. **(T-0)**

4.2.5. Hazardous and flammable materials used in laundry and dry cleaning processes shall be stored in accordance with **Chapter 22. (T-0)**

4.2.6. Floors in dry-cleaning rooms shall be of fire-resistant construction with a noncombustible and solvent-resistant surface. **(T-0)**

4.3. Lodging.

4.3.1. Some lodging supply operations require forklift trucks. Refer to 29 CFR § 1910.178, *Powered Industrial Trucks,* AFMAN 24-306, *Operation of Air Force Government Motor Vehicles,* and **Chapter 12** for additional guidance.

4.3.2. Kitchen Cleaning.

4.3.2.1. As needed, grease shall be cleaned from burners and ranges to prevent fires. **(T-0)**

4.3.2.2. Unplug heat producing appliances such as irons and coffee makers prior to cleaning or when not in use. **(T-0)** Refer to **Chapter 6,** for additional guidance.

4.3.2.3. Microwave ovens shall be cleaned daily. **(T-0)** Microwave ovens with broken doors or latches shall be removed from service so personnel will not be exposed to microwave energy. **(T-0)**

4.4. Food Service Operations.

4.4.1. Walk-in Refrigerators and Freezers. Refer to **paragraph 2.9** for additional guidance.

4.4.2. Food Preparation Area.

4.4.2.1. Movable parts on equipment shall be properly guarded. **(T-0)** Refer to **Chapter 11** for additional guidance.

4.4.2.2. Knives and cutting attachments shall be safeguarded when not in use. **(T-0)**

4.4.2.3. Hoods and Ducting. Hood filters over grease vapor producing activities, e.g., deep fat fryers and grills, shall be washed at least daily. **(T-1)** Hood filters in other areas shall be washed at least weekly. **(T-1)** Ducting shall be cleaned as necessary but at least once every six (6) months. **(T-1)** Cleaning of filters and ducts shall be documented in accordance with local procedures. **(T-1)** Cooking shall not be permitted under hoods without properly installed filters or when the fire extinguishing system is not operating. **(T-1)** Exhaust hoods shall be vented outside the facility. **(T-1)** Refer to NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations,* for additional guidance. **Exception**: Cleaning of hood and exhaust ducts used for food service equipment may be extended to every two years if a dining facility prepares less than 10 meals per month.

4.4.3. Machinery/Equipment. Supervisors shall maintain manufacturer's instructions for all machinery or equipment under their control or develop local operating instructions (OI), to include job safety, maintenance, lubrication and inspection, and identify operator and maintenance technician responsibilities. **(T-1)** Supervisors may use manufacturer's instructions to develop (OIs) or lesson plans to train operators on requirements of specific machinery. Refer to 29 CFR § 1910.212, *General Requirements for All Machines,* and 29 CFR § 1910.263, *Bakery Equipment,* for additional guidance on machinery. Equipment connected by flexible cords, e.g., extension cords, shall be disconnected when not in use for extended periods of time or at the end of the work shift. **(T-1)**

4.4.4. Fire Prevention. Refer to **Chapter 6** and NFPA 96 for guidance and information on food service facilities.

Chapter 5

NONDESTRUCTIVE INSPECTION (NDI) AND OIL ANALYSIS

5.1. Scope.

5.1.1. Nondestructive Inspection (NDI). The purpose of nondestructive inspection is to employ inspection methods such as magnetic particle, eddy current, liquid fluorescent penetrant, ultrasonic and radiographic to detect cracks or flaws, measure geometric characteristics or determine material structure or composition of equipment. Refer to TO 33B-1-1, *Nondestructive Inspection Methods, Basic Theory,* for additional guidance.

5.1.2. Oil Analysis Program. The purpose of the oil analysis program is to measure and evaluate metal property results by interpreting oil analysis samples. Most samples are from engine oil on special or routine aeronautical flights, but may also include special and routine non-aeronautical equipment from other fluid lubricated mechanical systems, such as equipment from other Services. Refer to TO 33-1-37-1, *Joint Oil Analysis Program Manual,* for additional guidance.

5.2. Safety Precautions.

5.2.1. Ultraviolet Radiation. Unfiltered ultraviolet radiation can be harmful to the eyes and skin. Black light bulbs shall not be operated without proper lenses and/or filters. **(T-0)**

Black lights can severely burn hands, arms, face or other exposed body areas and ignite fuel vapors. Black lights shall not be operated when flammable vapors are present. **(T-0)**

5.2.2. Ionizing Radiation and X-ray Equipment. Refer to OSHA 1910.1096, *Ionizing Radiation,* DAFMAN 48-125, *Personnel Ionizing Radiation Dosimetry,* AFMAN 48-148 and 21 CFR § Parts 1020.30 through 1020.33 for additional guidance.

5.2.3. Electrical Safety. NDI equipment to be used in hazardous areas shall meet NFPA 70 requirements. **(T-0)**

5.2.4. Compressed Gases. Compressed gases commonly used in NDI and/or oil analysis program laboratories are nitrous oxide, acetylene and sulfur hexafluoride. Care and attention must be given to handling, storage, marking and disposition of all compressed gas cylinders. **(T-1)**

5.2.5. Housekeeping. Good housekeeping is essential to safe operations in the NDI and oil analysis program laboratories. Soiled rags, paper towels, craft paper and other trash contaminated with oil or grease shall be placed in self-closing metal containers plainly marked to indicate contents. **(T-1)** Refer to **paragraph 2.4** for additional guidance on housekeeping.

5.2.6. Ventilation Systems. Only basic guidelines for NDI and/or oil analysis program laboratory ventilation are provided in this publication.

5.2.6.1. Surface area exhaust ventilation evaluations shall be conducted at least annually. **(T-0)**

5.2.6.2. Ventilation evaluation frequency is determined by BE in the occupational and environmental health risk assessment. As a minimum, areas that may require an evaluation for adequate ventilation include cleaning areas, penetrant tanks, remover tanks, penetrant

inspection viewing booths, stationary magnetic particle units, film processing rooms and the oil analysis program work area. **Note:** For more details on permissible exposure limits, flow rate requirements and design criteria, refer to American Conference of Governmental Industrial Hygienists' *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance*, and AFI 48-145, *Occupational and Environmental Health Program.* Ventilation for oil analysis program spectrometers shall also comply with technical order and manufacturer's requirements. **(T-1)** Refer to BE's occupational and environmental health risk assessment for additional guidance.

5.3. Supervisor Responsibilities. Supervisors will:

5.3.1. Ensure personnel are properly trained on NDI and oil analysis procedures prior to being authorized to accomplish nondestructive inspection and oil analysis work. **(T-1)**

5.3.2. Ensure waste oil and cleaning rags do not accumulate in the oil analysis program lab. **(T-1)** Waste oil, not to exceed five (5) gallons, may be stored in the lab in an approved self-closing metal waste container. Waste cleaning rags and towels shall be removed from the lab at the end of each shift. **(T-1)**

5.4. Nondestructive Inspection Equipment and Fire Protection Systems. Contact the installation F&ES Flight prior to operating equipment which utilizes black lights, X-rays, ultraviolet and/or infrared rays. Some fire suppression systems are actuated by ultraviolet or infrared detectors and must be disabled, or other management actions taken, prior to using this NDI equipment to preclude actuation of the fire suppression systems. **(T-1)**

Chapter 6

FIRE PREVENTION AND PROTECTION

6.1. Fire Extinguishers.

6.1.1. Hazards. The maintenance and operation of portable fire extinguishers and fire suppression systems may involve exposure to toxic fire extinguishing agents and by-products of combustion. Fires produce toxic by-products of combustion, consume oxygen and produce high temperatures which create areas immediately dangerous to life and health (IDLH). It is important personnel receive training in the proper use of available portable fire extinguishers and fire education safety on preventing fires, protecting themselves and intervening early when fire occurs. Refer to 29 CFR § 1910.157(a) for additional guidance. Coordination and approval of installation fire services is required.

6.1.2. Inspections, Testing and Maintenance. Fire detection, suppression and alarm systems, including fire hydrants, are subject to failure unless inspection, test and maintenance programs are conducted in accordance with UFC 3-601-02, *Operations and Maintenance: Inspection, Testing, and Maintenance of Fire Protection Systems*. When a fire protection system is out of service follow procedures in accordance with AFI 32-10141, *Planning and Programming Fire Safety Deficiency Correction Projects.* **(T-1)**

6.2. General Requirements.

6.2.1. Facility Managers/Supervisors shall:

6.2.1.1. Establish and maintain a fire prevention training program via the Job Safety Training Outline to ensure employees are trained and understand their fire prevention and protection responsibilities in their work areas in accordance with 29 CFR § 1910.157, *Portable Fire Extinguishers.* **(T-0)** This requirement shall be fulfilled through the job safety training and documentation process in accordance with AFI 91-202. **(T-3)**

6.2.1.2. If further guidance is required, consult the installation Flight and Emergency Services (F&ES) Flight. **(T-1) Note:** Building evacuation procedures in Services facilities may be practiced without actual participation of patrons, with the prior approval of the installation F&ES Flight Chief.

6.2.1.3. Make sure the facility is in a fire-safe condition at the close of business. **(T-1)**

6.2.1.4. Conduct and document daily closing inspections. **(T-3)**

6.2.1.5. Coordinate approval with the installation F&ES Flight concerning all social events when temporary decorations or unusual arrangements are anticipated. **(T-1)**

6.2.1.6. Emergency Lighting. Emergency lighting shall be provided in accordance with NFPA 101. **(T-0)**

6.2.2. Server rooms, e.g., information technology or data management rooms, located below floors equipped with water sprinkler systems are susceptible to water damage if the sprinkler systems are actuated. Managers shall provide a means of protecting data processing equipment in the event of a water leak or sprinkler activation (time permitting). **(T-0)** This may be accomplished by strategically locating pre-cut pieces of plastic sheeting within server rooms. In the event of a water leak or spill, equipment shall be shut down before it is covered with the

plastic sheeting. **(T-0)** This will reduce the possibility of the equipment overheating and catching on fire. The plastic sheeting shall be removed before restarting equipment. **(T-0)**

6.2.3. A survey of each server room by the installation BCE shall be requested to determine if a water hazard exists. **(T-1)** The building custodian shall keep the completed survey on file and brief incoming personnel during initial safety orientation. **(T-1)**

6.2.4. Commercial Food Service Facilities. Commercial food service facilities shall be maintained as required to prevent the loss of DAF resources. **(T-1)** The installation F&ES Flight shall inspect grease and heat removal hoods, ducts and exhausts at all food service facilities. **(T-1)** The FES inspection time and the contractor cleaning frequency shall be approved by the installation fire chief. **(T-1)** The unit commander will appoint in writing a Quality Assurance Evaluator for cleaning, maintenance and testing conducted under a service contract. **(T-3)** The Quality Assurance Evaluator function is usually accomplished by the facility manager. **(T-3)**

6.2.5. Health Care Facilities. Facility managers and/or safety officers of health care occupancies shall have in effect a written fire plan that addresses appropriate staff response to a fire emergency and appropriate education and training for all elements of the fire plan. **(T-2)** The plan will address facility-wide needs in response to fire, area-specific needs for all areas, training for all staff, employees and volunteers, and appropriate training for other non-staff personnel required to participate in the fire plan. **(T-2)** The installation fire chief or designee shall approve the fire plan. **(T-3)**

6.2.6. Portable Fire Extinguishers.

6.2.6.1. Fire Emergency Services (FES) Flight. The installation F&ES Flight manages the installation fire extinguisher program and is the authority for all matters involving fire extinguishers. The F&ES Flight shall provide facility managers information on facility fire extinguisher requirements outlined in NFPA standards and as required by UFC 3-600-01. **(T-1)**

6.2.6.2. Extinguishers are not normally provided for military family housing. Should MAJCOMs, FLDCOMs, DRUs or FOAs direct installation of extinguishers in military family housing, procedures shall be developed to ensure occupants are trained in their use and extinguishers are maintained. **(T-3)**

6.2.6.3. Fire Extinguisher Location. The installation F&ES Flight shall approve the location of all fire extinguishers. **(T-3)**

6.2.6.4. Fire Extinguisher Purchase and Maintenance. Facility managers and using organizations shall budget for purchase and maintenance of fire extinguishers. **(T-3) Note:** Not applicable to flightline fire extinguishers.

6.2.6.5. All fire extinguishers shall meet the requirements of NFPA 10, *Standard for Portable Fire Extinguisher*. **(T-1) Note:** This includes flightline fire extinguishers.

6.2.6.6. Worker Responsibilities. All employees are responsible for fire extinguishers in their work areas. Employees shall ensure fire extinguishers are readily accessible with unobstructed access and are used only for the intended purpose. **(T-0)** F&ES Flights shall be notified of any fire extinguisher discharge, accidental or intentional. **(T-3)**

6.2.6.7. Supervisor Responsibilities. Supervisors are responsible for fire extinguishers in areas under their control. Supervisors shall:

6.2.6.7.1. Perform visual inspections of fire extinguishers. **(T-0)**

6.2.6.7.2. Take defective extinguishers to an authorized servicing location, as determined locally and coordinated with the installation F&ES Flight, for services. **(T-0)** Fire extinguishers removed from service shall be immediately replaced. **(T-1)**

6.2.6.7.3. Mount fire extinguishers in or on vehicles or equipment in approved brackets, or otherwise secure them, to prevent damage as directed by TO or other directive. **(T-0) Note:** Vehicle fire extinguishers shall only be purchased with the approval of Vehicle Management to ensure the vehicle technical orders and AFIs require the vehicle to carry fire extinguishers. **(T-1)**

6.2.6.8. Visual Inspection. Managers and supervisors at all levels shall ensure a visual inspection is performed and documented monthly for all fire extinguishers under their control. **(T-0)** Extinguishers with discrepancies shall be removed from service until repaired. **(T-0)** This inspection includes:

6.2.6.8.1. Extinguisher located in a designated place.

6.2.6.8.2. No obstruction to access or visibility.

6.2.6.8.3. OIs on name plate legible and facing outward.

6.2.6.8.4. Safety seals and/or tamper indicators not broken or missing.

6.2.6.8.5. No obvious physical damage, corrosion, leakage or clogged nozzle.

6.2.6.8.6. Pressure gauge reading or indicator in the operable range or position.

6.2.6.8.7. For wheeled units, the condition of the tires, wheels, carriage, hose and nozzle checked.

6.2.6.8.8. Fullness determined by weighing or “hefting.”

6.2.7. Space Heaters.

6.2.7.1. Use Nationally Recognized Testing Laboratory (NRTL)-listed or host nation equivalent space heaters equipped with automatic shutoff devices that will shut off the heater if it tips over. Space heaters shall also have an overheat protection device, an automatic thermostat control and must be disconnected when not in use. **(T-3) Note:** Space heaters shall not be used without the approval of the installation energy manager. **(T-3)** Refer to the installation energy management program for additional local guidance. For a current list of OSHA-recognized NRTLs, visit **https://www.osha.gov/dts/otpca/nrtl/nrtllist.html**.

6.2.7.2. Plug space heaters directly into a wall receptacle. Do not plug space heaters into extension cords or multiple outlet strips. **(T-3)**

6.2.7.3. Maintain a 36 inch minimum distance or in accordance with manufacturer’s instructions between any space heater and combustibles. **Note:** The more restrictive of the guidance will apply. **(T-3)**

6.2.7.4. Do not leave these devices unattended when in use and unplug them at the end of the day or shift. **(T-3)**

6.2.7.5. The use of space heaters in any hazardous location as defined by NFPA 70, *National Electric Code*, is prohibited. **(T-1)**

6.2.8. Coffee Makers.

6.2.8.1. Keep coffee makers and the area around them free of paper products and other loose combustibles. **(T-1)**

6.2.8.2. Follow manufacturer's instructions and consult with facility manager prior to placement of coffee makers.

6.2.8.3. Unplug coffee makers at the end of the day. **Note:** Coffee makers/machines with integral timers and single serve coffee makers do not need to be unplugged, e.g., Bunn-type coffee brewers and Keurig.

6.2.9. Heating Systems.

6.2.9.1. Heating devices, such as furnaces or heaters, must be kept clear of combustible and flammable material. **(T-3)**

6.2.9.2. All heating, boiler, air conditioning, air handling and mechanical rooms shall be secured. **(T-0)** Only the installation F&ES Flight, Civil Engineer (CE) or authorized personnel shall have access to these areas. **(T-3)**

6.2.10. Decorations.

6.2.10.1. Electric string lights and wiring on an OSHA-recognized NRTL list is authorized. **(T-0)**

6.2.10.2. Unplug all electrical decorations when work area is unoccupied. **(T-3)**

6.2.10.3. Decorations shall be noncombustible or fire retardant. Use of an open flame is prohibited. **(T-3)**

6.2.11. Fire Alarm Systems. Supervisors shall ensure all personnel are familiar with the fire alarm systems, know how to report an emergency and how to activate the fire alarm system. **(T-0)** At no time shall a fire detection, suppression or alarm system or device be painted, blocked or obstructed in any manner. **(T-3)**

6.2.12. Emergency Evacuation Procedures.

6.2.12.1. Supervisors shall establish an emergency action plan. **(T-0) Note:** Employees shall know primary and secondary escape routes for every area of the building. **(T-1)**

6.2.12.2. Consult the installation F&ES Flight to determine requirements for practicing fire evacuation drills. Facility Managers ensure new personnel are trained in evacuation procedures. **(T-3)**

6.2.12.3. Personnel shall immediately evacuate the building whenever the fire alarm activates, unless otherwise provided for in an approved building fire evacuation plan or when non-evacuation testing or maintenance is being conducted on the fire alarm system. **(T-3)** Installation commanders may approve in writing, with coordination from the installation occupational safety office and F&ES Flight, any combat ready positions

authorized to remain in their work center during fire alarm activation. Upon direction of the senior fire official, all personnel shall immediately evacuate to include those combat mission ready positions. **(T-3) Note:** Command post and/or job control personnel are not considered combat mission ready.

6.2.12.4. Do not use elevators during evacuation; use the stairs. **(T-1)**

6.2.12.5. Establish a predetermined area for personnel to gather after evacuation so personnel can be accounted for. **(T-3)**

6.2.12.6. Appoint Emergency Action Procedures representatives to account for personnel at the predetermined meeting area. **(T-3)** This will help emergency response personnel determine who may still be in the building. At least two representatives per section shall be appointed; in case the primary leader is not in the building at the time of the emergency or is unable to evacuate the building, the alternate can fill in. **(T-3)** Sections with many personnel (20 or more) in their allocated space may require additional representatives. **(T-3)**

6.2.12.7. Assign workers to assist people in wheelchairs or anyone else who would have difficulty descending stairs on their own. Also, ensure people with hearing or sight problems know they are to evacuate. Assign someone to help them evacuate and report to the designated meeting area, if necessary.

Chapter 7

WALKING – WORKING SURFACES

7.1. General Requirements. Obstacles in walk areas, liquid spills, sawdust accumulations and the use of slippery surface cleaners can cause slipping hazards and shall be cleaned up immediately to prevent slips, falls and injuries. **(T-0)** Refer to 29 CFR § 1910, Subpart D – *Walking-Working Surfaces,* for definition and additional guidance.

7.1.1. All walking-working surfaces shall be maintained in a clean and dry condition as much as possible. **(T-0)** Drip or oil pans shall be used whenever the possibility of spilling or dripping exists. **(T-0)** Where wet processes are used, drainage shall be maintained and false floors, platforms, mats, or other dry standing places should be provided where practicable. **(T-0)** If floor drains are present, floors shall be sloped to allow liquids to naturally flow to the drains. **(T-0)** Drains shall be kept clear to prevent clogging, especially when hazardous or contaminated materials are present. **(T-0)** In locations where wet processes do not normally occur, and drains are not available, wet areas shall be clearly marked (e.g., wet floor signage) and immediately cleaned up and dried before permitting other personnel to enter the area. **(T-0)** Protective footwear for wet slippery surfaces shall be provided where appropriate. **(T-1)**

7.1.2. Condition. Floors, aisles, and passageways shall be kept clear and in good repair, with no obstructions, free of defects that can endanger employees or interfere with handling of materials, or hinder people leaving during emergencies. **(T-0)** Refer to 29 CFR § 1910.22, *General Requirements-Walking Working Surfaces*, for additional information.

7.1.3. Illumination. Control of light is important to prevent glare and harsh shadows. Soft shadows are usually acceptable, but harsh shadows should be avoided since they may obscure hazards or interfere with visibility. Supplementary lighting or additional lighting shall be provided where general lighting is not sufficient. **(T-1)** Facility managers shall ensure lighting is sufficient for walking surfaces in their work/facility area and that obstacles are visible. **(T-0)**

7.1.3.1. Consult the installation BCE facility design section whenever specific guidance on lighting is required. Some work may require increased illumination. Submit a work request when a lighting survey is required. If the safety of personnel is a factor, the work request shall be coordinated with the installation occupational safety office, who may assign a Risk Assessment Code, if warranted. **(T-1)**

7.1.3.2. All fluorescent light bulbs contain toxic materials and shall be managed in accordance with local disposal criteria for hazardous waste. **(T-0)** Consult with the installation Environmental Management Office on disposal guidance for hazardous waste materials. When fluorescent lighting fixtures are used, supervisors shall ensure any stroboscopic effect with moving machinery is avoided. **(T-1)**

7.1.4. Guards for Floor and Wall Openings. Every floor opening, such as a hatchway, chute, pit, trap door, manhole and ladderway, shall be guarded. **(T-0) Note:** Manholes shall comply with 29 CFR § 1910.24, *Step Bolts and Manhole Steps*. **(T-0)** The type of guard used depends on the location, reason for the opening and frequency of use. Refer to 29 CFR § 1910.28, *Duty to Have Fall Protection and Falling Object Protection,* for additional guidance. One of the following guards shall be installed:

7.1.4.1. Standard Railings and Toeboards. **(T-0)**

7.1.4.1.1. Railings and toeboards shall be permanently attached leaving only one exposed side, which shall have a removable railing. **(T-0)** When the exposed side is not in use, the railing shall be left in place. **(T-0)** Refer to 29 CFR § 1910.28 for specific detail on construction and installation.

7.1.4.1.2. Toeboards are required wherever falling objects may present a hazard. **(T-0)** Toeboards can be constructed of any 4-inch high rigid material, either solid or with openings not greater than 1 inch. They shall be securely fastened in place with not more than one-fourth inch clearance from the floor except at the entrance of the opening. **(T-0)** Toeboards must be capable of withstanding, without failure, a force of at least 50 pounds (222 N) applied in any downward or outward direction an any point along the toeboard. **(T-0)** Refer to 29 CFR § 1910.29 for additional information.

7.1.4.2. Floor Opening Cover. A cover shall be used for less frequently used openings where traffic across the opening prevents the use of fixed railings, such as openings located in aisle spaces. **(T-0)** In addition, covers or guards shall be used to protect people from the hazards of open pits, tanks, vats, ditches, etc. **(T-0)** Refer to 29 CFR § 1910.29, *Fall Protection Systems and Falling Object Protection-Criteria and Practices,* for additional requirements.

7.1.5. Guards.

7.1.5.1. Every stairway and ladderway opening shall be guarded by standard railings and toeboards on all open sides, except at the entrance of the opening. **(T-0)** If there is danger of a person walking straight into the opening, a swinging gate or offset passage shall be used. **(T-0)**

7.1.5.2. Every covered opening in a surface, such as a skylight floor opening, shall be guarded by a skylight screen or standard railing with toeboards on all exposed sides. **(T-0)** Skylight screen grillwork or slatwork shall be capable of withstanding a load of at least 200 pounds applied at any area of the screen. **(T-0)** Refer to 29 CFR § 1910.28 for additional information.

7.1.5.3. All open-sided floors, platforms and runways four (4) feet or more above the ground or floor shall be guarded by a standard railing on all open sides, except at ramp entrance to a ramp, stairway or fixed ladder. **(T-0)** Collapsible or removable railings may be installed on a runway, but shall only be removed when a special task (such as oiling, shafting or filling tank cars) is being performed and other protective measures, approved by the installation occupational safety office, are used. **(T-0)** Railings shall be reinstalled when the task is complete. **(T-0)**

7.1.5.4. Every permanent or temporary wall opening (to include windows) less than 39 inches above the floor (where there is a four [4] foot or more drop) shall be protected from falling by use of: guardrail system, safety net system, travel restraint systems or personal fall arrest systems. **(T-0)** If a guardrail system is used, the guard may be removable, but shall be installed when the opening is not in use. **(T-0)** A toeboard shall be installed when falling materials may present a hazard. **(T-0)** Refer to 29 CFR § 1910.28 for additional information.

7.1.5.5. Guard railings shall consist of securely mounted top rails, intermediate rails and posts. **(T-0)** The vertical height shall be 42 inches, plus or minus 3 inches, from the upper

surface of the top rail to the floor, platform, runway or ramp level. **(T-0) (Exception**: Guard railings in place constructed prior to 26 October 2016 shall consist of a top rail, intermediate rail and posts, or equivalent, and shall have a minimum vertical height of 36 to 44 inches from the upper surface of the top rail to the floor, platform, runway or ramp level. **[T-0])** Heights greater than 45 inches are permissible, provided the guard rail system meets all criteria of 29 CFR § 1910.29(b).

7.1.5.5.1. Top rails must be capable of withstanding, without failure, a force of at least 200 pounds (890 N) applied in any downward or outward direction at any point along the top rail. **(T-0)** When a 200 pound test is applied in a downward direction, the top rail must not deflect to a height of less than 39 inches (99 cm) above the walking-working surface. **(T-0)**

7.1.5.5.2. Midrails must be capable of withstanding, without failure, a force of at least 150 pounds (667 N) applied in any downward or outward direction at any point along the toprail. **(T-0)**

7.1.6. Coefficient of Friction of Walking and Working Surfaces. The finished surface shall have a coefficient of friction of at least 0.5 for level surfaces and 0.8 for sloped surfaces, as measured using ANSI/American Society of Safety Professionals (ASSP) A1264.2, *Provision of Slip Resistance on Walking/Working Surfaces*, or other adopted nationally recognized standards. **(T-1)** Consult the installation BCE when coefficient of friction guidance for a specific work surface is required or needs to be determined. **(T-1)** This requirement applies to all types of floors and other walking/working surfaces, including vinyl, tile, wood, carpet, steel, concrete, etc., and any coatings or surface treatment used on them.

7.1.7. Coatings includes painted and unpainted walking and working surfaces and shall exhibit anti-skid properties to reduce the risk of employee slips and falls. **(T-0)** The purchaser shall verify anti-skid properties with coating manufacturer or supplier before purchasing. **(T-0)**

7.1.8. Interior Walking and Working Surfaces.

7.1.8.1. Layout. All interior walking and working surfaces that are part of the means of egress shall comply with UFC 3-600-01 and NFPA 101. **(T-0)**

7.1.8.1.1. Equipment and machinery shall be arranged to permit an even flow of materials. **(T-1)**

7.1.8.1.1.1. Sufficient space shall be provided to handle the material with the least possible interference from or to employees or other work being performed. **(T-1)**

7.1.8.1.1.2. Machines shall be placed so it will not be necessary for an operator to stand in a passageway, aisle or exit access. **(T-0)**

7.1.8.1.1.3. Machine positioning shall allow for easy maintenance, cleaning and removal of scrap. **(T-1)**

7.1.8.1.1.4. After the initial positioning of equipment and machines is decided, clear zones (workspaces) of sufficient dimensions to accommodate typical work shall be established. **(T-1)**

7.1.8.1.1.5. If material exceeds established clear zones, rope and stanchions may be used to temporarily extend the workspace.

7.1.8.1.1.6. The supervisor shall consult with the installation occupational safety office as needed to determine the need to mark clear zones based upon hazard potential. **(T-1)**

7.1.8.1.1.7. Yellow or yellow-and-black hash-marked lines, two (2) to three (3) inches wide, shall be used when marking is necessary. **(T-1)**

7.1.8.1.2. Passageways, aisles and exit accesses shall be provided to permit free movement of employees and material, and shall be independent of clear zones and storage spaces and shall be clearly recognizable. **(T-0)** Markings shall be used unless impractical. **(T-0)** Floor markings shall provide a contrast to the floor color, such as yellow lines two (2) to three (3) inches wide on a gray floor. **(T-0)**

7.1.8.1.3. Where powered materials handling equipment (lift truck, etc.) is used, facility layout shall provide enough clearance in aisles, loading docks and through doorways to permit safe turns. **(T-0)** Obstructions that could create hazards shall not be permitted in aisles. **(T-0)** Aisles shall be at least two (2) feet wider than the widest vehicle used or most common material being transported. **(T-0)** Refer to 29 CFR § 1910.176, *Handling Materials—General*, for additional information.

7.1.8.1.4. Aisles shall be at least 36 inches wide to permit free movement of workers, equipment and supplies. **(T-0)** A minimum of 18 inches shall be provided for passageways formed by or between movable obstructions. **(T-0)** Refer to NFPA 101 and UFC 3-600-01 for additional information.

7.1.8.1.5. Sufficient access and working space shall be provided and maintained around all electrical equipment. **(T-0)** Refer to 29 CFR § 1910.303, *General (Electrical)*, for additional information.

7.1.8.2. Condition.

7.1.8.2.1. Floors shall not be cleaned with flammable liquids. **(T-0)** In accordance with AFMAN 32-7002, floor cleaning chemicals not currently loaded in the standardized Air Force Hazardous Material (HAZMAT) tracking system must be approved by the installation Hazardous Materials Management Program Team prior to use. **(T-2)** Adequate ventilation shall be provided and/or respiratory protection may be required. **(T-0)** Combustible or explosive dust shall be eliminated at the source. **(T-0)** If this is not possible, it shall be minimized during sweeping by spreading a noncombustible sweeping compound over the floor. **(T-0)**

7.1.8.2.2. After floors have been properly cleaned, nonskid finishing compounds may be used. In some locations, such as electroplating shops, finishing compounds shall not be applied if there is a possibility of a reaction with shop chemicals. **(T-0)**

7.1.8.2.3. When floors are being cleaned or finishing compounds applied, signs shall be posted to warn employees of a slipping hazard and shall remain in place until floors have dried. **(T-0)** The size and placement of these signs shall be at the discretion of the supervisor, but shall be visible to those entering the hazardous area. **(T-0)** Refer to **Chapter 17** for additional information on safety, fire prevention and health signs.

7.1.8.2.4. Loading Capacity. Supervisors shall ensure equipment weight and distribution comply with maximum floor loading capacity for all above grade storage

areas (including areas above basements). **(T-0)** The weights of equipment, such as hoists suspended under a floor, shall also be considered when determining floor loading capacity. **(T-0)** The supervisor shall have signs that identify the floor load capacity determined by the installation BCE permanently installed in plain view of all employees. **(T-0)** CE shall approve the installation of all equipment weighing more than 500 pounds in any multi-story building. **(T-1)** Supervisors shall ensure heavy loads are evenly distributed according to the floor's safe load limit. **(T-0)** Refer to 29 CFR § 1910.22. for additional information.

7.1.9. Exterior Walking and Working Surfaces. The proper layout and condition of exterior surfaces is important to the safe and efficient movement of people and equipment. The placement of walkways and parking areas is controlled by the installation BCE.

7.1.9.1. Parking Lots. The parking lots shall be smooth, have good drainage and be free of pedestrian tripping hazards. **(T-0)** Walkways shall be provided. **(T-0)** Entrances and exits shall not have obstructions that block a driver's or pedestrian's view of traffic. **(T-0)** Supervisors should contact the installation occupational safety office and CE for more detailed information. Specifications for signs are contained in UFC 3-120-01, *Design: Sign Standards.*

7.1.9.2. Walkways. Lighting shall be used to highlight hazards. **(T-0)** When loose gravel or crushed rock is used for surfacing, the largest dimensions of material used shall not exceed one-half of an inch. **(T-0)** Motorized vehicles shall not be operated over elevated walkways unless the load bearing capacity of the walkway will support the vehicle's weight. **(T-0)** Broken, uneven or cracked surfaces, which might reasonably present a hazard, shall be repaired. **(T-0)**

7.1.9.3. Grounds. All grounds adjacent to work areas shall be kept free of hazardous materials, trash, weeds, unguarded pits, openings or obstacles. **(T-0)**

7.1.9.3.1. Materials shall not be stored, left under or piled against buildings, doors, exits or stairways. **(T-0)**

7.1.9.3.2. Poisonous or toxic plants shall not be used for landscaping without prior approval of the installation medical services. **(T-0)** Weeds shall not be permitted to grow excessively or to accumulate. **(T-0)** Trees and bushes adjacent to walkways shall be trimmed to permit a clear path for pedestrians. **(T-0)**

7.1.9.3.3. All open drainage ditches that present a hazard shall be clearly identified in the daytime, guarded by fences or barriers and illuminated or marked with warning flashers at night. **(T-0)**

7.1.9.4. Construction. All construction work shall be clearly identified by signs that can be read from at least 50 feet, in addition to barriers marked with night reflective materials. **(T-0)** Illumination or warning flashers shall also be used after dark. **(T-0)**

7.1.9.5. Vehicle Repair, Service and Assembly Pits. The use of a fall protection system is not required for those work pits that are less than 10 feet deep provided that:

7.1.9.5.1. Access to pit is marked and limited within six (6) feet of the edge to authorized and trained employees only in accordance with 29 CFR § 1910.30, *Training*

Requirements. **Note:** Color use for floor marking must contrast with the surrounding area.

7.1.9.5.2. If floor markings are not feasible, physical stanchions (capable of resisting, without tipping over, a force of at least 16 pounds applied horizontally against the stanchion and a height of 30 inches) may be used and positioned six (6) feet from the edge of the pit. **Note:** The use of stanchions and markings may be combined, where applicable.

7.1.9.5.3. When two or more pits in a common area are not more than 15 feet apart, compliance may occur by placing contrasting floor markings at least six (6) feet from the pit edge around the entire area of the pits. Caution signs will be visible and posted, and meet the requirements of 29 CFR § 1910.145, *Specifications for Accident Prevention Signs and Tags*, and state CAUTION—OPEN PIT. **(T-0)**

7.2. Stairs and Ramps Requirements. Note: Egress components, such as stairs, ramps, guard rails or hand rails, constructed to any 1970 or newer edition of NFPA 101 are acceptable. The selection of a particular type of stairway or ramp is dependent upon the location, intended use and existing environmental conditions, and is normally performed by the installation BCE with recommendations from the installation occupational safety office and F&ES Flight. In addition to the below criteria, see NFPA 101, UFC 3-600-01, 29 CFR § 1910.28 and 29 CFR § 1910.25, *Stairways.*

7.2.1. Design Consideration. Stairway and ramp designs may have been based on prior use of a facility, whereas current use may dictate modifications or replacement of components. This could include changing the width, angle of rise, length and vertical clearance, as well as increasing load bearing capacity, inclusion of railings or enclosing open risers.

7.2.2. Strength. Stairs and fixed ramps shall be designed and built to carry a load of 5 times the normal live load anticipated but not less than a moving concentrated load of 1,000 pounds. **(T-0)**

7.2.3. Width. Stairs, if part of the exit access, shall have a minimum width of 36 inches if the occupant load of the building or structure is less than 50 persons. **(T-0)** If the occupant load is greater than 50, the minimum stair width is 44 inches. Fixed ramps, if part of the exit access, shall have a minimum width of 44 inches. **(T-0)** The authority having jurisdiction may reduce this requirement to 30 inches, with the concurrence of the Designated Fire Protection Engineer (DFPE) per UFC 3-600-01. For ramps or stairs not part of the exit access, a minimum width of 22 inches shall be provided. **(T-0)**

7.2.4. Angle of Rise. Stairs shall be installed at angles to the horizontal of 30 to 50 degrees. **(T-0)** For stairs constructed or installed after 17 January 2017, a maximum riser height of 9.5 inches, minimum tread depth of 9.5 inches and a minimum width of 22 inches between vertical barriers is required. Stairs constructed/installed prior to 17 January 2017 are in compliance if they meet the requirements of 29 CFR § 1910.25, Table D-1. Tread depth and riser height must be consistent throughout a new facility. **(T-0)** Tread depth and riser heights must also be consistent throughout a staircase. **(T-0)** Where the slope is less than 30 degrees, a ramp with a non-slip surface shall be installed. **(T-0)**

7.2.5. Ramps. Ramps not part of the exit access shall follow guidance in NFPA 101. For ramps that are part of the exit access, a maximum slope of 1 to 8 inches for existing ramps and 1 to 12 for new ramps is allowed.

7.2.6. Width of Landings. Landings and platforms not part of the exit access shall not be less than the width of the stairs and a minimum of 30 inches in length, measured in the direction of travel. **(T-0)** When doors or gates open directly onto a stairway, they shall not reduce the available width of the landing to less than 20 inches for platforms installed before 17 January 2017, and less than 22 inches for platforms installed on or after 17 January 2017. **(T-0)** Landings in stairs or ramps that are part of the exit access shall meet the requirements of NFPA 101. **(T-0)**

7.2.7. Vertical Clearance. Where there is less than six (6) feet, eight (8) inches of headroom over stairs, obstructions shall be padded. **(T-0)** When they cannot be padded, obstructions shall be color coded yellow or yellow-and-black stripes to highlight the hazards. **(T-0)** In all cases, caution signs shall be used to warn people of low clearances. **(T-0)**

7.2.8. Treads. All treads shall be slip-resistant and free of projections or lips that could cause a tripping hazard. **(T-0)**

7.2.9. Grating. Open grating type treads are desirable for stairs which are not enclosed. The use of open treads prevents the buildup of rainwater and snow on the tread surface.

7.2.10. Sidewalk Ramps. Sidewalk ramps shall be installed where equipment, such as housekeeping carts or hand trucks, are used. **(T-0)**

7.2.11. Stair Railings and Guards. Every flight of stairs with four (4) or more risers shall have standard guardrails or standard handrails as called for in 29 CFR § 1910.25. **(T-0)** The width of the stair shall be measured clear of all obstructions except handrails. **(T-0)**

7.2.12. Illumination. Stairs and ramps shall be lighted so all treads and landings are visible. **(T-0)** Consult the local CE facility design section whenever specific guidance on lighting is required.

7.2.13. Inclined Ladders. Some DAF facilities have permanent stairways installed which exceed a 50-degree angle. These stairways are commonly referred to as inclined ladders. Where an inclined ladder has been installed, it shall have handrails on both sides and open risers. **(T-0)** Construction or installation after 17 January 2017 shall have stairs installed within the range of 30-50 degrees. **(T-0)**

7.2.14. Maintenance. Stairs and ramps shall be kept clean, free of obstructions or slippery substances, and in good repair at all times. **(T-0)** Supervisors will ensure:

7.2.14.1. Loose boards, insecure treads, protruding nails and torn or worn stair treads are repaired or replaced immediately. **(T-0)**

7.2.14.2. Posters, bulletin boards and other objects that could distract a person's attention are not placed in stairwells or rampways. **(T-0)**

7.2.14.3. Slippery surfaces are replaced or made safe by coating them with nonslip surface materials. **(T-0)**

7.2.14.4. Treads and risers are of uniform size. **(T-0)**

7.2.14.5. Stair nosings (leading edge of the tread) are designed to prevent personnel from catching their heels on the treads. They must be securely fastened and rounded or beveled. **(T-1)**

7.2.14.6. Guardrails and handrails are smooth, free of splinters or burrs and securely mounted. **(T-0)**

7.2.14.7. Outside stairways, entrances, sidewalks, loading docks and ramps are cleared of snow and ice, and that abrasive materials, such as sand, ash or ice melting chemicals, are readily available and used during inclement weather. **(T-0)** This also includes all emergency exits and walks leading from them.

7.3. Fixed Ladders.

7.3.1. Requirements.

7.3.1.1. Acquisition. Fixed ladders, and their parts and accessories, and safety devices shall meet requirements of 29 CFR § 1910.23, *Ladders*. **(T-0)** Procurement specifications shall include permanent treatment for corrosion control so future treatment shall not be needed. **(T-1)**

7.3.1.2. Design and Installation. Fixed ladders provide a means of access to roofs, pits, silos, towers, tanks and other limited-access areas. Stairs shall be provided where access is daily or during each shift for gauging, inspection, regular maintenance or when carrying tools or equipment is normally required and sufficient space is available. **(T-0)** Fixed ladders may be used when a stairway cannot be used. The following paragraphs provide general design and installation criteria for fixed ladders.

7.3.1.2.1. Length. Ladders 24 feet or less shall be of a continuous length. **(T-0)** When they are more than 24 feet and of continuous length, the following requirements apply:

7.3.1.2.2. When platforms are required, they shall not be less than 24 inches wide by 30 inches long and shall be equipped with standard railings. **(T-0)** Toeboards are required where the hazard of objects falling is present. Refer to 29 CFR § 1910.29, *Fall Protection Systems and Falling Object Protection—Criteria and Practices,* for additional information.

7.3.1.2.3. Ladder Safety Devices, Cages and Wells. All ladder safety devices such as those that incorporate positioning belts, friction brakes and sliding attachments shall meet the design requirements of the ladders which they serve. **(T-0)** Where a cage is installed, it shall extend a minimum of 42 inches above the top of landing, unless other acceptable protection is provided. **(T-0)** Cages shall extend down the ladder to a point not less than seven (7) feet nor more than eight (8) feet above the base of the ladder. **(T-0)** Refer to 29 CFR §§ 1910.23 and 1910.28 for specific design and construction information. Ladder safety devices, cages or wells are required on all existing fixed ladders more than 24 feet. **(T-0)**

7.3.1.2.3.1. Existing fixed ladders. Each fixed ladder installed before 19 November 2018, is equipped with a personal fall arrest system, ladder safety system, cage, or well,

7.3.1.2.3.2. New fixed ladders. Each fixed ladder installed on and after 19 November 2018, is equipped with a personal fall arrest system or a ladder safety

system.

7.3.1.2.3.3. Replacement. When a fixed ladder, cage, or well, or any portion of a section thereof, is replaced, a personal fall arrest system or ladder safety system is installed in at least that section of the fixed ladder, cage, or well where the replacement is located.

7.3.1.2.3.4. Final deadline. In accordance with 29 CFR § 1910.28(b)(9)(i)(D), on and after 18 November 2036, all fixed ladders are equipped with a personal fall arrest system or a ladder safety system.

7.3.1.2.4. When a one-section fixed ladder is equipped with a personal fall protection or a ladder safety system or a fixed ladder is equipped with a personal fall arrest or ladder safety system on more than one section, ensure the following:

7.3.1.2.4.1. The personal fall arrest system or ladder safety system provides protection throughout the entire vertical distance of the ladder, including all ladder sections. **(T-0)**

7.3.1.2.4.2. The ladder has self-retracting lifelines and rest platforms at intervals not to exceed 150 feet (45.7 m). **(T-0)**

7.3.1.2.4.3. Ensure ladder sections having a cage or well. **(T-0)**

7.3.1.2.4.4. Are offset from adjacent sections. **(T-0)**

7.3.1.2.4.5. Have landing platforms provided at maximum intervals of 50 feet (15.2). **(T-0) Note:** A cage or well may be used in combination with a personal fall arrest system or ladder safety system provided that the cage or well does not interfere with the operation of the system.

7.3.1.3. Ladder Pitch. The preferred pitch of fixed ladders shall be 75 to 90 degrees from the horizontal. **(T-1)** Ladders with a pitch in excess of 90 degrees are prohibited. Refer to 29 CFR § 1910.27, *Scaffolds and Rope Descent Systems* for additional information.

7.3.1.4. Load Capacity. All ladders, platforms, appurtenances and fastenings shall meet the load requirements of 29 CFR § 1910.23. **(T-0)**

7.3.1.5. Lighting. Adequate illumination shall be available when using ladders. **(T-0)** Lamps shall be installed so the light does not reflect in a climber's eyes. **(T-0)** Consult the installation BCE when specific guidance on lighting is required.

7.3.1.6. Access. Where unauthorized use of a fixed ladder poses a hazard, the facility manager shall ensure the ladders are secured from unauthorized access. **(T-2)** Ladders available to public access require guarding to prevent unauthorized access. (T-0) The bottom seven (7) feet shall be guarded. **(T-0)** Examples of guarding include the use of a fence with locked gates and making the bottom portion portable or spring loaded and available only as needed. Additionally, there must be a warning sign prohibiting access by unauthorized persons. **(T-0)**

7.3.1.7. Slipping. When the potential for climbers to get mud, oil or grease on their footwear creates a slipping hazard, a mat of crushed rock, a raised platform or a boot scraper shall be provided. **(T-0)**

7.3.1.8. Electric Lines. Electrical conductors shall not be installed on or adjacent to fixed metal ladders, unless they are beyond reach and cannot be used as a handrail or grabbed inadvertently. **(T-0)** This distance shall be at least five (5) feet from the ladder. **(T-0)** If there is any potential for contact with parts of electric equipment or circuits, these parts shall be de-energized and locked out in accordance with **Chapter 21. (T-0)**

7.3.1.9. Rung Ladders. Rung ladders shall be built into the walls of each manhole over 12 feet deep. **(T-1)** The distance between rungs is the same as other fixed ladders. More detailed design criteria can be found in 29 CFR § 1910.23. **Note:** Newly constructed manholes completed on or after 17 January 2017 shall comply with 29 CFR § 1910.24. **(T-0)**

7.3.1.10. Grounding and Bonding. Ladders and related equipment shall be grounded and/or bonded, to drain off accumulated static electricity when static electricity is hazardous to the work operation, such as fuel cell repair or refueling vehicle maintenance. **(T-0)** Static discharge plates shall also be provided. **(T-0)**

7.3.2. Inspections.

7.3.2.1. A formal, fully documented inspection of all fixed ladders shall be accomplished upon installation and at least every three (3) years thereafter. **(T-0)** These inspections shall be performed by the installation BCE for ladders installed on real property facilities or real property installed equipment. **(T-0)** The using organization is responsible for ensuring inspections are done for facilities and equipment which are not real property. When qualified personnel are not available in the using organization, unit will submit a Work Order Request to the Civil Engineer Squadron. **(T-3)** Inspection documentation shall include the type ladder and safety climb device installed, location, a detailed list of all discrepancies and corrective action status. **(T-2) Note:** Real Property Installed Equipment (RPIE) is a CE responsibility. Information regarding RPIE is provided in DAFI 32-9005, *Real Property Accountability and Reporting*, and DAFMAN 65-605, Volume 1, *Budget Guidance and Technical Procedures.*

7.3.2.2. Climbers shall be alert to potential hazards and perform informal inspections of fixed ladders prior to every use. **(T-1)** No attempt to climb shall be made until all hazardous conditions are corrected. **(T-1)** Specific hazards to look for during inspections are: loose, worn and damaged rungs or side rails; damaged or corroded bolts and rivet heads; damaged or corroded handrails and brackets on platforms; and deteriorated masonry where fixed ladder anchorages are secured to a structure, including loose or damaged carrier rails or cables.

7.3.3. Maintenance. Repairs made to fixed ladders and related equipment shall meet the following requirements:

7.3.3.1. Materials used shall meet or exceed original construction. **(T-0)**

7.3.3.2. Any modification to ladder components, safety climb device or related equipment shall be coordinated with the property manager and occupational safety office, with final approval by the installation BCE. **(T-1)**

7.3.3.3. All welding shall be performed by a qualified welder. **(T-0)**

7.3.4. Selection of Personnel. Some individuals become spatially disoriented when working on elevated ladders or platforms. This condition is known as height vertigo. Common reactions

to this condition are to "freeze" and hang on to any permanent support or to experience dizziness, nausea, trembling and/or loss of consciousness. Supervisors shall be vigilant in screening and observing employees required to work at heights. **(T-1)** If the supervisor suspects an employee may be subject to vertigo, the employee shall be referred to the local medical facility for evaluation prior to resuming any height work. **(T-1)** Employees descending into pits or shafts may also experience vertigo. Individuals known to experience vertigo shall be disqualified as ladder users. **(T-1)**

7.3.5. Supervisors shall ensure climbers are trained to:

7.3.5.1. Check ladder for defects and slippery substances. **(T-0)**

7.3.5.2. Ensure ladder and climber's footwear are free of slippery substances. **(T-0)**

7.3.5.3. Raise or lower needed tools and materials by handlines after reaching the work position. **(T-0)**

7.3.5.4. Face the ladder and use both hands to grip the rungs or side rails firmly. **(T-0)**

7.3.5.5. Wear slip-resistant shoes with heels. **(T-0)**

7.3.5.6. Climb carefully, without haste and maintain three-point contact. **(T-0)**

7.3.5.7. Never run up or down or jump from the ladder. **(T-0)**

7.3.5.8. Remove hand jewelry (rings) prior to climbing. **(T-0)**

7.4. Portable Ladders.

7.4.1. The following practices are prohibited:

7.4.1.1. Ladders set on unstable surfaces. **(T-0)**

7.4.1.2. Ladders placed in front of doors which open towards the ladder without proper guarding. **(T-0)**

7.4.1.3. Ladders used as scaffolds, unless specifically designed for that purpose. **(T-0)**

7.4.1.4. Personnel reaching too far out to the sides. **(T-0)**

7.4.1.5. Personnel standing too high to maintain their balance. **(T-0)**

7.4.1.6. Use of a defective ladder, e.g., broken rail or rung. **(T-0)**

7.4.1.7. Improvising and using a make-shift ladder. **(T-0)**

7.4.1.8. Personnel carrying materials in their hands while ascending or descending a ladder. **(T-0)**

7.4.1.9. Using a ladder with conductive side rails while working on electrical circuits or near live electrical lines, etc. **(T-0)**

7.4.1.10. Descending with their back to the ladder, unless specifically designed for that purpose. **(T-0)**

7.4.1.11. Paint wood ladders with an opaque coating, since possible defects may be covered up. **(T-0)**

7.4.2. Requirements.

7.4.2.1. Acquisition and Selection Considerations.

7.4.2.1.1. Portable ladders shall meet ANSI design and construction specifications. **(T-0)**

Exception: Fire department ladders shall be maintained and inspected in accordance with NFPA 1931, *Standard for Manufacturer's Design of Fire Department Ground Ladders*, and NFPA 1932, *Standard on Use, Maintenance, and Service Testing of In-Service Fire Department Ground Ladders.* **(T-0)**

7.4.2.1.2. There are a variety of ladder styles; selection, to include construction material and proper size, shall be based on where and how the ladder may be used. **(T-1)** Ladders come in five (5) workload ratings. Supervisors shall order Type IAA, IA or I ladders whenever possible. **(T-1)** Type II ladders shall only be considered when local purchase is required and local manufacturers cannot provide Type IAA, IA or I. **(T-1)** Type III ladders shall not be procured for industrial use. **(T-1)** Refer to **Table 7.1** for additional information.

Table 7.1. Ladders Workload Ratings.

Ladders Workload Ratings		
Duty Rating	**Ladder Type**	**Working Load (Pounds)**
Extra Heavy Duty	IA	300
Extra Heavy Duty	IAA	375
Heavy Duty	I	250
Medium Duty	II	225
Light Duty	III	200

7.4.2.2. Inspections. Thorough visual inspections of ladders shall be made by the supervisor when the ladder is initially received and prior to being placed in service. **(T-1)** Workers shall perform a visual inspection prior to each use. **(T-0)** Refer to 29 CFR § 1910.23 for additional information. Defects or damage to look for include:

7.4.2.2.1. Evidence the ladder was exposed to excessive heat (such as in a fire) or corrosive substances. When ladders are so exposed, their ability to support the designed working load shall be questioned. **(T-0)** The ladder shall be retested in accordance with manufacturer's instructions. **(T-1) Note:** Any ladder with structural or other defects will be immediately tagged "Dangerous: Do Not Use" and removed from service until repaired. **(T-0)** Refer to 29 CFR § 1910.23(b)(10) for additional guidance.

7.4.2.2.2. Side rails, steps, rungs or related hardware that are cracked, split or deformed.

7.4.2.2.3. Pulleys, cables and ropes which bind or are frayed.

7.4.2.2.4. Rivets, connections and spreaders for looseness or shearing.

7.4.2.2.5. Nonskid base material that is loose or missing. Metal and metal-reinforced single and extension ladders, except aircraft boarding ladders, shall be equipped with safety shoes, spurs, spikes or combinations thereof to prevent slipping. **(T-0)**

7.4.2.2.6. Ladders with conductive side rails that are not marked for electrical hazards. Ladders not already marked with safety use instructions by the manufacturer shall be stenciled, "DANGER —DO NOT USE AROUND ELECTRICAL EQUIPMENT," in two-inch high red letters or the largest letters the surface will allow (minimum letter size is one inch). **(T-0)**

7.4.2.2.7. Ladders in which rungs and steps designed for use in ascending or descending on metal ladders are not corrugated, knurled, dimpled or coated with skid-resistant materials.

7.4.2.2.8. Ladders with broken or missing steps, rungs or cleats, broken side rails, or other defects shall not be used. **(T-0)**

7.4.2.3. Maintenance. Proper maintenance ensures the safe condition of the ladder. Hardware, fittings and related equipment shall be checked frequently and kept in proper working condition. **(T-0)** All bolts and rivets shall be in place and secured. **(T-0)** Joints between steps or rungs and the side rails shall be tight. **(T-0)** Refer to 29 CFR 1910.23 for additional information.

7.4.2.3.1. Lubricate metal bearings of locks, wheels, pulleys, etc., in accordance with manufacturer's instructions.

7.4.2.3.2. Replace frayed or worn rope.

7.4.2.3.3. Keep safety feet and other parts in good working condition.

7.4.2.3.4. Coat wood, metal and fiberglass ladders with a suitable protective material in accordance with manufacturer's instructions. If protective coatings are considered desirable for wooden ladders, use only transparent coatings or wood preservatives to prevent possible defects from being hidden. Protect metal ladders that may come in contact with acids or alkali solutions with a locally approved coating. When location demands, protect metal ladders against corrosion caused by moisture or salt spray. When plastic, fiberglass ladder rails or surfaces have the appearance of exposed fibers or an apparent color change from weather exposure, they shall be washed with a mild liquid detergent solution and allowed to air dry to determine surface integrity. **(T-1)** Spray or brush the ladder rails with acrylic lacquer, epoxy or other locally approved coating sufficient to cover the exposed fibers. Following the first coat, lightly sand the fiberglass surface with "00" sandpaper, or equivalent, to smooth the glass bristles.

7.4.2.4. Ladders with defects which cannot be immediately repaired shall be removed from service and scheduled for repair or replacement**. (T-0)** Use an AF Form 979, *Danger Tag,* or commercial equivalent, to warn employees that the ladder cannot be used. If a ladder is to be discarded, remove it from the work area and cut it in half to prevent further use. Do not attempt to straighten or use a bent ladder.

7.4.2.5. Requirements Applicable to All Ladders. Refer to manufacturer's instructions. **(T-1)** Additionally, use the following OSHA requirements:

7.4.2.5.1. Inspect ladders before climbing to ensure all parts are in good condition. **(T-0)** To permit inspection, procure and maintain wood ladders with transparent finish only.

7.4.2.5.2. Store ladders in a way that provides easy access for inspection and permits safe withdrawal for use. **(T-0)** When possible, store ladders on racks. Ensure the racks have enough supporting points to keep the ladders from sagging. Do not place material on stored ladders. Store wood ladders in a location free from exposure to the elements and excessive heat or dampness.

7.4.2.5.3. Allow only one person on a portable ladder at any time, unless designed for use by two people. **(T-0)** Only ladders specially designed to support greater loads shall be used in combination with ladder jacks and scaffold planks when an operation requires more than one person. **(T-0).** Refer to **Chapter 16** for additional guidance. **(T-0)**

7.4.2.5.4. Always maintain three-point contact (two feet and a hand or two hands and a foot) when ascending or descending a ladder, face the ladder and maintain a firm hold on the ladder. **(T-0)**

7.4.2.5.5. Place straight and extension-type ladders in a position to have at least one foot of slope for each four (4) feet of ladder length. **(T-0)** For example, a 12-foot extension ladder must be 3 feet from the supporting structure.

7.4.2.5.6. Use ladders of sufficient length to permit employees to reach their work when standing no higher than the third rung from the top of a straight ladder, or the second step from the top of a stepladder. **(T-0) Note:** The top of a stepladder is not a step and is not counted as a step when the ladder is greater than five (5) feet in length.

7.4.2.5.7. Do not carry anything that will interfere with the free use of both hands when climbing a ladder. **(T-0)** Raise material and equipment to the working position using a rope and canvas bucket or another approved method.

7.4.2.5.8. Do not stand on the top cap of trestle or combination ladders, nor the top step of stepladders. **(T-0)** Occupational safety staffs shall evaluate and provide guidance for military-unique operations. **(T-1) Note:** Three-step aircraft ladders are exempted.

7.4.2.5.9. Do not leave ladders in place unattended. **(T-0)**

7.4.2.5.10. Do not use portable metal reinforced ladders when performing work on or near electrical equipment, but use wood or fiberglass ladders. **(T-0)** Keep them clean. Remove all surface buildup of dirt, grease or oils to avoid creating a ready path for electrical current. **(T-0)** Refer to 29 CFR § 1910.333, *Electrical-Selection and Use of Work Practices,* for additional information. **Exception**: Fiberglass ladders with metal rungs are acceptable.

7.4.2.5.11. Ladders will be stored when not in use. **(T-1)** On the flightline and outdoor environments, ladders shall be laid down and secured when not in use. **(T-1)** Where possible, employees shall secure or remove the ladder to prevent unauthorized use or tripping hazards. **(T-1) Exception**: The more modern, durable, enhanced ladders such as the Little Giant© ladders can remain standing in environmentally controlled environments, e.g., hangars, spacious warehouses. **(T-1)**

7.4.2.6. Additional Requirements for Extension Ladders. Refer to manufacturer's instructions and the following requirements:

7.4.2.6.1. Develop local procedures for raising and lowering the ladder, if not covered in the manufacturer's instructions.

7.4.2.6.2. To support the top of the ladder at a window opening, an approved attachment per the manufacturer of the ladder shall be attached across the back of the ladder, extending across the window to provide firm support against the building walls or window frames. **(T-1)**

7.4.2.6.3. Short ladders shall not be spliced together to provide long sections. **(T-1)**

7.4.2.6.4. Follow manufacturer's instructions for proper minimum overlap of two-section extension ladders.

7.4.2.6.5. A ladder shall not be used to gain access to a roof unless the top of the ladder extends at least three (3) feet above the point of support eave, gutter or roof line. **(T-1)**

7.4.2.6.6. Hooks may be attached at or near the top of portable ladders to provide added stability.

7.4.2.7. Personnel Training. Personnel who use ladders at any working height shall be trained in the care and use of different types of ladders. **(T-0)** The supervisor or a designated trainer shall conduct this training when an employee is first assigned. **(T-1)** Refer to **paragraph 7.3.5** for additional information on ladder training. All training shall include hands-on instruction to include inspection of ladders for defects, possible electrocution hazards, proper positioning and placement of ladders for various job sites. **(T-0)** Training shall be documented in accordance with instructions in AFI 91-202. **(T-1)**

7.5. Stepladders.

7.5.1. A stepladder is self-supporting, nonadjustable in length, has flat steps and a hinged back.

7.5.2. Employees shall maintain three-point contact ascending or descending stepladders. **(T-0) Exception**: This requirement does not apply to stepladders under four feet.

7.5.3. Bracing on the back legs of stepladders shall not be used for climbing because it is designed solely for increasing stability. **(T-0)**

7.5.4. Stepladders shall be fully opened out and locked in position. **(T-0)**

7.6. Emergency Operations. Ladders used in emergency operations such as firefighting, rescue and tactical law enforcement operations or training for these operations, or designed into or is an integral part of machines or equipment *do not* have to meet the general requirements of 29 CFR § 1910.23.

Chapter 8

ELECTRICAL SAFETY

8.1. General Information.

8.1.1. Hazards. Refer to **paragraph 1.5,** and AFI 91-202 for further information on the JHA and job safety lesson plan. **Note:** A JHA is not required when existing guidance adequately covers all safety requirements of an operation or process. Example: TO 00-25-172, *Ground Servicing of Aircraft and Static Grounding/Bonding.*

8.1.1.2. Refer to **Chapter 2** and **Chapter 14** for additional guidance.

8.1.2. Only qualified electricians, using approved materials, shall install or perform electrical work in accordance with NFPA 70. **(T-0)**

8.2. Receptacles. Follow NFPA 70E, *Standard for Electrical Safety in the Workplace*, Article 245. It is not necessary to replace the cover for small cracks around the mounting screws.

8.2.1. Multiple plug adapters shall not be linked to provide additional or more convenient outlets as this could overload electrical circuits. **(T-0)** At no time shall a multiple plug adapter or strip be plugged into another multiple plug adapter or strip. **(T-0)**

8.2.2. Tamper-Resistant Receptacles. Tamper-resistant electrical receptacles shall be provided in accordance with the requirements of NFPA 70, Article 406.4 and Article 406.12. (T-0) These locations include child development centers per UFC 4-740-14, *Design: Child Development Centers, School-Age Facilities*, and many other facilities. **(T-0)**

8.2.3. Ground fault circuit interrupter (GFCI) shall be used in accordance with 29 CFR § 1910.304(b). **(T-0)** Receptacles on a two-wire, single-phase portable or vehicle-mounted electrical generator rated not more than five (5) kilowatts (kW), where electrical generator conductors are insulated from the generator frame and other grounded surfaces, shall be permitted without GFCI protection. Receptacles shall be located outside wet process areas or protected by a GFCI. **(T-0)** To protect large areas, GFCI breakers shall be located in the circuit panel. **(T-1)**

8.2.4. Arc-fault Circuit Interrupters. Arc-fault circuit interrupters are required in certain circuits in dwelling units. **(T-0)** Refer to NFPA 70, Article 210.12 for guidance.

8.3. Plugs. Follow NFPA 70E, Article 110.

8.4. Flexible Cords and Extension Cords. Flexible cords and extension cords shall only be used in accordance with guidance outlined in the NFPA 70, Article 240.5(B), NFPA 70E, Article 110.5, and as directed by 29 CFR § 1910.334 and 29 CFR § 1910.305(g). **(T-0)**

8.4.1. Extension Cords.

8.4.1.1. If extension cords are used, they shall have a single connection. **(T-0) Exception**: A heavy duty industrial extension cord with a multiple-outlet junction box may be utilized if the equipment amperage rating does not exceed the extension cord/circuit which it is plugged into. The wattage shall be verified. **(T-0)**

8.4.1.2. Report, replace, inspect or dispose of worn, cracked, damaged or frayed electrical extension cords, loose or broken electrical wires and worn or broken electrical plugs. **(T-0)** These

indications could be an indication of possible short circuiting or overheating. Defective cords shall be removed from service. **(T-0)** Refer to 29 CFR § 1910.334(a)(2) for defective electrical equipment and cords.

8.4.1.3. Electrical extension cords may be used when it is impractical to power equipment from facility wiring, such as in large hangars, flightline locations, field environments and when using electrical generators.

8.4.1.4. Only commercially procured extension cords bearing an OSHA-recognized NRTL certification or host nation equivalent certification may be used. Extension cords amperage rating must meet or exceed the amperage draw of the device being plugged into it. **(T-1)** The amperage shall be verified. **(T-0)** Extension cords may not be manufactured or altered.

8.4.1.5. Do not hang extension cords over nails, rafters or in a manner that constitutes a safety or fire hazard.

8.4.1.6. Do not place extension cords under rugs, carpets or other combustible material.

8.4.1.7. Refer to 29 CFR § 1910.334(a)(2) for visual inspection requirements.

8.4.2. Refer to 29 CFR § 1910.334(a)(3) for grounding of tools and equipment connected by flexible cords requirements. A grommet, stress relief device or National Electrical Code-approved clamp shall be installed on equipment housings to prevent abrasion of cord insulation and to prevent pull or strain put on the cord‘s internal wiring. **(T-1)** Cords used with heating appliances, such as electric irons, shall meet the requirements of 29 CFR § 1910.303(b)(2). **(T-0)**

8.4.3. When possible, equipment power cords shall be suspended from overhead in rigid raceways. **(T-1)**

8.4.4. When disconnecting cords, pull on the plug rather than the cord, to avoid damaging internal connections.

8.4.5. Electrical wiring/conduits shall only be used in accordance with 29 CFR § 1910.305. **(T-0)**

8.4.6. High wattage appliances such as refrigerators, microwaves, coffeemakers, heaters, etc., shall be plugged directly into a facility outlet. **(T-1)** In foreign countries, a voltage converter may be required to transform the facility power to match that of the host nation, as many times, overseas power systems operate at a higher voltage (220V) and a lower frequency (50 cycles) than the U. S. standard of 110/120 volts and 60 hertz. **Note:** In accordance with **paragraph 2.5.2.3,** the facility manager must review and approve high wattage appliances prior to use. **(T-1)** In this case, the voltage converter is considered the “direct connection,” or “facility outlet,” required by the guidance. Uses of these voltage converters are therefore permissible, provided neither the rated power, nor current of the transformer is exceeded.

8.4.7. Multi-receptacle surge protectors shall only be used in accordance with 29 CFR §§ 1910.303 and 1910.304. **(T-0)**

8.5. Disconnecting Means (Circuit Breakers and Disconnect Switches). Refer to NFPA 70, Article 408.4(A), *Circuit Directory or Circuit Identification,* for circuit breakers/fuse box identification requirements. For example, markings should not merely indicate “motor” or “lights,” but “motor, water pump #2” or “lights, front lobby.” Spare circuit breakers will be identified as

"spare." **(T-0)** Supervisors, in conjunction with the installation BCE, shall ensure electrical fuse, switch and circuit-breaker boxes are marked with correct voltage, current, wattage, foreign source of power or other ratings, as appropriate. **(T-1)** Personnel shall not stand directly in front of circuit breakers or switches when activating or deactivating them. **(T-0)** Refer to UFC 3-560-01, *Operation and Maintenance: Electrical Safety*, for additional guidance.

8.5.1. Circuit breakers and disconnect switches shall clearly indicate status - open (off) or closed (on). **(T-0)** Refer to NFPA 70, and 29 CFR § 1910, Subpart S for additional guidance.

8.5.2. Circuit breakers, disconnect switches and fuses shall be readily accessible to employees and building management personnel. **(T-0)** Work space in front shall be clear and unimpeded and shall not be located where exposed to physical damage or in the vicinity of easily ignitable material. **(T-0)** Refer to 29 CFR § 1910, Subpart S for additional criteria.

8.5.3. Circuit breakers shall not be taped in the "on" position. **(T-0)** Breakers that trip frequently indicate electrical problems and shall be promptly reported to CE and corrected. **(T-1)**

8.5.4. Employees shall not substitute larger fuses or breakers or use bypass wires, pennies, etc. **(T-0)**

8.5.5. If circuit breaker fails to close or immediately trips after resetting, a qualified electrical employee (electrician) shall be called to troubleshoot the circuit breaker, e.g., installation BCE shall be called immediately. **(T-1)**

8.5.6. Remote Disconnect Control circuits will comply with requirements found in NFPA 70. **(T-0)**

8.6. Guarding of Live Parts. Premises wiring shall meet NFPA 70, Article 215. **(T-1)**

8.7. Equipment Grounding.

8.7.1. Frames of electrical motors, regardless of voltage, shall meet the requirements of 29 CFR § 1910.304(g). **(T-0)**

8.7.2. Exposed noncurrent-carrying metal parts of fixed equipment that may be energized under abnormal conditions shall meet the requirements of 29 CFR § 1910.304(g). **(T-0)**

8.8. Restrictions. While working on or around live electrical equipment, workers are prohibited from wearing garments with exposed metallic fasteners or flammable articles such as celluloid cap visors. **(T-0)** Additionally, clothing shall be of the material necessary to comply with NFPA 70E requirements. **(T-0)** Refer to **paragraph 2.3** for jewelry and other metal article restrictions.

8.9. Electrical Installations and Equipment. Guidance in NFPA 70E, 29 CFR § 1910, Subpart S – Electrical, UFC 3-560-01, and AFMAN 32-1065, *Grounding and Electrical Systems*, for electrical installations and equipment shall be complied with. **(T-0)** Motor data plates shall be legible and not painted. **(T-0)**

8.9.1. Electrical Repairs. Only authorized, qualified electricians or appliance employees may install or repair electrical equipment. Work will only be performed on electrical equipment that is de-energized, locked out and tagged out in accordance with NFPA 70E and AFMAN 32-1065. **(T-0)** Refer to **paragraph 8.17** for work on energized equipment.

8.9.2. Supervisors shall ensure work areas are inspected for electrical hazards. **(T-1)** Sufficient workspace shall be provided and maintained around electrical equipment to permit safe

operation and maintenance in accordance with 29 CFR § 1910.303(g), *600 Volts, nominal, or less;* Table S-1 or 29 CFR § 1910.303(h), *Over 600 Volts, nominal;* Table S-2. **(T-0) Note:** High voltage is defined as greater than 600 volts, nominal.

8.9.3. Wires shall be enclosed in an electrically-listed box or control panel. **(T-0)**

8.9.4. In locations requiring the use of special tools (e.g., non-sparking), only tools certified for those areas shall be used. **(T-0)**

8.9.5. When equipment is replaced, a renovation project is planned or new construction is performed that potentially involves more than the control electrical energy in **paragraph 8.9.1,** make provisions to comply with hazardous energy control requirements in **Chapter 21.**

8.9.6. Parts of electrical equipment which ordinarily produce arcs, sparks, etc., shall not be operated or used in explosive atmospheres or in close proximity to combustible materials. **(T-0)**

8.10. Additional Electrical Equipment Requirements.

8.10.1. Close rack, panel or control box doors at all times except as necessary to accomplish authorized repairs.

8.10.2. Operators shall open and close equipment switches quickly and positively and shall not break contact between brushes and commutators or slip rings while equipment is operating. **(T-1)**

8.11. Electronic Equipment. Turn high voltage equipment off at provided switches and disconnecting means prior to unplugging, unless authorized by applicable technical publications.

8.11.1. Use only approved solvents to clean electronics equipment. Ensure adequate ventilation and wear appropriate PPE when required by applicable guidance (e.g., SDSs, BE occupational and environmental health assessment), the installation occupational safety office or BE. Vacuuming, with a vacuum approved for the task, is an effective cleaning method. Refer to **paragraph 2.4.8.8** for compressed air cleaning requirements.

8.11.2. Technicians shall not use lead pencils, screwdrivers or other unapproved tools to make radio frequency energy tests on electronic equipment as serious burns can result from arcs or faults created by these conditions. **(T-1)**

8.11.3. Personnel shall not hold meters in their hand while performing measurements on energized circuits or equipment. **(T-1)** Use non-conductive, insulated gloves or other effective PPE when necessary to hold meters or metering cables. The holder shall stand on a non-conductive mat or dry surface while using the meter. **(T-1)** Refer to **paragraph 14.4.7** for additional guidance.

8.11.4. Workbenches.

8.11.4.1. Workbenches shall be kept clean at all times. **(T-1)**

8.11.4.2. When voltage is applied to equipment being repaired or tested, personnel shall ensure tools and equipment not essential to the test are removed from the bench. **(T-1)**

8.11.4.3. Ground metal workbenches used for repairing and testing electronic equipment to a low resistance ground. **Note:** See TO 00-25-234, *General Shop Practice Requirements for the Repair, Maintenance, and Test of Electrical Equipment,* for electrostatic discharge control procedures.

8.11.5. Insulating Matting Specific Requirements (See 29 CFR § 1910.137, *Electrical Protective Equipment*).

8.11.5.1. Insulating matting shall be used near electrical apparatus or circuits in high voltage maintenance areas as an additional safety measure to protect personnel. **(T-1)** It shall be used to protect against accidental shock only and shall not be the only means of protection when handling energized wires and circuits. TOs 00-25-234 and 00-25-232, *Control and Use of Insulating Matting for High-Voltage Application*, provide information and instructions on control, use and marking of insulating matting. Insulating matting shall be permanently marked. **(T-0)**

8.11.5.2. Supervisors shall consult with installation occupational safety office to determine if insulating matting is required in their areas of responsibility. **(T-3)** This includes areas where potential shock hazards exist and additional protection is needed, floor resistance is lowered due to dampness and where employees are exposed to voltages of 50 volts or more. Refer to NFPA 70E, Article 130, *Work Involving Electrical Hazards*, for additional guidance.

8.11.5.3. Mats shall be cleaned as necessary to prevent contamination, using domestic cleaners, such as carpet cleaners, or other locally approved cleaners required for special situations. **(T-0)**

8.11.5.4. Insulating matting shall be replaced when worn to manufacturer‘s recommended replacement requirements. **(T-0) Note:** Shoes with nails, spikes or cleats shall not be worn on insulating matting. **(T-0)** Penetration of spikes or cleats to the floor can make the matting ineffective.

8.11.5.5. Insulating matting in front of and around electrical workbenches, high voltage cabinets, switch panels, etc., shall be one continuous length or strip. **(T-1)** Where possible, matting shall continue 24 inches beyond the end of the equipment. Overlapping at corners is not required if it produces a tripping hazard. If more than one run or strip of matting is required, the activity supervisor shall determine the amount needed. **(T-1)**

8.11.5.6. Insulating matting shall not be used for nonskid applications such as walkways, hall runners, in front of work benches (non-electric) on work-and-test benches, etc. **(T-0)** General purpose low-cost matting shall be used as it is, and is satisfactory for areas where shock protection is not required. **(T-0)** No certification for use of general purpose matting is required.

8.11.6. Use stools made of fiberglass or other non-conductive materials when working on electrical or electronic equipment.

8.11.7. Supervisors shall establish procedures requiring all accessories used with electronic and electrical equipment be serviceable and safe for use. **(T-1)** Supervisors shall also establish procedures to eliminate or control all hazard potentials to a safe acceptable level. **(T-1)**

8.12. Emergency Equipment (Electrical Safety). In addition to electrical PPE provided to employees, functional managers shall ensure emergency equipment is available at each operating location where maintenance is performed on energized circuits. **(T-1)** High voltage is defined as over 600 volts (nominal phase-to-phase). Equipment variations depend on local conditions and the squadron commander or functional manager may add additional items. The equipment may be

displayed on a board, stored in an unlocked cabinet or made available in a portable kit, and shall be situated in a conspicuous and prominent location at each site, well-marked and readily accessible in accordance with 29 CFR § 1910.151, *Medical Services and First Aid.* **(T-0)** Equipment shall be protected against chemical, mechanical or environmental deterioration and shall be inspected or tested for serviceability in accordance with 29 CFR § 1910.335, *Safeguards for Personal Protection.* **(T-0)** Emergency equipment shall consist of:

8.12.1. Safety operating instructions (OIs) or procedures for the site. **(T-1) Note:** If the F&ES Flight's emergency medical teams are rapidly available and the installation medical clinic operates on limited hours, contact the F&ES Flight emergency medical teams. **(T-2)**

8.12.2. Cardiopulmonary resuscitation (CPR) instructions. **(T-1)**

8.12.3. CPR facemask with disposable mouthpiece. **(T-1)**

8.12.4. Emergency phone numbers and building number. **(T-1)**

8.12.5. First aid kit provided by the unit. **(T-1)** This item is required for work performed in remote locations away from emergency responders. Installation medical treatment facility can provide recommendations on contents of the first aid kit. **Note:** In accordance with OSHA's letter of interpretation for 29 CFR § 1910.151(b), a first aid kit is required if a medical facility is more than three to four minutes away. **(T-0)**

8.12.6. Disposable gloves, impervious to body fluids, for first aid use. **(T-1)**

8.12.7. Nonconductive cane or hook with insulated handle (with less than 180 degrees of bend). **(T-1)**

8.12.8. High voltage insulated lineman's rubber electrical gloves (both inner and outer gloves) if rescuer(s) is (are) likely to contact live wires, conductors or current carrying parts while performing rescue. **(T-1)** Voltage rating shall be suitable for voltages encountered in the work area. **(T-1) Note:** Electrical gloves shall be checked before use in accordance with UFC 3-560-01, and American Society for Testing Materials (ASTM) F496-85, *Specification for In-service Care of Insulating Gloves and Sleeves*, and shall be tested and marked with the next test due date. **(T-0)** This may be accomplished as a step in a JHA prior to the workday or as a step in a unit's daily or weekly work preparation.

8.12.9. A 15-foot length of natural fiber rope, preferably 1/2 or 5/8 inch diameter. **(T-1)**

Note: Synthetic rope may melt or burn quickly when exposed to an electric arc, heat or flame.

8.12.10. Insulated fuse pullers, where required. **(T-1)**

8.12.11. Flashlight with nonmetallic case in operating condition. **(T-1)**

8.12.12. Grounding stick (shorting stick). **(T-1)**

8.12.13. Wool blanket(s), for extinguishing clothing fires and keeping injured person warm. **(T-1)**

8.12.14. Appropriate portable emergency signs constructed of nonconductive materials, such as AF Visual Aids (AFVA) 91-303, *DANGER—DO NOT ENERGIZE—PERSON WORKING ON ANTENNA*; AFVA 91-304, *DANGER—DO NOT ENERGIZE—WORK IN PROGRESS ON EQUIPMENT*; AFVA 91-305, *DANGER—INTERLOCKS DISABLED*; and AFVA 91-306, *DANGER—HIGH VOLTAGE*, are available through Air Force Publications web site at

http://www.e-publishing.af.mil. **(T-1)** Refer to **Chapter 17** for information on safety signs and tags.

8.12.15. Optional site-specific items (rescue breather; insulated lineman's gloves, etc.). **(T-1)** **Note:** Protect electrostatic sensitive components and equipment in accordance with TO 00-25-234.

8.13. Automated External Defibrillator (AED). AED presence and use is governed by the host installation commander and director of medical services. Safe use of an AED and its location and training is governed by AFI 44-177, and *Guidelines for Public Access Defibrillation Programs in Federal Facilities.*

8.14. Lighting. Consult installation BCE facility design office for specific guidance on lighting. Control of light is important to avoid glare and harsh shadows. Soft shadows are usually acceptable, but harsh shadows shall be avoided since they may obscure hazards or interfere with visibility. **(T-1)**

8.15. Moisture Guarding. Refer to 29 CFR § 1910.305, *Wiring Methods, Components, and Equipment for General Use,* for additional guidance and information.

8.16. Under-voltage Protection. Machines not adequately safeguarded to protect the worker during under-voltage situation or a power failure shall have an under-voltage device installed. **(T-0)** This device prevents the machine from starting up after a power interruption, exposing the worker to the hazards of moving parts.

8.17. Work on Energized Equipment.

8.17.1. Electrical circuits and equipment shall be de-energized before being worked on. **(T-0)** When authorized by the commander, applicable technical data or manufacturer's instructions, work may be performed on energized circuits and equipment as necessary to support a critical mission, prevent injury to personnel or to protect property. A qualified electrician checking for the presence of voltage is not considered energized work. For energized work refer to AFMAN 32-1065, and UFC 3-560-01 for task specific required number of qualified electricians. Depending on the task, one member of the two or three person team shall act as safety observer. **(T-1)** All employees shall be trained in CPR and equipment shutdown procedures and responsible for immediate assistance in an emergency. **(T-0)** Install electrical equipment in accordance with guidance contained in NFPA 70, UFC 3-560-01, and AFMAN 32-1065.

Note: Supervisor may be safety observer.

8.17.2. Additional PPE for Work on or Near Energized Equipment. Refer to NFPA 70, Sections 130.3. and 130.7., and UFC 3-560-01, Table 4.1., *PPE Criteria,* for additional guidance.

8.17.2.1. A rubber insulating blanket or other suitable guards shall be used when necessary to work adjacent to energized circuits. **(T-0)**

8.17.2.2. Arc flash protection shall be provided for all DAF operations exposing personnel performing duties on or in proximity of energized parts operating at 50 volts or more. **(T-0)** Protective clothing required, if any, shall be based on the procedures outlined in UFC 3-560-01, NFPA 70E and AFMAN 32-1065. **(T-0)**

8.17.2.3. Individuals required to work on or near (within 8 feet of) exposed energized equipment over 50 volts shall wear long sleeved, Arc Thermal Performance Value-rated PPE in accordance with UFC 3-560-01. **(T-0)**

8.17.2.4. Individuals operating or servicing electrical switch-gear over 15 kilovolts (kV) shall wear an appropriately Arc Thermal Performance Value-rated blast suit with hood and polycarbonate face shield. **(T-0)** Sheet metal and gypsum building materials do not provide the required minimum level of blast protection.

8.17.2.5. Clothing shall follow requirements of UFC 3-560-01. **(T-0)**

8.17.2.6. Any tools, e.g., hot sticks, insulating rubber sleeves, used as part of the task must follow the requirements of AFMAN 32-1065 and UFC 3-560-01. **(T-0)**

8.17.2.7. For additional guidance on working on energized equipment, refer to UFC 3-560-01, and AFMAN 32-1065.

8.17.3. Work Near Energized Equipment. Refer to UFC 3-560-01 and AFMAN 32-1065 for additional guidance on working near energized equipment.

Chapter 9

EMERGENCY SHOWER AND EYEWASH UNITS

9.1. Scope. This chapter addresses regulations and standards, acquisition, location and installation, maintenance, use and testing of emergency shower and eyewash units. Also included are performance specifications for both permanently-installed and self-contained units. Types of equipment covered are emergency showers, eyewash units, eye and face units, combination units, hand-held drench hoses and eyewash bottles.

9.2. Regulations and Standards.

9.2.1. OSHA Regulation.

9.2.1.1. General Requirements. In accordance with 29 CFR § 1910.151(c) and 29 CFR § 1926.50(g), Medical Services and First Aid, where the eyes or body of any employee may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of eyes and body shall be provided in the work area for immediate emergency use. **(T-0)**

9.2.1.2. Specific Requirements.

9.2.1.2.1. Storage and Handling of Anhydrous Ammonia. Refer to 29 CFR § 1910.111, *Storage and Handling of Anhydrous Ammonia.*

9.2.1.2.2. Telecommunications. Refer to 29 CFR § 1910.268, *Telecommunications.*

9.2.1.2.3. Batteries and Battery Charging. Refer to 29 CFR § 1926.441(a)(6).

9.2.2. UFC 3-420.01, *Plumbing Systems.*

9.2.3. ANSI/International Safety Equipment Association (ANSI/ISEA) Z358.1, *Emergency Eyewash and Shower Equipment.*

9.3. Equipment - Acquisition.

9.3.1. Emergency shower and eyewash equipment may be locally and centrally procured. The procuring document shall include a requirement that the manufacturer has documented that their equipment meets or exceeds ANSI/ISEA Z358.1 specifications. **(T-1)**

9.3.2. Each request for emergency showers and/or eyewashes shall be evaluated by the installation occupational safety and BE offices to determine the need for the installation and proper location of units. **(T-1)**

9.3.2.1. Rationale for decisions shall be documented and maintained by the respective owner. **(T-1)**

9.3.2.2. The type of material used, its properties, how the material is dispensed, probability of injury, extent of potential injury and PPE available and used shall be considered in determining the need for the units. **(T-0)**

9.3.3. Self-contained Units. Units shall be constructed of noncorrosive materials and provide a minimum of 15 minutes continuous flow. **(T-1)** Self-contained units should only be used in locations unable or unfeasible to plumb an eye wash. Stored fluid shall be protected against contaminants and temperature extremes. **(T-1)** Units may be filled with potable water or a

solution approved by either the manufacturer or the installation medical services. Instructions and expiration dates shall be permanently affixed to the unit. **(T-1)**

9.3.4. Eyewash Bottles. Shall provide an immediate flushing to the eyes. Eyewash bottles are not a replacement for other types of emergency equipment. **(T-1)** These bottles may be filled with potable water or an eye-flushing solution, either approved by the manufacturer or by the installation medical services. Local procedures shall be developed to prevent these units from being exposed to extreme temperatures. **(T-1)** Instructions and expiration dates shall be permanently affixed to the unit, if applicable. **(T-1)**

9.4. Location and Installation.

9.4.1. Location.

9.4.1.1. Eyewash and emergency showers shall be located as near to the hazard as possible with maximum of 10 seconds unobstructed travel distance from the source of exposure to the unit. **(T-0)**

9.4.1.2. Unobstructed means no objects, equipment, furniture or doors lie in the travel path. **(T-1)**

9.4.1.3. Path will be well lit. **(T-1)**

9.4.1.4. The emergency shower and eyewash station will be clearly marked with appropriate signage. **(T-1)**

9.4.1.5. Recommend emergency shower and eyewash station be located near an emergency exit to allow easy access by emergency responders.

9.4.2. Installation.

9.4.2.1. Permanent plumbed in emergency showers and eyewash stations shall meet UFC 3-420-01 or applicable code at time of construction. **(T-1)**

9.4.2.2. Installation must meet manufacturer's requirements. **(T-1)**

9.4.2.3. Water pipes servicing the emergency shower and eyewash station shall be protected from freezing or heating. **(T-1)**

9.4.2.4. Valves servicing the equipment shall be labeled to prevent inadvertent shut off. **(T-1)**

9.4.2.5. Water lines must be able to provide enough pressure to meet manufacturer's requirements for that equipment. **(T-1)**

9.4.2.6. Water supply used will be free of contaminants and shall not be delivered at extreme temperatures. Temperature shall be maintained between 60° and 100°F. **(T-1)** This prevents injury to the eyes and ensures personnel will be able to continue to use the equipment and not stop due to temperature discomfort. **(T-1)**

9.4.2.7. Emergency shower and eyewash stations shall remain activated without the use of the operator's hands on activated. **(T-1)** Activation of the equipment shall take one second or less. **(T-1)** Once activated, it shall remain on until intentionally shut off. **(T-1)**

9.5. Maintenance and Testing.

9.5.1. Permanently-installed shower and eyewash units shall be activated by the supervisor weekly to verify operation and to reduce accumulation of bacteria/sediment for time period directed by the manufacturer. **(T-1)** Maintain manufacturer's instructions with the unit. **(T-1)** **Note:** Eyewash station manufacturer's instructions provide direction on how often and how long to activate specific plumbed systems to reduce microbial contamination and generally reference ANSI Z358.1, *Emergency Eyewash and Shower Standard.*

9.5.2. Supervisor or designated employee shall inspect unit(s) in accordance with manufacturer's instructions and document the inspection when completed. **(T-1)** Inspections will include activation and a thorough check for damage, scale accumulation or other defects as required by the manufacturer. Documentation shall be maintained to show date of inspection and name of individual performing the test. **(T-0)** This documentation may be kept in a log, computerized or affixed to the equipment by tag or label. **Exception**: Units installed at missile sites, not permanently manned, shall be tested and documented by the team chief during the most frequently performed periodic inspection established for that system. **(T-1)**

9.5.3. Self-contained units shall be tested and inspected in accordance with the manufacturer's instructions and documented. **(T-0)**

9.5.4. Eyewash bottles shall be tested, refilled, maintained and disposed of in accordance with the manufacturer's instructions. **(T-0)**

9.5.5. All units shall be inspected by the installation occupational safety office during the annual facility/workplace inspection for proper placement, installation and documentation of supervisory testing and operation. **(T-1)**

9.5.6. Installed units that no longer meet the criteria of the manufacturer's instruction shall be evaluated by the installation occupational safety office for replacement or upgrade. **(T-1)**

9.6. Training. Workers shall be trained initially and annually thereafter, as part of the job safety training outline (JSTO), on the location and proper use of the emergency shower and eyewash station. **(T-1)** Include this training into the JSTO. Training shall include:

9.6.1. Locations of each emergency shower and eyewash station in the work center. **(T-1)**

9.6.2. Ensuring the paths to the emergency shower and eyewash station remains clear and the equipment is properly maintained. **(T-1)**

9.6.3. Taking proper actions to assist personnel who are exposed and need to use the emergency shower and eyewash station, to include calling for medical assistance. **(T-1)**

9.6.4. Instructing workers on the proper way to use the station to wash the exposed area(s), e.g., how to get the water into their eyes in the most effective manner. **(T-1)**

Chapter 10

GROUNDS, MOWING AND AGRICULTURE TRACTORS

10.1. General Information. Personnel involved with landscape and grounds maintenance shall observe all safety precautions in this chapter and those recommended by the manufacturer of the equipment. **(T-0)** Always read/comprehend the owner's manual/instructions before operating any type of equipment.

10.1.1. Training. Supervisors shall ensure employees are trained, using manufacturer's instructions, lesson plans, or JHA, prior to the operation of any type of equipment. **(T-0)** Supervisors will provide such instruction at time of initial assignment and refresher training, as required. **(T-0)** Specific requirements for training, licensing and/or certification of equipment operators will be documented in accordance with AFI 24-301, *Ground Transportation*. **(T-1)**

10.1.2. PPE is determined through an evaluation of the hazards by the supervisor in consultation with the safety office and BE, and entered into the work center Job Safety Training Outline.

10.1.3. Guard all mower discharge chutes with shields or approved grass catchers to deflect or stop foreign objects being thrown and to prevent operator contact with the blade. **(T-0)** Refer to 29 CFR § 1910.243, *Guarding of Portable Powered Tools*, for further guidance on the operation and maintenance of powered lawn equipment.

10.1.4. Employees will use boards and ramps of the appropriate size and construction for the weight of the equipment to be loaded and unloaded from vehicles or trailers. **(T-0)**

10.1.5. Employees will turn off equipment and allow to cool before refueling equipment. **(T-0)** Do not permit smoking in the area. **(T-1)**

10.1.5.1. Refuel equipment prior to use instead of refueling before storing inside a building. **(T-0)**

10.1.5.2. Complete refueling outside at least 25 feet away from the building and any open flame source. **(T-0)**

10.1.6. Operations during inclement weather will adhere to established policies. **(T-2)** Additional weather information may be found in **Chapter 3.**

10.1.7. When traveling on public roads, highways, local and state vehicle codes shall be used. **(T-0).** Slow- moving vehicle emblems shall be used in accordance with 29 CFR § 1910.145(d)(10). **(T-0)**

10.2. Inspection/Maintenance. The operator shall walk around the equipment and inspect for faults prior to initial setup/use and prior to initial startup on each shift. **(T-0)** The AF Form 1800, *Operator's Inspection Guide and Trouble Report*, shall be used as an inspection checklist and signed by the operator prior to use. **(T-1)** Manufacturer's instructions or technical data will be used to service or maintain the equipment. **(T-0)**

10.3. Mowing. Maintenance of installation grounds involves various sizes and types of lawnmowers. The two basic mower types are reel (several helical blades rotating around a horizontal shaft) and rotary (one or more knife like blades attached to a vertical shaft). They may

be pushed, self-propelled, ridden or towed. If equipped with a fuel shutoff valve, shut off the fuel supply line when parking mowers at the end of the duty day. When possible, and to ensure a clear and safe walkway between mowers, leave one to three feet separation space between parked gasoline-operated riding mowers. Never use electric mowers and grass trimmers while it is raining or the grass is wet, excluding light dew. Ensure electric mowers, trimmers and attached extension cords are effectively grounded. **(T-0)** However, listed or labeled portable tools protected by an approved system of double insulation, or its equivalent, need not be grounded.

10.3.1. Ensure powered mowers (push or self-propelled) riding-rotary, converted sulky and reel power lawnmowers meet design specifications in 29 CFR § 1910.243 and ANSI B71.1, *Consumer Turf Care Equipment – Pedestrian-Controlled Mowers and Ride-On Mowers – Safety Specifications.* **(T-0) Note:** Manufacturer's specifications identifies if the powered mower meets the requirements of ANSI B71.1. Deadman controls will not be disabled. **(T-0)**

10.3.2. Prior to mowing, operators shall clear the area of all people and inspect for foreign objects, raised sprinkler heads, holes, soft ground, obstructions or any other condition that could have impact on a safe operation. **(T-1)**

10.3.3. Operators shall never pull the mower backwards while the engine is running; the safety guard on the back may lift the mower off the ground and injure the operator. **(T-1)**

10.3.4. Always mow in a horizontal direction across the face of a steep slope, e.g., hills or banks exceeding a 30-degree angle, and keep firm footing at all times. **(T-0)**

10.3.5. Employees will stay clear of the front of self-propelled mowers during and after starting. **(T-1)** Employees will control the mower by hand pressure on the handle, not by foot pressure on the housing. **(T-1)**

10.3.6. Employees will not clean grass from the chute while the mower is running. **(T-1)**

10.3.7. Employees will follow manufacturer's instructions when cleaning, repairing or inspecting the mower. **(T-1)**

10.3.8. Wear hearing protection when using lawn mowers BE determined to produce hazardous noise.

10.4. Edgers. Guards will always be checked prior to the operation to ensure they are in place. **(T-0)** Edgers will not be used when people are in line with the cutting blade discharge pattern. **(T-1)** Follow manufacturer's instructions when cleaning, repairing or inspecting the edger.

10.5. Commercial Mowing and Turf Care Equipment. Commercial mowing and turf care equipment are used for mowing and maintaining areas too large or rough for residential type mowing equipment, but not large enough to warrant an agricultural tractor mower (described in **paragraph 10.9**). Commercial mowing equipment shall meet requirements in ANSI/Outdoor Power Equipment Institute (OPEI) B71.4., *Commercial Turf Care Equipment - Safety Specifications*. **(T-0)** Operators shall read the owner's manual before operating the equipment. **(T-1)**

10.5.1. If commercial mowers are used in areas where they can exceed the maximum slope allowed by the manufacturer, a Rollover Protective Structure and seatbelt shall be installed in accordance with manufacturer's instructions and used whenever the vehicle is in motion. **(T-0)**

10.5.2. While operating gang reel mowers on a slope, raise the upper reels as a counterbalance to prevent the mower from sliding or turning over. Ensure special equipment designed for steep hills or grades is available or employees can cut by hand using manual tools. **(T-1)**

10.6. Tree and Hedge Trimming. Supervisors shall complete a JHA for both routine and emergency tree maintenance operations. **(T-1)** Critical elements with serious potential to affect employee's safety, such as tree climbing, tree cutting and removal, trimming near electrical lines, use of chain saws, use of high-reach lifts and use of cutters or chipper equipment, shall be included. **(T-1)** Workers shall be trained for emergency conditions, such as adverse weather. **(T-0)** All workers shall receive training in emergency rescue and life-saving first aid techniques, and fall protection/prevention. **(T-1)** Refer to 29 CFR § 1910.269, *Electric Power Generation, Transmission, and Distribution*, for additional guidance.

10.6.1. PPE is determined through an evaluation of the hazards by the supervisor in consultation with the safety office and BE, and entered into the work center Job Safety Training Outline.

10.6.2. Two or more employees and an on-site job supervisor, fully qualified in tree maintenance, shall be assigned when routine tree maintenance involves climbing, working from a high reach lift, and while cutting down any tree other than small low trees that would pose no hazards to people, facilities and utility lines. **(T-2)** The area around trees being trimmed or cut and in the vicinity of operating chippers and stump grinders shall be effectively guarded with barricades or identified with cones or streamers to warn personnel against the danger of entry. **(T-0)**

10.6.3. Fall Protection. Fall protection equipment, ropes, D-rings, cutting tools, equipment and climbing gear shall be inspected to ensure it is in safe condition prior to each use. **(T-0)** Any equipment or climbing gear that is frayed, worn, broken or defective shall be removed from service immediately. **(T-0)** Each climber shall have at least one lifeline and one handline, normally nylon, 1/2 inch by 125 feet. **(T-0)** At least 2 – 3/4 inch polypropylene or equivalent lines (250 feet long each) shall be provided for each crew. **(T-0)** The nominal breaking strength of 1/2 inch ropes used for climbing shall not be less than 2,385 pounds. **(T-0)** Climbing and safety ropes shall not be spliced for repair or added length. **(T-0)** The ends of ropes shall be wrapped to prevent fraying. **(T-0)** A climbing rope shall always be used, even when work is performed from a ladder or lift device. **(T-0)** Refer to **Chapter 13** for additional fall protection requirements.

10.7. Fertilizers.

10.7.1. Fertilizers can become a combustible material and may explode if stored at temperatures over 130º F. When fertilizers become wet and start to decompose, they give off gas that will burn. Some fertilizers also give off toxic gases when burning. The installation FES shall be notified of any evidence of heating, smoking, combustion or fire in fertilizer. **(T-1)** In accordance with NFPA 400, *Hazardous Materials Code*, no more than 60 tons of fertilizer (mixtures containing 60 percent or more by weight of ammonium nitrate) shall be stored in a location unless the location and storage facility have been approved by the installation FES. **(T-0)**

10.7.2. When spreading fertilizer, pellets shall not be directed toward anyone. **(T-0)** If personnel enter the area, the spreader shall be turned off. **(T-0)** Fertilizer spreaders shall be

cleaned and lubricated daily. **(T-0)** Safety glasses and gloves shall be worn during fertilizing spreading operations. **(T-0)**

10.8. Irrigation Systems. Irrigation systems may involve hazards related to trenching and shoring, confined spaces and/or hazardous energy control. For requirements, refer to 29 CFR § 1926, Subpart P – Excavations, 29 CFR § 1910.146, *Permit Required Confined Spaces*, and 29 CFR § 1910.147, *The Control of Hazardous Energy (Lockout/Tagout)*, and **Chapter 21.**

10.9. Agricultural Tractors and Implement Attachments. An agricultural tractor is a two or four-wheel drive or tracked vehicle of 20 or more horsepower designed to furnish the power to pull, carry, propel or drive implements designed for agriculture. **Note:** While some commercial mowing equipment may exceed 20 horsepower, they are not designed as agricultural tractors and fall under guidance in **paragraph 10.5**.

10.9.1. Rollover Protection. Agricultural tractors with engines exceeding 20 horsepower shall be fitted with Rollover Protective Structure. **(T-0)** If a tractor is not equipped with Rollover Protective Structure, it shall not be operated on sloped areas. **(T-0)** Rollover Protective Structure-equipped tractors shall pass field upset tests (side and rear) specified in 29 CFR § 1926.1002, *Protective Frames (ROPS) for Wheel-Type Agricultural and Industrial Tractors Used in Construction*, and 29 CFR § 1928.51, *Rollover Protective Structures (ROPS) for Tractors Used in Agricultural Operations*, which shall be indicated by a manufacturer's label permanently attached to the Rollover Protective Structure. **(T-0)** Where a suspended (e.g., air ride or shock absorber equipped) seat is used, the seatbelt shall be fastened to the movable portion of the seat to accommodate the ride motion of the operator. **(T-0)** Seatbelts shall not be worn while operating low profile tractors not equipped with Rollover Protective Structure or other types of agricultural equipment identified in 29 CFR § 1928.51(b)(5). **(T-0)**

10.9.2. Procurement. Agricultural tractors procured for the DAF shall meet the requirements of 29 CFR § 1928.51 and military specifications. **(T-0)** Where commercially available, agricultural tractors and implement attachments shall be purchased with noise levels at the operator position of less than 85 Decibels-A-Weighted (dBA). **(T-0)**

10.9.3. Training. Every employee who operates an agricultural tractor shall be trained in safe operating procedures and practices dictated by the work environment in accordance with the commander's approved training program. **(T-0)** A training plan shall be developed and, at a minimum, shall include all attachments used by the organization and a copy of the most recent noise hazard survey conducted in accordance with DoDI 6055.12, *Hearing Conservation Program (HCP)*. **(T-0)**

10.9.4. Hazardous Noise Warnings. If the noise level at the operator position as determined by the noise hazard survey is 85 dBA or greater, tractors shall be marked with a placard stating: "*Caution – Hazardous Noise – Operator Ear Protection Required*." **(T-0)**

10.9.5. Vehicle Emblems. Each agricultural tractor shall have a "*Slow Moving Vehicle*" emblem affixed on the rear that is clearly visible to all traffic approaching the tractor from the rear. **(T-0)**

10.9.6. Guarding and Shielding. All power take-off shafts, including rear-, mid-, or side-mounted shafts, shall be shielded to protect employee from contact with moving machinery parts. **(T-0)**

10.9.7. Agricultural tractors and implement attachments may be “field modified” for uses other than those intended by the manufacturer when the modification has been certified in writing by the manufacturer or equivalent entity. The manufacturer or equivalent entity must certify the safety of the modified equipment has not been compromised during modification.

10.9.8. Special Considerations for Agricultural Tractors. Riders shall not be allowed on tractors, the draw bar or towed equipment, except where the equipment is specifically designed to allow riders. **(T-0)** Speed shall be reduced with heavy loads when vision is limited or when operating on rough terrain. **(T-1)**

10.9.9. Operation, Use and Training. Equipment operation, use and training should be in accordance with manufacturer’s instructions and 29 CFR § 1910, 1926 and 1928, as applicable.

Chapter 11

HAND TOOLS, PORTABLE POWER TOOLS AND MACHINERY

11.1. General Requirements.

11.1.1. Tool Procurement. Specific criteria for tool use shall be contained in technical data requiring use of the tool. **(T-1)** Refer to TO 32-1-101, *Use and Care of Hand Tools and Measuring Tools*, for additional guidance and information on tools and equipment. Portable powered tools shall conform to military specifications (Mil Specs), if available. **(T-0)** If Mil Specs applicable to a portable powered tool have not been published, the procuring document shall include a requirement for the tool to meet or exceed requirements in 29 CFR § 1910.243, *Guarding of Portable Powered Tools*, and 29 CFR § 1910.304, *Wiring Design and Protection.* **(T-0) Note:** When possible, low noise power tools or tools with noise reduction attachments shall be utilized. Additionally, tools should be selected that minimize operator's exposure to noise, vibration and awkward positions.

11.1.2. Machinery Acquisition. Machines and attachments may be locally and centrally procured. Newly acquired machines shall meet the design and construction requirements identified in Mil Specs. **(T-0)** Machines design, foundation requirements, attachments and safety guidance are found in 29 CFR § 1910.212, *General Requirements for all Machines.* OSHA standards in **Table 11.1** will be used when no Mil Specs exist. **(T-0)** If a machine is not specifically covered by this publication, a Mil Spec or an OSHA standard, the installation occupational safety office shall be contacted for assistance in identifying applicable criteria. **(T-1)**

11.2. Tools. The unsafe use of hand and power tools can injure employees or damage equipment. Supervisors shall enforce strict tool control procedures. **(T-1)** Use of personally owned hand and power tools shall be prohibited. **(T-1)** Tools shall be properly stored when not in use. **(T-1)** Appropriate PPE shall be provided to employees and use enforced. **(T-1)**

11.2.1. Hand Tools.

11.2.1.1. In accordance with 29 CFR § 1910.242, *Hand and Portable Powered Tools and Equipment, General,* and 29 CFR § 1926.302, *Tools-Hand and Power, General,* supervisors are responsible for the safe condition of tools and equipment used by employees.

11.2.1.2. Refer to **paragraph 2.4.8.8** for compressed air cleaning requirements.

11.2.1.3. Supervisors and employees shall frequently inspect all hand tools required for the operation. **(T-1)** Defective tools shall be immediately removed from service. **(T-0)**

11.2.1.4. Employees carrying hand tools while on ladders, scaffolds, platforms or work stands shall use carrying bags, e.g., shoulder bags or backpacks, or tool belts for tools that are not in use. **(T-0)** Employees shall not intentionally drop tools from elevated surfaces or throw tools to each other. **(T-0)**

11.2.2. Non-powered Hand Tools.

11.2.2.1. Screwdrivers. Screwdrivers shall not be used as a prying tool, punch, wedge, chisel, punch bar, nail puller or be struck with a hammer. **(T-0)** If the tips of any

screwdriver or special fastener are worn or misshaped they shall be repaired or replaced. **(T-0)**

11.2.2.2. Chisels and Punches. Chisels shall be kept sharp with the edge and striking surface ground true. **(T-0)** Cold chisels and punches with mushroom heads shall not be used. **(T-0)** A chisel or punch holding device shall be used when working space permits. **(T-0)** The angle of cut shall be away from the body. **(T-0)** Safety goggles shall be worn when using a chisel, punch or an alignment drift. **(T-0)**

11.2.2.3. Wrenches. Damaged, bent or broken wrenches, including those with sprung jaws, shall not be used. **(T-0)** Wrenches shall not be struck with a hammer unless designed for this purpose. **(T-0)** Worn box wrenches or sockets shall be replaced. **(T-0)**

11.2.2.4. Hammers. A hammer of suitable design, size and weight for the task shall be used. **(T-0)** Hammers with loose or damaged handles shall not be used until the handle is repaired/replaced. **(T-0)** A hammer shall be discarded if it shows dents, cracks, chips, mushrooming or excessive wear. **(T-0)**

11.2.2.5. Saws. Crosscut saws shall be used for cutting (wood or lumber) across the grain, ripsaws for cutting with the grain and hacksaws for cutting metal. **(T-0)** Saws with broken teeth or broken or cracked handles shall not be used. **(T-0)** Saw teeth shall be kept sharp and well set to prevent binding. **(T-0)** If a saw binds while cutting, the employee shall not attempt to force it through the stock. **(T-0)** If the saw sticks in damp or gummy wood, a small amount of oil or paraffin applied to the blade will make it cut smoothly.

11.2.2.6. Pliers, Hand Snips and Cutters. Pliers are designed for gripping and cutting operations and shall not be used as a substitution for a wrench or any purpose for which it was not intended. **(T-0)** Hand snips are designed for cutting sheet-metal. Hand snips shall not be hammered on to make a cut. **(T-0)** Cutters are designed for use on wire, rods or bolts, and shall not be used to pull nails or as a pry bar. **(T-0)**

11.2.2.7. Knives. Hook-bill knives, utility knives or other similar extremely sharp knives, when not in use, shall be stored in a holder or sheath. **(T-0)** Employees shall always cut away from their body. **(T-0)** Hacking motions shall not be applied when cutting. **(T-0)** Jackknives, multipurpose tools or pocketknives with locking capability shall be removed from service when the locking mechanism is inoperative. **(T-0)**

11.2.2.8. Crowbars and Wrecking Bars. Makeshift bars, such as pipes or other metal objects, shall never be used in place of crowbars and wrecking bars. **(T-0)** Crowbars shall have a point or toe to grip the object to be moved and a heel to act as a pivot or fulcrum. **(T-0)** A block of wood may be used under the heel to prevent the crowbar from slipping and injuring the user or fellow employees. Damaged crowbars shall not be used. **(T-0)** Case-hardened steel tools shall never be used to strike crowbars or wrecking bars. **(T-0)** Only plastic, wood or soft metal objects shall be used to hammer on pry-type bars. **(T-0)**

11.2.2.9. Files. Files shall never be cleaned by being struck against a vise or other metal object, because they chip and break easily. **(T-0)** They shall not be used as a pry bar. **(T-0)** Broken files shall be discarded and not made into a center punch, chisel or other type of tool, since the hardened steel may fracture in use. **(T-0)** Supervisors shall ensure defective handles are replaced immediately. **(T-0)**

11.2.2.10. Shovels, Rakes, Ice Chippers and Sod Lifters. None of these tools shall be used as prying tools. **(T-0)** Replace defective handle immediately. These tools shall be properly stored when not in use. **(T-0)** When shovels, rakes, hoes and similar tools are not in use at the job site, they shall be positioned where the working surface cannot be stepped on. **(T-0)**

11.2.2.11. Chains. The chain shall be inspected before and after each use. **(T-0)** The chain shall not be held in the hand when pressure is applied, nor shall an employee stand closer than one-half the length of the chain when the chain is under tension. **(T-0)**

11.2.3. Portable Power Tools. See 29 CFR § 1910, Subpart P for detailed information.

11.2.3.1. Electric power tools shall either be of the approved double-insulated type or grounded in accordance with 29 CFR § 1926, Subpart K, *Electrical*. **(T-0)** The use of electric cords for hoisting or lowering shall not be permitted. **(T-0)**

11.2.3.2. Extension Cords. Refer to **Chapter 8** for information on extension cord requirements for electric power tools. **Note:** Consideration may be needed for portable power tools purchased in host nations where OSHA-recognized NRTL certification and/or NFPA 70 are not recognized.

11.2.3.3. Use of GFCI devices is recommended with handheld power tools such as routers, planers and shears. Refer to 29 CFR § 1910.304 for additional information.

11.2.3.4. Fire Hazards. Electric power hand tools shall not be used near flammable materials or in explosive atmospheres unless approved to meet NFPA 70 requirements for the type of area and atmosphere in which the tool is to be used. **(T-0)**

11.2.3.5. Grounding. All portable electric tools with exposed metal parts shall be grounded in accordance with the NFPA 70 to prevent electric shock. **(T-0)** Approved three-wire cords shall be used to effectively ground these tools. **(T-1)** The ground prong of a three-wire plug shall never be removed. If a cord is found with the ground prong removed, it shall be removed from service, rendered unusable and turned in for repair or replacement. **(T-0)** Refer to 29 CFR § 1910.304 for additional information.

11.2.3.6. Damp or Wet Locations. Electric powered tools used in damp or wet locations, such as in tanks, boilers or outdoors, shall be grounded, unless double insulated. **(T-0)** GFCI devices shall be used in accordance with the NFPA 70. **(T-0)** Refer to 29 CFR § 1910.304 for additional information.

11.2.4. Powder-actuated tools. Powder-actuated tools shall meet the requirements of 29 CFR § 1926.302(e). **(T-0)** Employees using powder-actuated tools shall pass a written and hands-on practical use examinations. Employees shall carry their certification card while using these tools. **(T-0) Note:** Storage of powder-actuated shells may require an explosive storage license. Contact the installation weapons safety office for guidance.

11.3. Machinery. Refer to 29 CFR § 1910, Subpart O, *Machinery and Machine Guarding,* for additional guidance.

11.3.1. Safe Operations.

11.3.1.1. Supervisors will maintain manufacturer's operation manuals for all machinery or equipment under their control. **(T-1)** These manuals will be incorporated into on-the-job training and work center Job Safety Training Outlines (JSTO). **(T-1)** In the absence of

manufacturer guidance, supervisors shall develop JHAs and local OIs in accordance with TO, DAFMAN, OSHA and other related guidance. **(T-1)** Training shall include job safety, maintenance (e.g., cleaning and sanitizing, lubrication), and inspection. **(T-1)** Identify location of training instructions (e.g., manufacturer's manuals, JHAs or local OIs) in the work center JSTO. Ensure only authorized employees operate and maintain shop equipment. **(T-0)** Refer to 29 CFR § 1910.212, and 29 CFR § 1910.263, *Bakery Equipment,* for additional information.

11.3.1.2. Supervisors shall periodically evaluate machinery or equipment operators to ensure they are following proper and safe operating procedures. Machines shall be used only for work within the rated capacity specified by the machine manufacturer. **(T-0)**

11.3.1.3. Machines shall not be operated unless all guards are securely in place and operational. **(T-0)** Any time guards are to be removed, follow hazardous energy control procedures. Refer to 29 CFR § 1910.212, 29 CFR § 1910.147, *The Control of Hazardous Energy (Lockout/Tagout),* and **Chapter 21.**

11.3.1.4. Employees operating, helping or observing machine operations shall comply with PPE requirements for each particular machine and work area. **(T-0)** Refer to 29 CFR § 1910.132, *Personal Protective Equipment,* and **Chapter 14** for additional information.

11.3.1.4.1. Machine operators or other personnel in close proximity to machines/equipment shall not wear gloves, loose fitting clothing, neckties, rings, bracelets or other apparel that is not authorized by the machine/equipment manufacturer, or that may become entangled in moving machinery, power transmission apparatus, powered hand tools or moving parts. **(T-1)**

11.3.1.4.2. Hair nets or caps shall be worn to keep long hair under control and safely away from moving machinery, power transmission apparatus or moving parts. **(T-0)**

11.3.1.4.3. Machine operators will not wear gloves during operations when manufacturer's instructions specify that the wear of gloves will increase the chance of injury. **(T-1)**

11.3.1.5. The operator shall allow all moving parts to come to a complete stop before any attempt is made to clean or clear jammed work or debris from any part of a machine. **(T-0)** Chips or other particles shall be removed using brushes, tools designed for such a purpose or compressed air. **(T-0)** Refer to **paragraph 2.4.8.8** for compressed air cleaning requirements.

11.3.1.6. Refer to **Chapter 8** for additional guidance on under-voltage protection.

11.3.2. Inspection and Maintenance.

11.3.2.1. Supervisors shall ensure all machines are inspected upon receipt to detect and correct defects. **(T-0)** Follow manufacturer's instructions and TO 34-1-3, *Inspection and Maintenance – Machinery and Shop Equipment*, for periodic inspection requirements. **(T-1)**

11.3.2.2. Operator's inspection shall be conducted prior to the start of each shift, following a new setup or when operators change. **(T-0)** This inspection shall ensure operating components are in good working order, and guards, interlocks and other protective devices are activated or in place, operating properly and in proper adjustment. **(T-0)** Records of inspections and any machine maintenance shall be maintained on AFTO Form 244 in accordance with TO 34-1-3.

11.3.2.3. Repairs or maintenance beyond the operator's qualifications shall only be accomplished by a qualified technician. **(T-1)** Any maintenance and repair, regardless of whether it is performed by an operator or qualified technician, shall be performed in accordance with work center hazardous energy control program requirements. **(T-0)** If machinery is out of service for a period of time, it will be properly tagged. **(T-0)** Refer to **Chapter 17** for tagging procedures. Refer to **Chapter 21** for specific guidance on hazardous energy control.

11.3.3. References. Refer to **Table 11.1.**

Table 11.1. OSHA Standards for Machinery.

OSHA Standards	
Subject	**OSHA Standards**
The Control of Hazardous Energy (Lockout/Tagout)	29 CFR § 1910.147
Machinery & Machine Guarding	29 CFR § 1910, Subpart O
Machinery & Machine Guarding (Definitions)	29 CFR § 1910.211
General Requirements for all Machines	29 CFR § 1910.212
Woodworking Machinery Requirements	29 CFR § 1910.213
Abrasive Wheel Machinery	29 CFR § 1910.215
Mechanical Power Presses	29 CFR § 1910.217
Mechanical Power Transmission Apparatus	29 CFR § 1910.219

11.3.4. Training. Employees shall be trained by the supervisor or a designated trainer on all machinery or equipment they are required to use prior to use. **(T-0)** Only trained personnel or those undergoing supervised on-the-job training shall operate shop machinery or equipment. **(T-0)** Training shall be documented and immediately available in the work center.

11.3.4.1. Operators shall be trained on machine or equipment maintenance or repairs they are required and qualified to perform. **(T-0)**

11.3.4.2. Supervisors and operators shall receive training on hazardous energy control procedures contained in **Chapter 21**, as appropriate, to ensure the purpose of the program is understood. **(T-1)** (**Note:** Services craft or hobby shop patrons shall be trained by the supervisor or a designated trainer on the proper operation, safety procedures, hazard recognition and emergency procedures for each piece of equipment they will use.) **(T-1)** An Arts and Crafts Equipment Qualification card shall be issued to identify the machinery the patron is authorized to operate. **(T-1)** Personnel shall not operate machines or equipment if this card is not available. **(T-1)** Services patrons, e.g., base hobby shops, shall receive general awareness training to understand the Hazardous Energy Control program, but shall not apply or remove locks or tags. **(T-1)**

11.3.5. Machine Layout Requirements.

11.3.5.1. Machines subject to movement because of vibration, rotation or other reasons shall be securely fastened to prevent their movement while operating. **(T-0) Exception**: Machines, such as meat slicers, cause very little vibration or movement and can be satisfactorily held in position with rubber feet.

11.3.5.2. Sufficient space for material handling and maintenance shall be provided around each machine. **(T-0)** The installation occupational safety office and CE shall be contacted for assistance on layout issues. **(T-3)**

11.4. Specific Requirements for Machinery.

11.4.1. Refer to 29 CFR § 1910.213 and 1910.147 for electrical requirements and safeguards.

11.4.1.1. The motor START switch shall be protected against accidental or inadvertent operation. **(T-0)** Refer to 29 CFR § 1910.217 for additional information.

11.4.1.2. Electrical hardwiring of all machinery shall be installed in accordance with NFPA 70. **(T-0)**

11.4.2. Safeguarding devices shall be installed, adjusted and used in accordance with manufacturer's operating and maintenance instructions. **(T-0)** Refer to 29 CFR §§ 1910.212, 1910.213 and 1910.217 for additional safe distance and maximum opening requirements.

11.4.3. Safety Devices.

11.4.3.1. Devices such as anti-kickback dogs and fingers or safety hold-down wheels shall be installed when ripping material. **(T-1)** Anti-kickback dogs and fingers shall be inspected before each use and kept sharp to maintain their holding power. **(T-1)**

11.4.3.2. When procuring new table saws, consider purchasing them with skin sensing safety features, if available, to prevent injury. **(T-1)** This type of sensing technology detects contact with the skin, immediately shutting off the motor and stopping the blade.

11.4.3.3. The working part of a band saw blade, between the guide rolls and the upper wheel enclosure, shall be guarded to prevent accidental human contact with the saw blade. **(T-0)** The guard shall be self-adjusting and attached to the gauge so that, in any position the guard will protect the saw blade at the front and outer side. **(T-0)**

11.4.4. Safeguarding by Location or Distance. Before attempting safeguarding by location or distance, a thorough JHA of each machine and particular situation shall be performed by the supervisor with consultation from the installation occupational safety office as needed. **(T-1)** The analysis must clearly identify that employees are protected from dangerous moving parts and one of the restrictions in **paragraph 11.4.3** is met. **(T-0)**

11.4.4.1. To safeguard by location, the machine or its dangerous moving parts must be positioned so hazardous areas are not accessible or do not present a hazard to an employee during the normal operation of the machine. **(T-0)** This may be accomplished by locating a machine where a building design feature, such as a wall, protects the employee and other personnel. Additionally, enclosure walls or fences can restrict access to machines. Another possible solution is to have dangerous parts located high enough to be out of the normal reach of any employee.

11.4.4.2. Unguarded moving parts of machines shall be at least eight (8) feet above the work level, e.g., floor, platform or passageway. **(T-0)** Refer to 29 CFR § 1910.212 for additional information.

11.4.4.3. Machines with live parts shall be in an enclosed area with a locked entrance. **(T-1)** The enclosure (wall or fence) shall be at least eight (8) feet high. **(T-1)** Refer to 29 CFR § 1910.219 for additional information.

11.4.5. Related Equipment (Shield and Holding Tools). While these aids do not give complete protection from machine hazards, they could provide the operator an extra margin of safety. Sound judgment is needed in their application. Since these aids are not used instead of the safeguards, sound judgment is needed in their application.

11.4.5.1. Shields may be used to provide protection from flying particles.

11.4.5.2. Holding tools designed to aid material placement in and out of machinery shall be used to prevent placing hands in the danger zone. **(T-1)** These tools are not a substitute for guarding required by this or any other machine standard. They shall only be used to supplement guard protection provided. **(T-1)**

11.4.6. Exhaust Ventilation. Machines that develop fine dust and fumes must be evaluated by installation BE to safeguard workers. **(T-0)** Refer to AFMAN 48-146, *Occupational and Environmental Health Program Management,* and 29 CFR § 1910.94, *Ventilation*, for additional guidance.

11.4.7. Illumination. Refer to **paragraph 7.1.3** for additional guidance.

11.4.8. Machine energy isolating devices shall be capable of being locked out by a designed hasp or other attachment or an integral part to which, or through which, a lock can be affixed or the energy isolated by simply disconnecting an electrical plug. **(T-1)**

11.4.9. Wheel and Spindle Speeds.

11.4.9.1. The spindle rpm of grinders shall be shown on the machine in a location readily visible to the operator. **(T-0)** It is the supervisor‘s and employee‘s responsibility to verify the speed of the wheel spindle to ensure the speed is correct for the size and type of wheel used. Refer to 29 CFR § 1910.215 for additional information.

11.4.9.2. All grinding wheels shall have the operating speed affixed to the wheel. **(T-0)** Those without a rating shall be tagged and removed from service until the rpm rating is validated. **(T-0)**

Chapter 12

MATERIAL HANDLING EQUIPMENT (MHE)

12.1. Scope. This chapter specifies requirements for MHE used for moving, storing, lifting and controlling equipment in warehouses and industrial workplaces. This equipment includes transport equipment, positioning equipment and storage equipment. **Note:** **Table 12.1** provides a comprehensive list of reference sources.

12.1.1. Hazards. Injury or death may occur when MHE are improperly operated, inadvertently driven off loading docks, tipping, striking personnel, etc. Most injuries and property damage are caused by unsafe operating procedures, lacking of safety-rule enforcement, personnel not wearing required personal protective equipment (PPE), insufficient or inadequate training and operator error. The most common hazards associated with lifting equipment are overloading, dropping or slipping of the load from improper hitching or sling, obstruction to load passage and failure to stabilize the load during the movement.

12.1.2. Administrative areas/offices must be protected from exhaust buildup either by distance or positive air flow pressure in relation to the warehouse activities. **Note:** When internal combustion engine equipment is used inside warehouses, ventilation requirements shall be determined by the installation BE to preclude exposure of workers to carbon monoxide gas. **(T-1)**

12.2. General Requirements.

12.2.1. Documentation. Personnel may use authorized Air Force forms, to include MAJCOM/FLDCOM or locally devised forms, general purpose forms or automated systems for documenting and tracking inspections, maintenance, training and other MHE activities. Electronic signatures are acceptable for documentation. Please check the prescribing directive(s) before discontinuing use of any forms. Maintenance units shall follow documentation guidance in AFI 21-101, *Aircraft and Equipment Maintenance Management*, and 00-20 series TOs. **(T-1)** Units shall review the Air Force Records Disposition Schedule for disposal guidance for historical records of all inspection, repair and test documentation. **(T-1)**

12.2.2. MHE Not in Regular Service. Cranes, hoists and derricks idle for at least one month, but less than six months, shall be inspected prior to placing in service. **(T-0)** Cranes, hoists and derricks idle for six months or more shall be given a complete inspection as defined in **paragraph 12.4,** prior to placing in service. **(T-0)** Standby cranes and derricks shall be inspected at least semiannually. **(T-0)** The user will determine the need for more frequent inspections of cranes and derricks exposed to an adverse environment. **(T-1)** Refer to 29 CFR § 1910.179, *Overhead and Gantry Cranes*, 29 CFR § 1910.180, *Crawler Locomotive and Truck Cranes*, and 29 CFR § 1910.181, *Derricks*, for specific equipment requirements.

12.2.3. MHE Parked Inside Warehouses. Gasoline or diesel-powered MHE parked in general purpose warehouses must be approved by the group commander responsible for the designated warehouse, with recommendations by the installation F&ES Flight, BE and Occupational Safety office. **(T-2)** The equipment shall be parked so it does not block fire aisles, fire-fighting equipment, fire alarm boxes, stairways, elevators or fire exits. **(T-0)** The warehouse supervisor shall conduct daily inspections to ensure powered materials handling equipment is parked in designated locations, equipment does not contain excessive grease and lint, and gasoline lines,

tanks, oil seals and so forth are not leaking. **(T-1)** A minimum of 10-foot clearance shall be maintained between parked equipment and combustible materials. **(T-1)**

12.2.3.1. Operators shall not park liquid petroleum (LP)-fueled industrial and lift trucks near sources of heat, open flames or similar sources of ignition. **(T-1)** Trucks equipped with a permanently mounted LP-gas container shall be fueled outdoors. **(T-1)**

12.2.3.2. Gasoline or diesel powered equipment used in multistory buildings shall be parked on the ground floor when not in use. **(T-1)**

12.2.3.3. Units with internal combustion engines shall not be refueled inside warehouses or while the engine is running. **(T-1)** Refueling shall be accomplished in outside areas approved by the installation F&ES Flight. **(T-2)** When fuel is spilled during servicing, operations shall be stopped and equipment cleaned up in accordance with local procedures prior to restarting fuel servicing operations. **(T-1)** Notify the installation F&ES Flight and Environmental Management office if a significant spill occurs.

12.2.4. Electric or battery powered equipment shall be used indoors when possible. **(T-1)**

12.2.5. Storage Racks/Shelving. The load size and rating of storage racks/shelving shall be determined by the manufacturer's specifications or by a structural/civil engineer or a certified testing agency if manufacturer's specifications do not specify the load size and rating for the storage racks/shelving. **(T-1)** Workers shall report any damage to racks at the time of incident, specifically damage due to mechanical equipment. **(T-1)** Repair defective storage racks in a timely manner. All damage and repairs shall be documented appropriately. **(T-1)**

12.2.5.1. Inspections of storage racks/shelving units shall follow manufacturer's instructions. **(T-1)**

12.2.5.2. Inspection shall include frequency inspection and preventative maintenance, inspection of all recommended storage racks/shelving components. **(T-1)**

12.2.5.3. Inspections shall be documented on AFTO Form 95, *Significant Historical Data*, or MAJCOM/FLDCOM or locally devised automated systems. **(T-1)**

12.2.6. Storage of material shall not create a hazard. **(T-0)** Bags, containers, bundles, etc., stored in tiers shall be stacked, blocked, interlocked and limited in height so they are stable and secure against sliding or collapse. **(T-1)**

12.2.7. Where MHE is used in warehouses or industrial workplaces, sufficient space clearances shall be allowed for aisles, loading docks, doorway entrances, overhangs and passageways with no obstructions that could create a hazard. **(T-0)** Operators shall use caution when traveling on docks or loading platforms and remain clear of the edge. **(T-0)** Passengers shall not ride on powered lift equipment unless a passenger seat is part of the manufacture design. **(T-0)**

12.2.8. The maximum load capacity shall be posted on each piece of lifting equipment, in view of the operator. **(T-0)** Modifications and additions which affect capacity and safe operation require manufacturer's written approval. **(T-0)** If modifications or additions are completed, capacity, operation and maintenance instruction plates, tags or decals shall be changed accordingly. **(T-1)**

12.2.9. Roll-up Doors. See **paragraph 2.7** for roll up door requirements.

12.2.10. Spotter Requirements During Loading/Unloading Operations. Safe loading and unloading requirements to include the use of trained spotters during loading and unloading operations, when the vehicle is operated in a congested area, or when the operator's vision is obscured.

12.2.10.1. Spotters will remain in full view of the operator at all times. **(T-1)**

12.2.10.2. At a minimum, spotters will be trained on forklift tine length compared to cargo, load stability and standard hand signals between operator and spotter. **(T-1)**

12.2.10.3. Supervisors will establish a spotter training plan within the unit and document initial and three-year refresher training in appropriate records, e.g. AF Form 623, *Individual Training Record Folder*, AF Form 1098, *Special Task Certification and Recurring Training*, AF Form 55, *Employee Safety and Health Record*, or MAJCOM/FLDCOM-directed record system. **(T-1)**

12.2.10.4. Refer to **paragraph 30.3.3.2** for additional guidance.

12.2.11. Forklifts shall not be operated on an incline greater than that allowed by the manufacturer.

12.3. Acquisition.

12.3.1. Commercially procured materials handling and lifting equipment or parts shall comply with design manufacturing requirements and specifications in OSHA standards and as applicable, ANSI/ASME requirements and specifications. **(T-0)** Local modifications of centrally procured materials handling equipment shall be coordinated with the installation occupational safety office and with approval of equipment item managers. **(T-1)** Local purchase acquisition requests shall be coordinated with the installation occupational safety office. **(T-1)**

12.3.2. Lever-operated hoists shall meet the requirements and specifications of recognized industry standards. **(T-0)** Slings procured for DAF use shall comply with design and manufacturing requirements in 29 CFR § 1910.184, *Slings*, and ANSI/ASME B30.9, *Slings*. **(T-0)** Locally manufactured slings that do not meet the engineering requirements of ANSI/ASME B30.9 are prohibited and shall be disassembled and removed from service. **(T-0)** **Note:** Design and manufacturing requirements are specified in OSHA's *Tables and Figures: Guidance on Safe Sling Use* (**https://www.osha.gov/dsg/guidance/slings/tables-figures.html**).

12.3.3. Capacity of all lever-operated devices shall be permanently and conspicuously marked in a readily visible place on the hoist. **(T-1)** Only ratchet and pawl, and load brake hoists, which include a means to prevent a suspended load from self-lowering, shall be procured. **(T-1)** Lowering under load shall be by operation of the hoist lever. **(T-1)**

12.3.4. Overhead hoists shall meet design specifications, characteristics and rules of ASME B30.7, *Winches*, ASME B30.10, *Hook*s, and ASME B30.16, *Overhead Underhung and Stationary Hoists*. **(T-0)** When applicable, a system safety program shall be established. **(T-1)** **Note:** Nuclear-certified hoists must also meet requirements in **paragraph 12.5** and AFMAN 91-118, *Safety Design and Evaluation Criteria for Nuclear Weapon Systems.* **(T-1)**

12.4. Inspections. MHE, specifically hoists, slings, cranes, derricks, powered industrial trucks and associated components, will be inspected for damage or wear at intervals specified (frequent and/or periodic), including observations during operation. **(T-0)** Deficiencies will be carefully

examined and a determination made by the operator and the shop or facility supervisor as to whether they constitute a safety hazard. **(T-1)**

12.4.1. Prior To Use. A visual/prior to use inspection (pre-operational) inspection will be performed by the operator or designated person prior to the first use of each shift. **(T-1)**

12.4.2. Frequent. A visual inspection will be performed by the operator or designated person at certain intervals: normal use – monthly; heavy use – weekly; severe use – daily. **(T-1)** (**Note:** These intervals will apply unless MAJCOMs/FLDCOMs or installations have more stringent directives.) The record of inspection shall be maintained by the using agency until the next periodic inspection has been performed. **(T-1)** If slings are damaged, defected or abuse is detected, remove the sling from service until periodic testing is accomplished. **(T-1)**

12.4.3. Periodic. A complete inspection will be performed by a qualified person at intervals between 1 and 12 months. **(T-1)** The required intervals of periodic inspections will be based on the type of use experienced by the equipment: normal service – annually; heavy service – semiannual; severe service – quarterly. Follow periodic inspection schedules outlined in applicable technical orders and/or manufacturer's instructions where intervals are established.

12.4.3.1. During the periodic inspection, some systems may require the removal of covers or parts to gain access. Appropriate hazardous energy control procedures will be used where removal of covers or parts expose individuals to an uncontrolled energy source (e.g., an electrical or mechanical hazard) and result in accidental start-up of equipment. **(T-0)** Refer to **Chapter 21** for additional guidance.

12.4.3.2. Disassembly of the MHE or major components, not designed to be removed or opened, is not required for the sole purpose of the inspection.

12.4.3.3. If the individual performing the periodic inspection finds evidence of damage or wear that constitutes a potential hazard, further inspection to determine cause or to repair the system may be required and total disassembly or removal of major components may be necessary. Consult manufacturer's instructions, where available, for additional guidance.

12.4.4. Inspections for each item shall be documented (separate documentation). **(T-1)** Documentation will include date and time of the monthly inspection, signature of the inspector, an identifier for the equipment inspected and condition of the equipment. **(T-0) Note:** Units shall review the Air Force Records Disposition Schedule for disposal guidance for historical records of all inspection, repair and test documentation. **(T-1)**

12.4.5. Inspections identified as monthly and annual inspections will be considered as such and not a 30 or 365 day inspection. **(T-1)** The next inspection must occur by the last day of the respective month. **(T-1)**

12.4.6. Mandatory Monthly Inspections. Wire ropes, chains and hooks associated with overhead and gantry cranes shall be thoroughly inspected monthly. **(T-0)** Inspections for each item shall be documented. **(T-1)** Documentation will include date and time of the monthly inspection, signature of the inspector, an identifier for the equipment inspected and condition of the equipment. **(T-0)** Inspection criteria will be in accordance with this chapter and applicable ANSI standards or manufacturer instructions. **(T-1) Note:** Units shall review the Air Force Records Disposition Schedule for disposal guidance for historical records of all inspection, repair and test documentation. **(T-1)**

12.4.7. New or Modified MHE. Prior to initial use, all newly procured or modified (altered or repaired) MHE shall be inspected by a qualified person to ensure compliance with the provisions of this and manufacturer's instructions. **(T-1)**

12.4.8. Hoist, Sling and Hook Certification. Hoist, sling and hook certification documents received from the manufacturer when hoists, slings or hooks are purchased or repaired shall be maintained for the life of the equipment (or until the hooks are replaced). **(T-1)** For repaired items, the previous certification shall be replaced with the new documentation. **(T-1)**

12.4.9. For cranes and derricks used in construction, consult with installation BCE and refer to 29 CFR § 1926.1400, *Cranes and Derricks in Construction.*

12.4.10. Inspections shall be documented in accordance with **paragraph 12.2.1**. **(T-1)**

12.5. Nuclear-certified Lifting Equipment. For nuclear-certified MHE, the supervisor or designated representative will perform periodic inspection semiannually. **(T-1)** The supervisor or designated representative will ensure operational and load tests of nuclear-certified hoists, cranes or slings are conducted annually at not less than 100 percent or more than 125 percent of rated capacity. **(T-0)** Perform annual tests in conjunction with one of the two semiannual inspections. **(T-1)** Nuclear-certified hoists must also meet requirements in AFMAN 91-118. **(T-1)**

12.5.1. The annual load test may be performed as either a static or dynamic test as determined by a qualified person.

12.5.2. For nuclear-certified slings and wire rope assemblies, supervisors will use the appropriate 11N series TOs for testing criteria. **(T-1)**

12.5.3. Supervisors will ensure synthetic rope slings are not used to lift nuclear or critical loads. **(T-1)**

12.5.4. For nuclear-certified hoist hooks and hooks used in lifting critical loads, perform a dye penetrant, magnetic particle or other suitable nondestructive inspection (NDI) on the hook annually. **(T-1)** Perform the annual NDI in conjunction with one of the two scheduled semiannual hoist and crane inspections. **(T-1)** If the hook retaining nut is welded to the hook shank, removal of the hook for inspection is not required. In this case, a visual inspection of the inside of the block assembly shall be performed. **(T-1)** If the block is designed such that disassembly is not feasible, this inspection is not required. If hook is removed from hoist for NDI, verify that the hook is properly reinstalled before use. **Note:** Hooks repaired by welding or reshaping are not authorized on nuclear-certified hoists or lifting equipment used to lift critical loads. **Note:** Painted hooks shall not be used on nuclear-certified hoists or lifting equipment or equipment used to lift critical loads. **(T-1)**

12.6. Qualification and Training.

12.6.1. MHE operator qualification and training will be provided by the organization responsible for the operation or equipment and will be in accordance with applicable DAF guidance, OSHA requirement or manufacturer's instructions or guidance. **(T-0)** Organizations requiring MHE training shall designate qualified personnel as unit instructors for unit trainees. **(T-1)** Appropriate shop supervisor and vehicle control officer or noncommissioned officer shall keep the list of approved instructors, with the background and experience on the type(s) of equipment the instructor is providing training. **(T-1)**

12.6.2. Lesson plans for each vehicle or equipment type, shall be accomplished by the unit in accordance with AFMAN 24-306. **(T-1)** Lesson plans shall include formal instruction, hands-on demonstrations by the instructor with practical exercises performed by the trainee and an evaluation of the trainee's performance to confirm their knowledge of equipment operations and service instructions. **(T-1)**

12.6.3. MHE training will be in accordance with applicable technical data and manufacturer's instructions, e.g., cranes, hoists, conveyors, forklifts. **(T-1)** A qualified instructor shall evaluate each operator at least once every three (3) years and provide refresher training, as applicable. **(T-1)** MHE shall be operated only by properly trained, and qualified personnel or trainees under direction supervision of a qualified trainer/instructor. **(T-1)** The operator shall be familiar with all operating controls and be instructed in the operations to be performed. **(T-1)** Training should include warnings, manufacturer's instructions and requirements from this manual and OSHA guidelines, as applicable.

12.6.4. Mobile cranes shall only be operated by designated, qualified operators with a valid AF Form 483, *Certificate of Competency,* or by persons in training under the direct supervision of a designated operator. **(T-1)** (**Exception**: Operators of DAF special purpose vehicle/truck cranes shall be licensed in accordance with AFI 24-301, in lieu of AF Form 483.) **(T-1)** No other personnel will enter a crane cab except for oilers, supervisors and qualified inspectors whose duties require cab entry. **(T-1)** A list of qualified crane operators shall be kept by the using organization and appropriate entries shall be made in the individual's training records. **(T-1)**

12.6.5. Training Currency for Deployment. Supervisors shall ensure personnel scheduled for deployment are current/trained in operations on this equipment prior to deploying. **(T-0)** Additionally, supervisors at deployed locations shall verify personnel are current in operations before they operate the equipment, and provide additional training as needed for personnel to safely operate any new type equipment. **(T-0)**

12.7. Testing.

12.7.1. All new hoists, cranes, slings, derricks and other similar lifting devices, regardless of type, required to lift any type of load shall be tested prior to initial use by a qualified person. **(T-0)** This load test shall be at not less than 100 percent or more than 125 percent of the rated load, unless otherwise recommended by the manufacturer, and annually thereafter at not less than 100 percent or more than 125 percent of rated capacity. **(T-0)** Refer to 29 CFR § 1910.179, *Overhead and Gantry Cranes,* 29 CFR § 1926.552, *Material Hoists, Personnel Hoists and Elevators,* 29 CFR § 1926.1433, *Design, Construction and Testing,* and applicable ASME's B30 Codes and Standards for additional guidance.

12.7.2. DAF materials shall be designated as critical loads for purposes of lifting or hoisting by an appropriate Program Manager or the functional manager at the facility where the lift will occur. **(T-1)** Prior to accomplishing load tests on equipment attached to facility structural members, a qualified person, e.g., civil engineer, shall assess the sufficiency of the structure to withstand the loads being tested. **(T-0)**

12.7.3. Load Tests.

12.7.3.1. Hoists and Cranes. All new or altered hoists/cranes, with replaced or repaired load suspension parts shall be load tested prior to use at not less than 100 percent or more

than 125 percent of the rated load of the equipment, unless otherwise recommended by the manufacturer. **(T-0)** This load test shall include all functions outlined in applicable technical data or manufacturer's instructions. **(T-1)** The replacement of load chain or rope is specifically excluded from this test; however, an operational test under a no-load condition shall be conducted prior to putting the hoist back into service. **(T-0)** Prior to accomplishing load tests on equipment attached to facility structural members, a qualified person, e.g., civil engineer shall assess the sufficiency of the structure to withstand the loads being tested. **(T-0)** Using organizations will maintain written certification that all required load testing has been accomplished. **(T-1)** The test shall be conducted as follows:

12.7.3.1.1. Hoist the test load a distance to assure load is supported by the crane and held by hoist brake(s). **(T-0)**

12.7.3.1.2. Transport test load by the trolley or carrier for the full length of the bridge. **(T-0)**

12.7.3.1.3. Transport the test load by the bridge for the full length of the runway in one direction with trolley or carrier as close to the extreme right-hand end of the crane as practical and in the other direction with trolley or carrier as close to the left-hand end of the crane as practical. **(T-0)** When cranes operate on more than two (2) runways (multiple-truck cranes), the crane will also transport the test load the full length of the runway with the trolley or carrier positioned at each intermediate end truck. **(T-0)**

12.7.3.1.4. For monorail systems, follow ASME B30.17, *Cranes and Monorails (With Underhung Trolley or Bridge),* for the hoist test and transport test load by the carrier for the full length of the monorail system. **(T-0)**

12.7.3.1.5. On hoists incorporating overload devices, a load test shall be accomplished with a test load of least 100 percent of rated capacity, after which the overload device shall be tested. **(T-0)**

12.7.3.1.6. Test weights for load testing shall be tagged or marked indicating total weight in pounds and owner or agency identification number. **(T-0)** Rebar steel shall not be used for test weight lift points. **(T-0)**

12.7.3.2. Slings. Prior to use, each new, repaired or reconditioned alloy steel chain sling, including all welded components in the sling assembly, shall be proof tested by a qualified person. **(T-0)** Periodic load testing shall only be accomplished with written permission and procedural guidance from the sling manufacturer or equivalent DAF organization (e.g., the specific equipment TO or the item manager for locally manufactured equipment). **(T-1)**

12.7.4. Operational Tests. All new hoists, cranes and other similar lifting devices which have had load-suspension parts altered, replaced or repaired shall be operationally tested before use. **(T-0)** Rebar steel shall not be used for test weight lift points. **(T-0)** Conduct tests first by hand, if practical, and then under slowest possible speed. Test with increasing speeds up to maximum speed. Actuated mechanisms shall be located so they trip switches or limiting devices in sufficient time to stop motion without damage to the hoisting arrangement. **(T-0)** On hoists having adjustable trip-setting limit devices, care shall be exercised to achieve adjustment setting without the load block striking the hoist frame or without all the slack being taken out of the unloaded chain or less than one wrap of rope on the drum. **(T-0)**

12.7.4.1. Hoists, cranes and other similar lifting devices not used within the preceding 12 months shall be operationally tested by a qualified person. **(T-0)**

12.7.4.2. Operational testing shall consist of operating all functions of the lifting device under a no-load condition to test all functions of the lifting device, including hoisting and lowering, operation of brakes, testing of all limit, locking, safety devices and other movable mechanisms, such as trolley travel, bridge travel, load lifting and lowering mechanisms, etc. **(T-0)**

12.7.5. Derricks. Prior to initial use, all modified and altered derricks shall be operationally tested to ensure compliance with this publication and requirements in 29 CFR § 1926, Subpart CC, *Cranes and Derricks in Construction.* **(T-0)** All new derricks shall have the manufacturer's certification that all required testing has been accomplished. **(T-0)**

12.8. Powered Industrial Trucks.

12.8.1. Local modifications of centrally procured materials handling equipment shall be done only with approval of equipment item managers. **(T-1)** (**Note:** Modifications and additions, which affect capacity and safe operation, require manufacturer's written approval. However, **s**ome manufacturers may void the warranty of equipment modified without their approval. Therefore, coordinate with the installation contracting and occupational safety offices prior to contacting the equipment item manager.)

12.8.2. Safe Operations.

12.8.2.1. The maximum load capacity shall be posted on each piece of lifting equipment, in view of the operator. **(T-0)** If equipment is modified, the capacity, operation and maintenance instruction plates, tags or decals shall be changed accordingly. **(T-0)**

12.8.2.2. All high-lift rider trucks shall be equipped and operated with overhead guards to protect the operator from falling objects. **(T-0)** Overhead guards shall not be covered with material that could obstruct the operator's vision. **(T-0)**

12.8.2.3. When a forklift is used to elevate personnel, an approved safety pallet shall be used. **(T-0)** The operator shall remain at the controls at all times when personnel are on the safety pallet, but shall not move the forklift. **(T-0)** Instructions prohibiting movement of the forklift with personnel on the safety pallet shall be posted on the pallet in plain sight, visible to the operator and all personnel. **(T-0)**

12.8.2.4. Whenever possible, electric or battery powered equipment shall be used indoors. **(T-1)** Internal combustion engines shall not be operated inside buildings unless an exhaust system or other ventilation approved by BE is installed and used. **(T-1)** Administrative areas, e.g., offices, must be protected from exhaust buildup either by distance or positive air flow pressure in relation to the warehouse activities. When internal combustion engine equipment is used inside warehouses, BE personnel shall determine ventilation requirements to preclude exposure of workers to carbon monoxide gas. **(T-1)** Refer to DESR 6055.09_AFMAN 91-201 for operating in explosives and weapons areas.

12.8.2.5. When leaving powered lifts unattended, operators shall fully lower the forks, neutralize controls, shut power off and set brakes. **(T-0)** Wheels of the vehicle shall be chocked if parked on an incline or decline. **(T-0)**

12.8.2.6. Operators shall use caution when traveling on docks or loading platforms and remain clear of the edge. **(T-0)**

12.8.2.7. Operators shall not use forklifts to push or pull objects, such as freight cars, or to open and close freight, hangar or warehouse doors. **(T-0)** (**Exception**: When side-loading vans are not available, munitions containers with permanently installed skids may be pushed or pulled into open-ended vans with the use of a spotter. Ensure safety precautions, such as keeping personnel clear of potentially hazardous areas, have been considered and included in the procedure.)

12.8.2.8. Operators shall set brakes and dock locks or put wheel chocks in place to prevent any movement of trucks, trailers or railroad cars while loading or unloading. **(T-0)**

12.8.2.9. Operators who load and unload aircraft using materials handling and lifting equipment will comply with TO 36M-1-141, *Operator and Operation Instruction—Material Handling Equipment System Components of 463L,* TO 36M2-3-35-11, *Operation and Operator Maintenance Instructions, Truck, Aircraft Cargo Loading/Unloading 60,000 Pound Capacity,* and TO 36M2-3-45-1, *Halvorsen 25K Aircraft Cargo Loaders.* **(T-1)**

12.8.2.10. Refer to DESR 6055.09_AFMAN 91-201 for operating material handling and lifting equipment in explosives and weapons areas.

12.8.3. Maintenance.

12.8.3.1. Repairs to material handling equipment assets under Vehicle Management's control shall be accomplished by Vehicle Maintenance (maintenance agreement may be necessary for locally procured assets). **(T-1)** Deviations to this requirement shall be approved by host Vehicle Maintenance or installation vehicle maintenance contractor. **(T-1)**

12.8.3.2. Equipment shall be cleaned in designated locations and only with cleaning agents approved by the installation F&ES Flight and BE. **(T-1)**

12.9. Conveyors.

12.9.1. Safe Operations. Workers shall not operate conveyors unless all guards are in place. **(T-0)** Do not take off guards at end of conveyor or from belts feeding the conveyor. Workers will report defective or worn shafts, rollers or bearings that may break and permit rollers to fall from the frame. **(T-0)** Refer to **Chapter 21** for additional guidance on lockout/tagout requirements. Keep the area around them free of obstructions to permit a clear view of the conveyor and ready access to the devices. **(T-0)**

12.9.2. Inspections. Supervisors shall ensure the entire conveyor system is inspected daily. **(T-1)** Defective parts that affect safe operation of the system shall be replaced prior to continued operation. **(T-0)** Operators shall ensure crossover walkway surfaces are in good condition. **(T-0)**

12.9.3. Maintenance. No work shall be initiated on a power conveyor until the power switch or disconnect has been locked and tagged out. **(T-0)** Refer to **Chapter 21** for lockout/tagout procedures.

12.10. Manual Hoisting and Pulling Devices.

12.10.1. Safe Operations.

12.10.1.1. Lever-operated hoists shall only be used in a direct pull. **(T-0)** Where indirect pulls are permitted by design of the hoist, a sheave or pulley of adequate size shall be used. **(T-0)**

12.10.1.2. Hoist cables, ropes and chains shall not be wrapped around the load. **(T-0)** Use only slings or other approved lifting fixtures. **(T-0) Example:** Cargo straps shall not be used for lifting, unless stated in approved Air Force technical data. **(T-1)**

12.10.1.3. Extensions to levers, such as cheater bars or pipes, unless designed and permanently installed by the manufacturer, shall not be used to increase leverage. **(T-0)**

12.10.1.4. Manually operated lever hoists shall only be operated by personnel trained on use of the equipment. **(T-0)** Operator qualifications shall be as determined by the facility manager, shop supervisor or designated representative. **(T-2)**

12.10.1.5. The rated capacity shall not be exceeded except for authorized load tests. **(T-0)**

12.10.1.6. Hoists shall be attached to well-defined dead-end points capable of withstanding the intended load. **(T-0). Note:** Lifeline attach points shall not be used for hoists. **(T-0)**

12.10.2. Maintenance. Maintenance shall be performed in accordance with the manufacturer's instructions or applicable TO. **(T-0)**

12.11. Hoists. This section outlines basic requirements for power-operated hoists used for vertical lifting and are not permanently mounted to other equipment, e.g., a crane, monorail or derrick that serves as a supporting structure. **(T-0)**

12.11.1. Acquisition. Overhead hoists shall meet design specifications, characteristics and rules of ASME B30.7, *Winches*, B30.10, *Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks and Slings*, and B30.16, *Overhead Underhung and Stationary Hoists.* **(T-0)** When applicable, a system safety program shall be established. **(T-1) Note:** Nuclear-certified hoists must also meet requirements in AFMAN 91-118. **(T-1)**

12.11.2. Safety Requirements.

12.11.2.1. Hoist platforms shall have suitable side and overhead protection to prevent operator injury from a falling load. **(T-0)**

12.11.2.2. Standard operating signals, understood by operators and signalers, shall be used in hoist operations. **(T-0)**

12.11.2.3. Hoist engines and motors shall be guarded to protect personnel. **(T-0)**

12.11.2.4. Self-locking brakes, capable of holding at least 125 percent of the rated capacity, shall be installed on all hoists. **(T-0)**

12.11.2.5. The conductors and switches of electric hoists shall be guarded against accidental contact. **(T-0)**

12.11.2.6. All loads shall be balanced on hoist carriages and secured to prevent slipping or shifting. **(T-0)**

12.11.2.7. Latch-type safety hooks shall be installed on all hoists. **(T-0)**

12.11.2.8. Load Rating. The rated capacity shall be permanently marked on the hoist or its load block and shall be legible from the operating position. **(T-0)** The rated capacity for each member of the suspension device, when used as intended, shall be equal to the other suspension members to which it is attached. **(T-0)** When this is not feasible, a plan shall be developed to identify special precautions that shall be taken to ensure the lowest rated suspension member's rated capacity is not exceeded. **(T-0)**

12.11.2.9. Warnings. Supervisor will ensure information concerning operating procedures shall be posted by all hoists or displayed on a label affixed to the hoist, controls or block. **(T-1)**

12.11.3. Safe Operations.

12.11.3.1. The rated capacity shall not be exceeded except for properly authorized tests. **(T-0)** If it is known or suspected that a hoist may have been overloaded (other than a required and approved test load), the supervisor shall ensure that all frequent and periodic inspections are completed prior to use. **(T-0)**

12.11.3.2. When a *Danger, Out of Order, Do Not Start* or *Equipment Lockout* tag is attached to the starting controls, the hoist operator shall not apply power to the unit or start operations until the condition has been corrected and the tag and any lock(s) are removed. **(T-0)**

12.11.3.3. The operator shall be familiar with the equipment and its proper care. **(T-0)** If adjustments or repairs are necessary or any damage is observed or suspected, the operator shall promptly report the problem to the supervisor. **(T-0)**

12.11.3.4. Hoisting the load. Ensure that:

12.11.3.4.1. Hoist ropes or chains are not twisted about each other. **(T-0)**

12.11.3.4.2. The load does not contact any obstruction. **(T-0)**

12.11.3.4.3. Ropes or chains are protected against sharp edges of the load. **(T-0)**

12.11.3.5. The rope or chain shall be properly seated on the drum sheaves or sprockets before starting the lift. **(T-0)** Hoists shall not be operated until the hoist unit is centered over the load. **(T-0)**

12.11.3.6. A hoist shall not be used for hoisting personnel unless specifically designed for this purpose and only if it is the safest means of accomplishing the work. **(T-0)** Loads shall not be carried over personnel. **(T-0)**

12.11.3.7. The operator shall test the brakes each time a load is handled by raising the load just enough to clear the floor or supports and checking for brake action. **(T-0)** The lift shall be continued only after ensuring the braking system is operating properly. **(T-0)**

12.11.3.8. Suspended loads shall not be left unattended. **(T-0)**

12.11.3.9. If a load must remain suspended for a considerable time, a pawl or other equivalent means, rather than the brake alone, shall be used to hold the load. **(T-0)** The ground area below the suspended load shall be barricaded to prohibit entry of personnel or equipment. **(T-0)**

12.11.4. Maintenance.

12.11.4.1. Preventive Maintenance. The using organization shall establish a preventive maintenance program based on the manufacturer's recommendations. **(T-1)** (**Note:** If manufacturer's instructions cannot be obtained, the using organization shall contact the DAF equipment item manager for assistance. **[T-1]**) Preventive maintenance shall be documented in accordance with **paragraph 12.2.1,** as appropriate. **(T-1)**

12.11.4.2. Lubrication. All moving parts of the hoist for which lubrication is specified shall be regularly lubricated. **(T-0)** Manufacturer's or TO recommendations for points and frequency of lubrication and quantity and type of lubricant to be used shall be followed. **(T-0)** Machinery shall be stationary, with energy sources locked out, while lubricants are applied. **(T-0)**

12.11.4.3. Rope Replacement and Maintenance. Items requiring replacement or maintenance shall be in accordance with technical data, manufacturer's instructions or applicable ASME B30 standard. **(T-1)**

12.11.4.4. Adjustments and Repairs. Repair, replacements or adjustments shall be made as necessary to ensure correct performance of all hoist components. **(T-0)**

12.11.4.5. Maintenance Procedures. The following precautions shall be taken before adjustments or repairs are started on a hoist:

12.11.4.5.1. A lock and a danger or equipment lockout tag shall be placed on the hoist and all energy controls (air, electrical, hydraulic, etc.) locked out in accordance with **Chapter 21** when adjustments, modifications or repairs are scheduled. **(T-0)** The hoist operator will not apply power to the equipment or start operations until the conditions have been corrected and the tag and lock removed in accordance with **Chapter 21. (T-0)**

12.11.4.5.2. Drum pawls shall be engaged or other means provided to prevent load ropes from inadvertently rotating the mechanism. **(T-0)**

12.12. Slings. Refer to 29 CFR § 1910.184 and ANSI/ASME B30.9 for additional guidance. **Note:** Locally manufactured slings that do not meet the engineering requirements of ASME B30.9 are prohibited and shall be disassembled and removed from service. **(T-1) Note:** Written proof test certification is not required for new synthetic rope slings manufactured in accordance with ASME B30.9 and not used to lift nuclear or critical loads. **(T-1)**

12.12.1. DAF primarily uses four types of slings: ally steel chain, wire rope, metal mesh and synthetic web slings. **Note:** Refer to ASME B30.9 for guidance on other types of slings.

12.12.2. ASME B30.9 provides the required markings and identifications for each type of sling.

12.12.3. Specific Requirements.

12.12.3.1. Alloy Steel Chain Slings.

12.12.3.1.1. Prior to use, all new, repaired or reconditioned alloy steel chain slings, including all welded components in the sling assembly shall be proof tested to 200 percent of rated capacity. **(T-0)**

12.12.3.1.2. For multiple leg slings, each leg shall be proof tested to 200 percent of the single leg rated load. **(T-0)**

12.12.3.1.3. Alloy steel chain slings shall not be used with loads more than the rated capacities. **(T-0)**

12.12.3.1.4. Worn or damaged alloy steel chain slings and attachments shall not be used until repaired (or reconditioned) and proof tested by the manufacturer or a qualified person. **(T-0)**

12.12.3.1.5. Refer to 29 CFR § 1910.184 and ASME B30.9 for additional guidance.

12.12.3.2. Wire Rope Slings.

12.12.3.2.1. Prior to initial use, all new wire rope slings shall be proof tested as follows:

12.12.3.2.1.1. Proof load for swaged-socket and poured-socket assemblies shall be in accordance with the wire rope or fitting manufacturer's recommendations. **(T-0)**

12.12.3.2.1.2. Proof load for single leg hand tucked slings shall be not less than 100 percent or more than 125 percent of the rated capacity. **(T-0)**

12.12.3.2.1.3. Proof load for mechanical splice single leg slings and endless slings shall be 200 percent of the vertical rated capacity. **(T-0)**

12.12.3.2.1.4. Proof load for multiple leg bridle slings shall be applied to the individual legs and shall be 200 percent of the vertical rated capacity of a single leg sling of the same size, grade and construction of rope. **(T-0)**

12.12.3.2.2. Wire rope slings shall not be used with loads in excess of capacities. **(T-0)**

12.12.3.2.3. Only new rope shall be used to fabricate slings. **(T-0)** Use of repaired or reconditioned rope is prohibited. **(T-0)**

12.12.3.2.4. Refer to 29 CFR § 1910.184 and ASME B30.9 for additional guidance.

12.12.3.3. Metal Mesh Slings.

12.12.3.3.1. All new and repaired metal mesh slings, including handles, shall be proof tested at a minimum of 150 percent of their rated capacity before use. **(T-0)** Elastomer impregnated slings shall be proof tested before they are coated. **(T-0)**

12.12.3.3.2. Except for required proof tests, metal mesh slings shall not be used to lift loads in excess of their rated capacities. **(T-0)**

12.12.3.3.3. Refer to 29 CFR § 1910.184 and ASME B30.9 for additional guidance.

12.12.3.3.4. Metal mesh slings not impregnated with elastomers may be used from minus 20° F to 550° F without decreasing the working load limit. **(T-0)** Metal mesh slings impregnated with polyvinyl chloride or neoprene may be used only from 0° F to 200° F. **(T-0)** For operations outside these temperature ranges or for metal mesh slings impregnated with other materials, the sling manufacturer's recommendations shall be followed. **(T-0)**

12.12.3.4. Natural and Synthetic Fiber Rope Slings.

12.12.3.4.1. Prior to use, new fiber rope slings shall be proof tested to 200 percent of the vertical rated load. **(T-0)**

Fiber rope slings made from conventional three-strand construction rope shall not be used with loads in excess of rated capacities. **(T-0)**

12.12.3.4.2. Cargo straps shall not be used as a sling or part of a sling configuration. **(T-0)**

12.12.3.4.3. Only new rope shall be used to make fiber rope slings. **(T-0)** Use of repaired or reconditioned fiber rope slings is prohibited. **(T-0)**

12.12.3.4.4. Refer to 29 CFR § 1910.184 and ASME B30.9 for additional guidance.

12.13. Mobile and Locomotive Cranes. All crawler, locomotive and truck cranes shall meet design specifications, characteristics, and rules of ANSI/ASME B30.5, *Mobile and Locomotive Cranes.* **(T-0)**

12.13.1. Specific Requirements.

12.13.1.1. A substantial and durable rating chart with clearly legible letters and figures shall be securely fixed to the crane cab in a location easily visible to the operator while seated at the control station. **(T-0)** A duplicate load rating chart (legible from the ground) shall also be provided on the outside of the crane. **(T-0)** The load rating chart for truck cranes shall list loads for the crane operating both with and without counterweights. **(T-0)**

12.13.1.2. Exposed moving parts such as gears, set screws, projecting keys, chains, chain sprockets and reciprocating parts shall be guarded, as they may create a hazard to personnel. **(T-0)**

12.13.1.3. Some crane hazards, such as rotating equipment or holes, cannot be mechanically safeguarded. Personnel will exercise extreme care when exposed to unguarded rotating equipment or holes. **(T-1)** Such conditions shall be clearly marked with appropriate warning decals. **(T-0)**

12.13.1.4. Cranes shall be designed to protect operators from falling objects, swinging loads and cable failures. **(T-0)** Cranes that are operated in inclement weather, shall protect the operator from the weather. **(T-0)**

12.13.1.5. An audible warning device shall be provided when hoisting operations or moving equipment might endanger personnel in the work area. **(T-0)** The device control shall be within easy reach of the operator. **(T-0)**

12.13.2. Safe Operating Practices.

12.13.2.1. The operator will sound or give an audible warning signal each time before traveling (backing), and when approaching workers or other congested areas. **(T-1)** The signal may be mechanical (automatic) or oral.

12.13.2.2. During periods of non-use, high winds, or weather alerts, the operator will lower the boom to ground level, a resting platform or otherwise ensure the boom is secure against movement from wind or other forces. **(T-1)**

12.13.2.3. Operators shall be familiar with the equipment and its proper care. **(T-0)** If adjustments or repairs are necessary or any damage is known, the operator will report them promptly to the supervisor and document them in accordance with **paragraph 12.2.1,** as appropriate. **(T-1)**

12.13.2.4. All controls shall be tested by the operator at the start of a new shift. **(T-0)** Controls that do not operate properly shall be adjusted or repaired before continuing operation. **(T-0)**

12.13.2.5. No crane shall be loaded beyond its rated capacity, except for test purposes. **(T-0)** Weight of all loads shall be determined before lifting. **(T-1)**

12.13.2.6. The crane shall not be operated while anyone is on the load or hook. **(T-1)**

12.13.2.7. On truck mounted cranes, loads shall not be lifted over the front area of the truck unless specifically allowed by manufacturer's operating instructions. **(T-1)**

12.13.2.8. When two (2) or more cranes are used to lift one load, one designated person shall be responsible for the operation. **(T-0)** They will analyze the operation and instruct all personnel involved in proper positioning, rigging the load, and movements to be made. **(T-0)**

12.13.2.9. A designated supervisor shall be responsible for determining and controlling safety before traveling a crane with a load. **(T-0)** Decisions such as position of load, boom location, ground support, travel route and speed of movement shall be in accordance with his/her determination. **(T-0)** Specified tire pressures shall be maintained. **(T-0)** The boom shall be carried in line with the direction of motion, sudden starts and stops shall be avoided and tag or restraint lines shall be used to minimize swinging of the load. **(T-0)**

12.13.2.10. All crawler, locomotive and truck cranes shall operate on surfaces which will support the weight of the crane and the weight of the loads without supporting surfaces collapsing or slipping away from the crawlers, wheels and support stanchions. **(T-1)**

12.13.3. Maintenance.

12.13.3.1. The Vehicle Fleet Manager or Vehicle Management Superintendent shall establish a preventive maintenance program based on this publication and crane manufacturers' instructions. **(T-1)**

12.13.3.2. After adjustments and repairs have been made, the crane shall not be operated until all guards have been reinstalled, trapped air removed from hydraulic system, safety devices reactivated and maintenance equipment removed. **(T-0)** Adjustments to operating mechanisms, safety devices, control systems and power plants shall be maintained to ensure correct functioning. **(T-1)**

12.13.3.3. All replacement parts or repairs shall have at least the original manufacturer's design safety factor. **(T-0)**

12.13.3.4. Lubrication. All moving parts of the crane, where lubrication is specified, shall be regularly lubricated in accordance with manufacturer's instructions or TO procedures as to points and frequency of lubrication, maintenance of lubricant levels and types of lubricant. **(T-0)** Cranes not equipped for automatic or remote lubrication shall be stationary when lubricated, with all controls in the "*OFF*" position, the main power control switch, if equipped, locked out or "*OFF*" and pawls applied. **(T-0)**

12.14. Derricks. Refer to 29 CFR § 1910.181, *Derricks,* and 29 CFR § 1926.1436, *Derricks,* for guidance and information.

12.15. Related Hoisting Equipment.

12.15.1. Wire ropes, chains and hooks associated with cranes, hoists, slings and other types of lifting equipment shall be thoroughly inspected in accordance with **paragraph 12.4.6**. **(T-0)** Inspection for each item shall be documented in accordance with **paragraph 12.2.1**. **(T-1)** For routine and preventative maintenance on wire ropes, chains, sheaves, equalizers and other related equipment, refer to applicable OSHA and ASME B30-series standards.

12.15.2. Hooks. Refer to ASME B30.10, *Hooks*, for additional guidance and information.

12.15.2.1. Repairs by welding or reshaping are not recommended as a standard practice. If such repairs are attempted, they shall only be accomplished by a qualified person, and the hook shall be tested to the load requirements of the specific equipment in use. **(T-0) Note:** Hooks repaired by welding or reshaping are not authorized on nuclear-certified hoists or lifting equipment. 12.15.2.2. Rated capacity for a hook, when used as intended, shall be equal to other suspension members to which it is attached. **(T-0)** When this is not feasible, special precautions shall be taken to ensure the hook's rated capacity is not exceeded. **(T-0)**

12.15.2.3. Hooks shall not be painted. **(T-0)** Unless specifically permitted by TO or other technical guidance, DAF-users are not authorized to paint hooks. Hooks (including hooks on slings) received painted by the manufacturer may be used in applications not requiring them to be non-destructively inspected. Painted hooks removed from service shall be replaced. **(T-0) Note:** Painted hooks shall not be used on nuclear-certified hoists or lifting equipment or equipment used to lift critical loads. **(T-1) Note:** Hooks with protective coatings applied by the manufacturer that do not affect or interfere with NDI may be used in applications requiring hook NDI. **(T-1) Note:** Existing painted hooks may have the paint removed for NDI, but may not be repainted unless authorized above.

12.15.2.4. Where operations require removal or replacement of hooks and/or lifting fixtures, the lifting capacity of the hooks/lifting fixtures shall be marked on the hook/lifting fixture and readily identifiable to the hoist/crane operator to prevent overloading the crane or hook/lifting fixture when load capacities are different. **(T-0)**

12.15.2.5. Hooks, rings, oblong or pear-shaped links, welded or mechanical coupling links or other attachments shall have a rated capacity at least equal to that of the alloy steel chain with which they are used. **(T-0)** The sling shall not be used in excess of the rated capacity of the weakest component. **(T-0)**

12.16. Portable Automotive Lifting Devices and Related Equipment.

12.16.1. Requirements. All personnel shall observe all safety precautions in this chapter and those recommended by the manufacturers of the portable automotive lifting devices. **(T-1)** Always read the owner's manual before operating the portable automotive lifting devices. **(T-1)** The owner's manual/instructions spell out the proper operating procedures and basic function of the components, which includes the recommended replacement fluid, maintenance and inspection procedures and intervals as applicable.

12.16.2. Maintenance and Inspection.

12.16.2.1. Maintenance. The portable automotive lifting devices shall be maintained in accordance with the product instructions. **(T-0)**

12.16.2.2. Inspection.

12.16.2.2.1. Visual inspection shall be made before each use of the portable automotive lifting devices by checking for abnormal conditions, such as cracked welds, leaks and damaged, loose or missing parts. **(T-1)**

12.16.2.2.2. Other inspections shall be made per product operating instructions. **(T-1)**

12.16.2.2.3. Each portable automotive lifting devices shall be inspected immediately if the lift is believed to have been subjected to abnormal load or shock. **(T-1)** It is recommended that this inspection be made by a manufacturer's or supplier's authorized repair facility.

12.16.2.2.4. Owners and/or operators should be aware that repair of this equipment may require specialized knowledge and facilities. It is recommended that an annual inspection of the portable automotive lifting devices be made by a manufacturer's or supplier's repair facility and that any defective parts, decals or safety labels or signs are replace with manufacturer's or supplier's specified parts. A list of repair facilities is available from the manufacturer or supplier.

Table 12.1. Quick Reference Guide for Material Handling Equipment.

QUICK REFERENCE GUIDE FOR MATERIAL HANDLING EQUIPMENT		
MHE	**OSHA Standard**	**ANSI/ASME Standard**
Materials Handling Equipment	29 CFR § 1910, Subpart N, *Materials Handling and Storage*	ANSI/ASME B30.16, *Material Handling*
Hooks and Related Hoisting Equipment	29 CFR § 1910.244, *Other Portable Tools and Equipment* 29 CFR § 1926.1413, *Wire Rope—Inspection* 29 CFR § 1926.1414, *Wire Rope—Selection and Installation Criteria*	AMSE B30.10, *Hooks – Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks and Slings*
Manual Hoists	29 CFR § 1926.552, *Material Hoists, Personnel Hoists and Elevators*	ASME B30.21, *Lever Hoists*
Overhead and Gantry Cranes	29 CFR § 1910.179, *Overhead and Gantry Cranes* 29 CFR § 1926.554, *Overhead Hoists* 29 CFR § 1926.1438, *Overhead and Gantry Cranes*	ASME B30.2, *Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)*
Powered Industrial Trucks	29 CFR § 1910.178, *Powered Industrial Trucks*	American National Standards Institute/Industrial Truck Standards Development Institute Foundation (ANSI/ITSDF) B56.1A,

QUICK REFERENCE GUIDE FOR MATERIAL HANDLING EQUIPMENT		
		Safety Standard for Low Lift and High Lift Trucks
Slings	29 CFR § 1910.184, *Slings*	ASME B30.9, *Slings*
Mobile and Locomotive Cranes	29 CFR § 1910.180, *Crawler Locomotive and Truck Cranes* 29 CFR § 1926.1400, *Cranes and Derricks in Construction* 29 CFR § 1926.1433, *Design, Construction and Testing*	ASME B30.5, *Mobile and Locomotive Cranes*
Derricks	29 CFR § 1910.181, *Derricks* 29 CFR § 1926, Subpart CC, *Cranes and Derricks in Construction* 29 CFR § 1926.1436, *Derricks*	ASME B30.6, *Derricks*
Overhead Hoists (Underhung)	29 CFR § 1926.554, *Overhead Hoists*	ASME B30.16, *Overhead Hoists (Underhung)*
Cranes and Monorails	29 CFR § 1926.406, *Specific Purpose Equipment and Installations*	ASME B30.17, *Cranes and Monorails (With Underhung Trolley or Bridge)*
Cableways and Conveyors	29 CFR § 1926.555, *Conveyors*	ASME B30.19, *Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks and Slings*
Personnel Hoists	29 CFR § 1926.552, *Material Hoists, Personnel Hoists and Elevators* 29 CFR § 1926.1431, *Hoisting Personnel*	ASME B30.23, *Personnel Lifting Systems*
REFERENCE MATERIAL		
Subject	**Reference**	
Aircraft Equipment Management	AFI 21-101, *Aircraft and Equipment Maintenance Management*	
Lifting Equipment Design for Nuclear Weapon Systems	AFMAN 91-118, *Safety Design and Evaluation Criteria for Nuclear Weapon Systems*	
Operators Training	AFI 24-301, *Ground Transportation*	
MHE for Aircraft Loading/Unloading	TO 36M-1-141, *Operator and Operation Instruction—Material Handling Equipment System Components of* 463 TO 36M2-3-35-11, *Operation and Operator Maintenance Instructions, Truck, Aircraft Cargo Loading/Unloading 60,000 Pound* Capacity TO 36M2-3-45-1, *Halvorsen 25K Aircraft Cargo Loaders*	
MHE in Weapons and Explosive Areas	DESR 6055.09_AFMAN 91-201, *Explosives Safety Standards*	

QUICK REFERENCE GUIDE FOR MATERIAL HANDLING EQUIPMENT	
Lockout/Tagout Procedures	**Chapter 21**
Sling Guidance	OSHA's *Tables and Figures: Guidance on Safe Sling Use*
Note: This table is not all-inclusive. DAF adopts all the standards in the ASME B30-series.	

Table 12.2. Synthetic Web Slings. 1,000 Pounds per Inch of Width – Single Ply (Rated in capacity in pounds).

Sling Body Width (inches)	**Triangle -- Choker slings, type I** **Triangle -- Triangle slings, type II** **Eye and eye with flat eye slings, type III:** **Eye and eye with twisted eye slings, type IV**					
	Vertical	**Choker**	**Vertical Basket**	**30° Basket**	**45° Basket**	**60° Basket**
1	1,000	750	2,000	1,700	1,400	1,000
2	2,000	1,500	4,000	3,500	2,800	2,000
3	3,000	2,200	6,000	5,200	4,200	3,000
4	4,000	3,000	8,000	6,900	5,700	4,000
5	5,000	3,700	10,000	8,700	7,100	5,000
6	6,000	4,500	12,000	10,400	8,500	6,000
Sling Body Width (inches)	**Endless Slings, type V**					
	Vertical	**Choker**	**Vertical Basket**	**30° Basket**	**45° Basket**	**60° Basket**
1	1,600	1,300	3,200	2,800	2,300	1,600
2	3,200	2,600	6,400	5,500	4,500	3,200
3	4,800	3,800	9,600	8,300	6,800	4,800
4	6,400	5,100	12,800	11,100	9,000	6,400
5	8,000	6,400	16,000	13,900	11,300	8,000
6	9,600	7,700	19,200	16,600	13,600	9,600
Sling Body Width (inches)	**Return Eye Slings, type VI**					
	Vertical	**Choker**	**Vertical Basket**	**30° Basket**	**45° Basket**	**60° Basket**
1	800	650	1,600	1,400	1,150	800
2	1,600	1,300	3,200	2,800	2,300	1,600
3	2,400	1,950	4,800	4,150	3,400	2,400
4	3,200	2,600	6,400	5,500	4,500	3,200
5	4,000	3,250	8,000	6,900	5,650	4,000
6	4,800	3,800	9,600	8,300	6,800	4,800
Notes: 1. All angles shown are measured from the vertical. 2. Capacities for intermediate widths not shown may be obtained by interpolation.						

Table 12.3. Synthetic Web Slings. 1,200 Pounds per Inch of Width – Single Ply (Rated capacity in pounds).

Sling Body Width	**Triangle -- Choker slings, type I** **Triangle -- Triangle slings, type II**

(inches)	Eye and eye with flat eye slings, type III: Eye and eye with twisted eye slings, type IV					
	Vertical	**Choker**	**Vertical Basket**	**30° Basket**	**45° Basket**	**60° Basket**
1	1,200	900	2,400	2,100	1,700	1,200
2	2,400	1,800	4,800	4,200	3,400	2,400
3	3,600	2,700	7,200	6,200	5,100	3,600
4	4,800	3,600	9,600	8,300	6,800	4,800
5	6,000	4,500	12,000	10,400	8,500	6,000
6	7,200	5,400	14,400	12,500	10,200	7,200
Sling Body Width (inches)	**Endless Slings, type V**					
	Vertical	**Choker**	**Vertical Basket**	**30° Basket**	**45° Basket**	**60° Basket**
1	1,900	1,500	3,800	3,300	2,700	1,900
2	3,800	3,000	7,600	6,600	5,400	3,800
3	5,800	4,600	11,600	10,000	8,200	5,800
4	7,700	6,200	15,400	13,300	10,900	7,700
5	9,600	7,700	19,200	16,600	13,600	9,600
6	11,500	9,200	23,000	19,900	16,300	11,500
Sling Body Width (inches)	**Return Eye Slings, type VI**					
	Vertical	**Choker**	**Vertical Basket**	**30° Basket**	**45° Basket**	**60° Basket**
1	950	750	1,900	1,650	1,350	950
2	1,900	1,500	3,800	3,300	2,700	1,900
3	2,850	2,250	5,700	4,950	4,050	2,850
4	3,800	3,000	7,600	6,600	5,400	3,800
5	4,750	3,750	9,500	8,250	6,750	4,750
6	5,800	4,600	11,600	10,000	8,200	5,800
Notes: 1. All angles shown are measured from the vertical. 2. Capacities for intermediate widths not shown may be obtained by interpolation.						

Table 12.4. Synthetic Web Slings. 1,600 Pounds per Inch of Width – Single Ply (Rated capacity in pounds).

Sling Body Width (inches)	Triangle -- Choker slings, type I Triangle -- Triangle slings, type II Eye and eye with flat eye slings, type III: Eye and eye with twisted eye slings, type IV					
	Vertical	**Choker**	**Vertical Basket**	**30° Basket**	**45° Basket**	**60° Basket**
1	1,600	1,200	3,200	2,800	2,300	1,600
2	3,200	2,400	6,400	5,500	4,500	3,200
3	4,800	3,600	9,600	8,300	6,800	4,800
4	6,400	4,800	12,800	11,100	9,000	6,400
5	8,000	6,000	16,000	13,800	11,300	8,000

Sling Body Width (inches)	Triangle -- Choker slings, type I Triangle -- Triangle slings, type II Eye and eye with flat eye slings, type III: Eye and eye with twisted eye slings, type IV					
	Vertical	**Choker**	**Vertical Basket**	**30° Basket**	**45° Basket**	**60° Basket**
6	9,600	7,200	19,200	16,600	13,600	9,600
Sling Body Width (inches)	**Endless Slings, type V**					
	Vertical	**Choker**	**Vertical Basket**	**30° Basket**	**45° Basket**	**60° Basket**
1	2,600	2,100	5,200	4,500	3,700	2,600
2	5,100	4,100	10,200	8,800	7,200	5,100
3	7,700	6,200	15,400	13,300	10,900	7,700
4	10,100	8,200	20,400	17,700	14,400	10,200
5	12,800	10,200	25,600	22,200	18,100	12,800
6	15,400	12,300	30,800	26,700	21,800	15,400
Sling Body Width (inches)	**Return Eye Slings, type VI**					
	Vertical	**Choker**	**Vertical Basket**	**30° Basket**	**45° Basket**	**60° Basket**
1	1,050	1,050	2,600	2,250	1,850	1,300
2	2,600	2,100	5,200	4,500	3,700	2,600
3	3,900	3,150	7,800	6,750	5,500	3,900
4	5,100	4,100	10,200	8,800	7,200	5,100
5	6,400	5,150	12,800	11,050	9,050	6,400
6	7,700	6,200	15,400	13,300	10,900	7,700
Notes: 1. All angles shown are measured from the vertical. 2. Capacities for intermediate widths not shown may be obtained by interpolation.						

Table 12.5. Number of Spacing of Clips for Ropes of Various Sizes. (If manufacturer's recommendations are not available).

Rope Diameter (inches)	Minimum Number Of Drop Forged Clips	Amount of Rope to Turn Back (inches)	Torque in Ft. Lbs.	Minimum Spacing (inches)
1/8	3	3-1/4	4.5	3
¼	3	4-3/4	15	3
½	3	11-1/2	65	3
5/8	3	12	95	3-3/4
¾	4	18	130	4-1/2
7/8	4	19	225	5-1/4
1	5	26	225	6
1-1/8	6	34	225	6-3/4
1-1/4	6	44	360	7-1/2
1-3/8	7	44	360	8-1/4

1-1/2	7	54	360	9
1-5/8	8	58	430	
1-3/4	8	61	590	
2	8	71	750	
2-1/4	8	73	750	

Notes:
1. Apply the initial load and retighten nuts to the recommended torque. The rope will stretch and shrink in diameter when loads are applied inspect periodically and retighten.
2. The efficiency rating of a properly prepared termination for clip sizes 1/8 to 7/8 in. is approximately 80 percent and for sizes 1 to 3 in. is approximately 90 percent. This rating is based on the catalog breaking strength of wire rope. If a pulley is used in place of a thimble for turning back the rope, add one additional clip.
3. 1 in. = 2.54 cm. / 1 ft-lb = 1.36 Newton-meter.
4. The number of clips shown is based upon using right regular or Lang lay wire rope, 6 x 19 class or 6 x 37 class, fiber core or Independent Wire Rope Core, Improved Plow Steel or Extra Improved Plow Steel. If Seale construction or similar large outer wire type construction in the 6 x 19 class is used for sizes 1 in. (2.5 cm) and larger, add one additional clip.
5. The number of clips shown also applies to right regular lay wire rope, 8 x 19 class, fiber core, Improved Plow Steel, nominal sizes 1-1/2 in. and smaller; and right regular lay wire rope, 18 x 7 class, fiber core, Improved Plow Steel or Extra Improved Steel, nominal sizes 1-3/4 in. and smaller.
6. For other classes of wire rope not mentioned above, it may be necessary to add additional clips to the number shown.
7. Turn back the specified amount of rope from the thimble. Apply the first clip one base width from the dead end of the wire rope (U-bolt over dead end — live end rests in clip saddle). Tighten nuts evenly to recommended torque.
8. Apply the next clip as near the loop as possible. Turn on nuts firm but do not tighten. Space additional clips, if required, equally between the first two. Turn on nuts — take up rope slack — tighten all nuts evenly on all clips to recommended torque.

Chapter 13

FALL PROTECTION

13.1. Scope. This chapter applies to all workplaces and covers all walking-working surfaces unless specifically covered by another chapter or industry.

13.1.1. General Industry. Fall protection shall be provided whenever employees can fall four (4) feet or more. **(T-0)** This four (4) foot rule applies to all walking and working surfaces and includes open-sided floors and platforms, wall openings and window wall openings at a stairway landing, floor, platform or balcony with a drop of four (4) feet or more. Refer to 29 CFR § 1910, Subpart D – *Walking-Working Surfaces,* for additional requirements, and **paragraph 13.2.4** for types of fall protection. **Exception**: Refer to **paragraph 7.1.9.5** for vehicle repair, service and assembly pits.

13.1.2. Construction Operations. Fall protection shall be provided when employees can fall six (6) feet or more during construction operations. **(T-0)** This six (6) foot rule applies to all walking and working surfaces, including roofs, open-sided floors and platforms, wall openings and window wall openings at a stairway landing, floor, platform or balcony with a drop of six (6) feet or more. Refer to 29 CFR § 1926, Subpart M – *Fall Protection* (29 CFR § 1926.500), for additional requirements.

13.1.3. Work on low-slope roofs shall be in accordance with 29 CFR § 1910.28(b)(13) and 29 CFR § 1926.501(b)(10). **(T-0)**

13.1.4. Aircraft Flightline Operations. Flightline operations will meet the requirements of this chapter and **Chapter 24. (T-0)**

13.1.5. Portable Ladders. Refer to **Chapter 7,** 29 CFR § 1910.23, *Ladders,* and 29 CFR § 1926.1053, *Ladders,* for additional requirements and guidance.

13.1.6. Powered Platforms, Aerial Lifts and Scaffolding. Refer to **Chapter 16,** 29 CFR §§ 1910.66(j), *Powered Platforms for Building Maintenance,* 1910.67(c)(2)(v), *Vehicle-Mounted Elevating and Rotating Work Platforms,* and 1910.27, *Scaffolds and Rope Descent Systems,* for additional requirements and guidance.

13.1.7. Fire and Emergency Services. Fall protection shall be provided for FES personnel when exposed to falls greater than four (4) feet during routine operations as stipulated by General Industry standards (29 CFR § 1910, Subpart D).

13.1.8. ANSI/ASSP Z359.0, *Definitions and Nomenclature Used for Fall Protection and Fall Arrest,* and ANSI/ASSP Z359.2, *Minimum Requirements for a Comprehensive Managed Fall Protection Program,* are incorporated by reference as referenced by this chapter.

13.1.9. This chapter does not apply to portable ladders or when employers are inspecting, investigating or assessing workplace condition or work to be performed prior to the start of the work or after all work has been performed. Refer to 29 CFR § 1910.28(a)(2), *Duty to Have Fall Protection and Falling Object Protection,* for specific exemptions to this paragraph.

13.2. Hazards and General Information.

13.2.1. General Hazards.

13.2.1.1. Falls from open-sided floors and platforms, wall openings and window wall openings at a stairway landing, floor, platform or balcony with a drop of four (4) feet or more.

13.2.1.2. Working over dangerous equipment and machinery that is not covered or guarded to eliminate the hazard.

13.2.2. Hazards to consider when using personal fall arrest systems equipment to protect from damage when used.

13.2.2.1. Electrical.

13.2.2.1.1. Wire rope or rope covered wire lanyards, some plastics (such as nylon) and wet lanyards are conductive and shall not be used near electrical hazards. **(T-0)**

13.2.2.1.2. Metal personal fall arrest systems connectors.

13.2.2.2. Thermal.

13.2.2.3. Chemical.

13.2.2.4. Sharp edges and abrasive surfaces.

13.2.3. Refer to **Chapter 2** and **Chapter 14** for additional guidance on workplace hazards and proper PPE.

13.2.4. Types of Fall Protection.

13.2.4.1. Passive. Passive fall protection, such as guardrails, work stands and platforms (aircraft maintenance stands, e.g., B-1, B-4, B-5), nets, ladder cages and other devices can prevent an employee from falling, but are not directly connected to the employee. If passive fall protection is not feasible, active fall protection is the preferred option. **Note:** Nets do not prevent an employee from falling, but does prevent an employee from hitting the next level.

13.2.4.2. Active. Active fall protection devices include, but are not limited to, ladder climbing devices and personal fall arrest, positioning and restraint systems (requiring employees to wear a harness and attach to an anchorage or lifeline).

13.2.4.2.1. Positioning and restraint systems. Fall restraint/positioning systems restrict an employee's range of movement preventing the individual from falling.

13.2.4.2.2. Personal Fall Arrest Systems (PFAS). PFAS allow an employee to fall, but limits arresting loads to generally safe levels and prevents the employee from hitting the next level. Refer to paragraph **13.8** and **29** CFR § 1910.140, *Personal Fall Arrest Systems,* for additional guidance on PFAS.

13.3. Fall Protection Program.

13.3.1. Unit Fall Protection Policy. A policy statement will be developed that states the commander's commitment to providing a safe workplace for employees working at heights. **(T-1)** The policy will also provide general goals and guidance for the fall protection program. **(T-1)** An example statement can be found in ANSI/ASSP Z359.2.

13.3.2. Responsibilities.

13.3.2.1. Unit Commander. The unit commander is ultimately responsible for the development and implementation of the fall protection program that promotes a safe and healthful workplace.

13.3.2.2. Unit Fall Protection Program Administration. The unit fall protection program will be administered and managed by a competent person as defined in **paragraph 13.3.2.4** The unit commander will assign a person to act as an administrative liaison between the unit and the installation Occupation Safety office. **(T-1)** The competent person will be identified in writing by the unit commander and meet the requirements of ANSI/ASSP Z359.0 and ANSI/ASSP Z359.2. **(T-1)** This includes providing and evaluating fall protection training, and, as applicable, developing, implementing, monitoring and evaluating the fall protection program to assure unit compliance with ANSI/ASSP Z359.2 and as defined in 29 CFR § 1910.21(b). **(T-0)**

13.3.2.3. Qualified Person. In accordance with ANSI/ASSP Z359.0, the qualified person shall:

13.3.2.3.1. Be trained and meet the responsibilities outlined in ANSI/ASSP Z359.2 and as defined in 29 CFR § 1910.21(b). **(T-0)**

13.3.2.3.2. Be designated in writing by the unit commander. **(T-1)** If the qualified person comes from outside the organization, documentation of the service agreement will be kept on file. **(T-1)**

13.3.2.4. Competent Person. In accordance with ANSI/ASSP Z359.0, the competent person shall:

13.3.2.4.1. Be trained and meet the responsibilities outlined in ANSI/ASSP Z359.2 and as defined in 29 CFR § 1910.140(b). **(T-0)**

13.3.2.4.2. Be designated in writing by the unit commander. **(T-1)**

13.3.2.5. Authorized Person. Authorized person will meet the definition outlined in 29 CFR § 1910.21(b) and ANSI/ASSP Z359.0 and meet all applicable responsibilities in ANSI/ASSP Z359.2. **(T-0)**

13.3.2.6. Installation occupational safety. The installation occupational safety office (or applicable tenant safety office) will provide advice and guidance to the Unit Fall Protection Program Administrator in the management of the unit fall protection program. **(T-1)** These duties include:

13.3.2.6.1. Assisting in fall hazard surveys and development of written fall protection and rescue procedures to ensure rescue procedures, equipment and training meet fall protection requirements in **paragraph 13.5**. **(T-1)**

13.3.2.6.2. Identifying unabated fall hazards and providing a risk assessment code (RAC) and tracked in accordance with AFI 91-202. **(T-1)**

13.3.2.6.3. Conduct thorough annual review of fall protection program elements and documents annually in safety inspection/assessment reports. **(T-1) Note:** Occupational safety professionals do not meet the requirements of a qualified person or competent person in accordance with ANSI/ASSP Z359.0 and will not be used to fulfill those roles, unless they meet requirements found in paragraphs **13.3.2.3** and **13.3.2.4**. **(T-1)**

13.3.2.7. Fire & Emergency Services (F&ES) Flight. The F&ES Flight will assist in the fall hazard surveys and development of written fall protection and rescue procedures. The F&ES Flight will ensure equipment and training meet fall protection requirements in **paragraph 13.4** and **paragraph 13.5**. **(T-1)** The F&ES Flight may also act as the competent rescuer when they meet the requirements as defined in ANSI/ASSP Z359.0 to perform rescue at height when included in the organizational rescue plan and agreed to by the installation fire chief.

13.3.2.8. Authorized Rescuers. Authorized rescuers will meet the definition outlined in ANSI/ASSP Z359.0 and meet all applicable responsibilities in ANSI/ASSP Z359.2. **(T-1)**

13.3.2.9. Supervisors. Supervisors shall: (**Note:** Refer to AFI 91-202 for additional responsibilities.)

13.3.2.9.1. Ensure each authorized, qualified and competent person using a fall protection/fall arrest system is trained and evaluated on proper use, application and inspection of fall protection/fall arrest systems. **(T-1)** A supervisor may also be a qualified, competent and/or authorized person if they meet the requirements of **paragraph 13.7**.

13.3.2.9.2. Be familiar with the shop's typical work assignments and fall protection/fall arrest systems required. **(T-1)**

13.3.2.9.3. Be responsible for the procurement of fall protection/fall arrest systems required by the organization or shop as directed by the qualified person. **(T-1)**

13.3.2.9.4. Be able to provide recommendations for qualified and competent personnel in the organization to the unit commander. **(T-1)**

13.3.2.9.5. Be designated in writing by the unit commander. **(T-1)**

13.3.2.10. Trainers. Trainers will be designated in writing by the unit commander. **(T-2)** **Note:** If the trainer comes from outside the organization, documentation of the service agreement will be kept on file. **(T-1)**

13.3.3. Fall Protection Assessments.

13.3.3.1. The unit fall protection program administrator will assess the compliance of the fall protection program requirements, with assistance of the competent/qualified person, as needed. **(T-1)** Findings will be documented and corrected. **(T-1)**

13.3.3.1.1. Final report will be routed to the unit commander for review and signature within 10 days of assessment completion. **(T-1)**

13.3.3.1.2. The unit fall protection program administrator will maintain a minimum of three (3) years of completed assessments. **(T-1)**

13.3.3.2. The installation or tenant unit's Occupational safety office will complete an annual assessment of fall protection program requirements for each unit and document results as required in AFI 91-202. **(T-1)**

13.4. Fall Hazard Survey.

13.4.1. A fall hazard survey will be conducted in all work areas where employees are exposed to fall hazards. **(T-1)** The survey team will be led by the unit competent/qualified person(s)

and comprised of the work center supervisors, authorized persons, installation occupational safety office and F&ES Flight. **(T-1)** Team composition allows all personnel to have input on the hazards and best ways to protect against those hazards. Refer to ANSI/ASSP Z359.2 for additional guidance about fall hazard surveys.

13.4.2. A fall hazard survey will include:

13.4.2.1. Identification of fall hazards and include details of each hazard such as: **(T-1)**

13.4.2.1.1. Means of access to the fall hazards.

13.4.2.1.2. Locations of the fall hazards.

13.4.2.1.3. Tasks that create exposure to fall hazards.

13.4.2.1.4. Hidden fall hazards that are not always readily apparent.

13.4.2.2. Pertinent information about the fall hazards to include showing its basic configuration. **(T-1) Note:** Use of graphics, drawings and/or photographs are highly encouraged.

13.4.2.3. Identification of environmental factors that will affect the installation, use, inspection, maintenance and dismantling of any fall protection system. **(T-1)**

13.4.2.4. A risk assessment to determine the level of risk for each fall hazard identified. **(T-1)** Assign risk assessment codes (RACs), as necessary. Refer to AFI 91-202, *The US Air Force Mishap Prevention Program*, for additional guidance on RACs.

13.4.2.5. Appropriate abatement actions, as required by AFI 91-202. **(T-1)**

13.4.2.6. Selected fall protection method(s) for each identified hazard. **Note:** If personal fall arrest systems are selected, the calculation of all clearances will be included in the written fall protection procedures. Employees shall not use PFAS until adequate clearances are available.

13.4.3. Competent or qualified person will prepare the fall hazard survey report and submit copies to the unit fall protection program administrator, F&ES Flight and installation occupational safety office. **(T-1)**

13.4.4. Fall hazard surveys will be updated or re-accomplished when changes occur in the work center. **(T-1)** Completed fall hazard surveys will be maintained by the unit fall protection program administrator and be available to all qualified, competent and authorized workers for reference. **(T-1)**

13.4.5. When fall hazards are identified resulting from item or equipment upgrades, modification or replacements, the DAF item managers (depot level) shall perform necessary functions (e.g., describing planned upgrades, costs, timetables and prioritization), for DAF equipment not meeting fall protection standards. **(T-1) Note:** Reference **paragraph 24.16** for further details.

13.5. Written Fall Protection and Rescue Procedures.

13.5.1. Fall protection and rescue procedures will be documented specifically for each workplace and task they are applied to when the use of fall protection is required. **(T-1)** If a procedure can be effectively used in multiple workplaces/tasks, then the same procedure can

be used. Procedures shall be prepared and modified by a qualified or competent person as defined in this chapter. **(T-1)** Fall protection and rescue procedures shall be reviewed every two years for currency and accuracy. **(T-1)**

13.5.2. Written procedures shall include:

13.5.2.1. Purpose of the fall protection procedure. **(T-1)**

13.5.2.2. Location and photographs/diagrams of the fall hazard(s) and fall protection system setup. **(T-1)**

13.5.2.3. Appropriate standards, regulations or requirements for the task(s) conducted. **(T-1)**

13.5.2.4. Training requirements for the fall protection procedure based on the fall protection equipment required. **(T-1)**

13.5.2.5. Fall protection system design parameters. **(T-1) Note:** Include fall calculations based on identified equipment and equipment design parameters, which include a detailed list of PPE and who developed the procedure, when it was developed, system certifications and inspection logs.

13.5.2.6. Equipment requirements. **(T-1)**

13.5.2.7. Procedures documenting how to safely erect, use and dismantle the fall protection equipment. **(T-1)**

13.5.2.8. Preparatory actions to be conducted by the supervisor to ensure authorized persons know the fall protection and rescue procedures. **(T-1)**

13.5.2.9. Steps to take when work is completed, e.g., clean up, storage. **(T-1)**

13.5.2.10. A detailed rescue plan, which includes: **(T-1)**

13.5.2.10.1. Coordination with outside rescue agencies (installation F&ES Flight, contracted rescue unit, etc.) to determine requirements to ensure prompt rescue of fallen personnel as part of preplanning. **(T-1)** Ensure the outside rescue agency completes pre-planning prior to work start.

13.5.2.10.2. Procedures to contact the rescue agency if a fall occurs. **(T-1)**

13.5.2.10.3. Training on actions an authorized person can take to attempt self-rescue, when possible. **(T-1)**

13.5.2.10.4. Actions to be taken by the organization to rescue fallen authorized personnel, when possible. **(T-1)**

13.5.2.10.5. Location of rescue anchorage. **(T-1)**

13.5.2.10.6. Equipment needed. **(T-1)**

13.5.2.10.7. Location of attachment to fallen employee's harness. **(T-1)**

13.5.2.10.8. Specific actions to achieve successful rescue. **(T-1)**

13.5.2.10.9. Required training for rescuers. **(T-1)**

13.5.3. The unit shall establish good lines of communication with the installation F&ES Flight or a contracted rescue agency for prompt rescue of a fallen worker. **(T-1)** When rescue by the F&ES Flight or contracted agencies is unavailable, then the unit shall ensure a unit rescue team is available. **(T-1)** (**Warning**: Hanging in a harness for an extended period of time can be fatal. Consideration should be given to purchasing and utilizing suspension trauma prevention devices as an adjunct to a six-minute rescue plan as outlined below.) In accordance with ANSI/ASSP Z359.4, *Safety Requirements for Assisted-Rescue and Self-Rescue Systems, Subsystems and Components*, prompt rescue means getting to the subject within six (6) minutes after an accidental fall.

13.6. Fall Protection Plans. Fall protection plans will be used only in construction, for residential roofs, leading edge work and precast concrete erection work. **(T-0)** The written plan shall be coordinated with the installation occupational safety office (or applicable tenant Safety office) before the plan and its procedural controls are used. **(T-1)** When it is determined to not be feasible to use fall protection systems while on residential roofs as identified in 29 CFR § 1910.28(b)(1)(ii), a written fall protection plan, meeting the requirements of 29 CFR § 1926.502(k) and coordinated with the installation occupational safety office, shall be developed. **(T-0)** Training for the fall protection plan must meet the requirements of 29 CFR § 1926.503(a) and (c). **(T-0)** **Note:** A corrective action plan will be accomplished describing planned upgrades (equipment, cost and timetable, prioritized by the shop) and appropriate Risk Assessment Codes, to partially or totally eliminate need for procedural controls. **(T-1)** Consistent with OSHA guidelines, cost shall not be a consideration for selecting the fall protection plan's procedural controls versus implementing fall protection. **(T-0)**

13.7. Training. Before employees are exposed to a fall hazard, training shall be completed in accordance with 29 CFR § 1910.30, *Training Requirements*. **(T-0)** Trainers conducting fall protection and rescue training shall meet the requirements of ANSI/ASSP Z490.1, *Criteria for Accepted Practices in Safety, Health and Environmental Training.* **(T-1)**

13.7.1. Qualified and competent persons will be trained in accordance with ANSI/ASSP Z359.2 to meet requirements found in 29 CFR § 1910.21(b) and 29 CFR § 1910.140(b). **(T-0)** Personnel trained as a qualified person must also meet the training requirements of a competent person before applying fall protection system principles. **(T-1)**

13.7.2. Authorized personnel will be trained by a competent or qualified person trainer in accordance with ANSI/ASSP Z359.2. **(T-1)**

13.7.3. Program administrators shall be trained on all equipment and practices applicable to the scope of work in accordance with ANSI/ASSP Z359.2. **(T-1)**

13.7.4. Retraining. Supervisors shall ensure authorized persons are retrained in accordance with 29 CFR § 1910.30(c). **(T-0)**

13.7.5. Recurring Training. Recurring training shall be performed at least annually. **(T-1)** The training shall establish employee proficiency, include an in-depth review of current and previous procedures and introduce a new or revised control methods and procedures, as necessary. **(T-1)**

13.7.5.1. Personnel trained as competent and authorized persons shall be retrained at least every two years. **(T-1)** Annual refresher training shall be conducted the year following attendance in the initial course. **(T-1)**

13.7.5.2. Competent and authorized persons who are also identified as rescuers must meet requirements as identified in **paragraph 13.3.2.8**. **(T-1)**

13.7.6. Training Documentation. All training, e.g., familiarization, initial, retraining and recurring, shall be documented in accordance with AFI 91-202, with the required information detailed in OSHA Publication 2254, *Training Requirements in OSHA Standards.* **(T-0)**

13.8. Equipment Inspections and Maintenance.

13.8.1. Personal fall arrest systems (PFAS) users shall comply with TO 00-25-245, *Operations Instructions - Testing and Inspection Procedures for Personnel Safety and Rescue Equipment,* and manufacturer's instructions for inspection, maintenance, cleaning and storage. **(T-1)** If defects or damage to equipment or inadequate maintenance of equipment is found, the equipment shall be immediately tagged unserviceable and removed from service. **(T-1)** Unserviceable PFAS will be destroyed to prevent further use. Inspections shall be documented in accordance with TO 00-25-245 or manufacturer's instructions, whichever is more restrictive. **(T-1)**

13.8.2. Authorized person(s) shall inspect PFAS prior to use. **(T-0)**

13.8.3. Supervisors shall ensure all PFAS components receive a thorough inspection at least quarterly. **(T-1)** This inspection shall be documented and maintained for at least one year. **(T-1) Exception**: Components of a PFAS that have been professionally installed and certified will be inspected in accordance with manufacturer's instructions, at the interval recommended by the manufacturer, and by a person qualified to perform the inspection. Inspection shall be documented and maintained. **(T-1)**

13.8.4. Supervisors shall maintain manufacturer's instructions and performance testing information for PFAS used by their employees. **(T-1)**

13.8.5. For overseas locations, the use of anchorage points is authorized when the host country provides documentation of applicable testing and inspections.

13.9. Fall Mishap Reporting. Falls from heights, regardless of whether an injury or damage has occurred, will be reported to the servicing occupational safety office and investigated by a competent person and occupational safety personnel. **(T-0)** A mishap investigation will be accomplished to determine the cause of the fall and used to correct any issues found in procedures, equipment or rescue, as applicable. **(T-0)**

Chapter 14

PERSONAL PROTECTIVE EQUIPMENT (PPE)

14.1. Scope. This chapter establishes DAF specific personal protective equipment (PPE) requirements, to include the use, selection, care and maintenance for protective equipment for eyes, face, head and extremities, protective clothing, respiratory devices and protective shields/barriers. Additional OSHA requirements are found in 29 CFR § 1910, Subpart I, *Personal Protective Equipment,* and 29 CFR § 1926, Subpart E, *Personal Protection and Life Saving Equipment.* For issues involving Radio Frequency or laser radiation, refer to AFI 48-109 *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health Program,* AFI 48-139 and AFMAN 48-148. **Note:** A cross-reference of host nation and US standards is not available. On a case-by-case basis, when procuring PPE outside of the DAF supply system, each wing/delta/installation should conduct a product risk assessment to determine if the product meets or exceeds the US standards. If the product does not meet or exceed the US standards, then purchase a product within US standards, if possible.

14.2. Training.

14.2.1. Training shall be provided to each affected employee who is required to use PPE when accomplishing any work activity. **(T-0)** Supervisors shall train each employee in accordance with 29 CFR § 1910.132(f), *Training,* and applicable manufacturer's instructions. **(T-0)** Respiratory protection training shall be in accordance with 29 CFR § 1910.134, *Respiratory Protection,* and AFI 48-137. **(T-0)** Hearing protection shall be in accordance with AFI 48-127.

14.2.2. Retraining. Affected employees shall be retrained in accordance with 29 CFR § 1910.132(f)(3) when:

14.2.2.1. There is a change in their job assignment(s). **(T-0)**

14.2.2.2. There is a change in the work processes that present a new hazard. **(T-0)**

14.2.2.3. There is a change in the type of PPE required/used. **(T-0)**

14.2.2.4. Other conditions as specified in 29 CFR § 1910.147(f)(3) requires retraining. **(T-0)**

14.2.3. Supervisor shall document training in accordance with **paragraph 1.7** and AFI 91-202. **(T-1)** Respiratory training shall be documented in accordance with AFI 48-137. **(T-1)**

14.3. Hazard Assessment and Equipment Selection. The use of PPE is the least preferred method and not a replacement for other, more effective controls, such as elimination, substitution, engineering and administrative controls. If a hazard assessment reveals PPE is the best solution, or until controls can be implemented, PPE, e.g., hard hats, gloves, hearing protection, will be the primary means to protect personnel against hazards. **Note:** If PPE is required for the performance of a task, it shall be provided by the command and/or functional manager. **(T-1)** Subordinates are not responsible for providing their own PPE. A documented job hazard analysis (JHA) shall be conducted to determine if hazards are present and take actions necessary to protect employees from injury, illness or death in accordance with 29 CFR § 1910.132(d), *Hazard the Assessment and Equipment Selection: Personal Protective Equipment – General Requirements.* **(T-0)** Units should consult with the installation occupational safety office and BE if they have questions regarding

PPE. BE is responsible for selecting respirator and filter types, and fit testing for users requiring respiratory protection.

14.3.1. Supervisors shall:

14.3.1.1. Conduct and document hazard assessments in accordance with 29 CFR § 1910.132(d). **(T-0)** Refer to **paragraph 1.5** and AFI 91-202 for additional guidance on JHA.

14.3.1.2. Contact BE and Environmental Management when workplace operations change to schedule appropriate evaluation when new hazardous materials are introduced, processed or procedures are changed, or engineering controls are modified or added. **(T-1)**

14.3.1.3. If PPE is required, the supervisor shall ensure that PPE is provided, used and maintained in a sanitary and serviceable condition in accordance with manufacturer's instructions. **(T-0)**

14.3.2. DAF personnel shall comply with PPE requirements and:

14.3.2.1. Ensure PPE is used when required, serviceable, and properly adjusted or fitted. **(T-0)**

14.3.2.2. Notify their supervisors if they wear contact lenses. **(T-0)** This information is vital to emergency medical personnel who may need to remove a lens from the individual's eye. The use of contact lenses can present additional hazards, e.g., chemical environments, welding operations. A JHA should be conducted to ensure that the use of contact lenses does not expose employees to additional risks.

14.3.2.3. Notify their supervisors in advance if they have a medical condition or are taking medications that could interfere with their safe performance of assigned duties. **(T-0)**

14.3.2.4. Notify supervisors of any changes in medical status which might impair their ability to safely wear PPE, e.g., weight changes, facial scarring, dental changes, disfigurement. **(T-0)**

14.3.3. Eye and Face Protection. Only protective eye and face devices that meet ANSI/ISEA Z87.1, *Occupational and Educational Personal Eye and Face Protection Devices*, will be used. **(T-0).** Refer to 29 CFR § 1910.133, *Eye and Face Protection*, for additional requirements. **Note:** Eye protection is required to protect against small particles of debris when performing a task above eye level that could be expected to create such a hazard. **Note:** Face shields are considered face protection only and must be worn with appropriate eye protection at all times. **(T-0)** In the case of primary protection, other protective devices such as safety goggles shall be worn. **(T-0)**

14.3.4. Respiratory Protection. BE, as the OPR for the Air Force Respiratory Protection Program, recommends and approves all respiratory protection devices and shall be consulted on respiratory protection required for specific shop activities and job sites, if required. **(T-1)** AFI 48-137 and 29 CFR § 1910.134, *Respiratory Protection*, provide guidance on control of occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, vapors or in oxygen-deficient environments.

14.3.5. Head Protection. Personnel working in areas where there is a potential for injury from falling or flying objects, bumping head against a fixed object or electrical shock or burns, shall

be provided and use proper protective head gear. **(T-0)** Typical examples of these areas are construction sites, flightlines and warehouses. Protective helmets must comply with ANSI/ISEA Z89.1, *American National Standard for Industrial Head Protection,* and 29 CFR § 1910.135, *Head Protection.* **(T-0)**

14.3.5.1. Hair Protection (Includes Facial Hair). Employees who work around chains, belts, rotating devices, suction devices, blowers, etc., shall secure their hair, especially long hair, to prevent it being caught in moving equipment. **(T-0)** While such equipment is normally guarded, long hair can fit between the mesh of guards and be drawn into the moving parts.

14.3.5.2. Safety Helmets (Hard Hats). Commanders, supervisors and team members shall ensure workers working on or near underground or aerial installation, construction and certain maintenance-related jobs wear an approved safety helmet (as determined by a property conducted hazard assessment) at all times. **(T-1)** The chinstrap shall be worn during work aloft or anytime the helmet may fall off the workers head while performing a specific task possibly resulting in injury to workers or damage to property. **(T-1)** Refer to ANSI/ISEA Z89.1 for additional guidance on chinstraps. **(T-0)**

14.3.5.3. Bump Caps. Bump caps are constructed of lightweight materials and provide minimal protection against bumps or lacerations to the head. They do not afford adequate protection from high impact forces or penetration by flying or falling objects and shall not be used as a substitute for safety helmets, where applicable. Their use shall be determined by the supervisor's hazard assessment, in conjunction with the installation occupational safety office. **(T-0)**

14.3.6. Hearing Protection. Exposure to high noise levels can cause hearing loss or impairment, in addition to physical and psychological stress. Specifically designed protection may be required, depending on the type of noise encountered and the auditory condition of the employee. AFI 48-127 is the primary Air Force directive on hazardous noise exposure policies, responsibilities and procedures, including hearing protective device information. Contact BE for information on the Air Force Hearing Protection Program. Refer to AFI 48-127 for additional guidance and information.

14.3.7. Electrical Workers' Clothing and Equipment. Electrical clothing shall be used in accordance with UFC 3-560-01, NFPA 70E, AFMAN 32-1065 and manufacturer's instructions. **(T-0)** Rubber insulating PPE such as blankets, matting, covers, line hose, gloves and sleeves shall be used in accordance with 29 CFR § 1910.137, *Electrical Protective Equipment,* and manufacturer's instructions. **(T-0)**

14.3.8. Hand and Arm Protection. When an employee's hands or arms are exposed to hazards, such as skin absorption of harmful substances, severe cuts, lacerations, abrasions, punctures, chemical burns or harmful temperature extremes, appropriate hand or arm protection shall be provided and used. **(T-0)** Sleeves, padded arm protectors, hand pads and other items shall be worn to protect the hands and arms when hot or sharp materials are handled. **(T-0)** There is a wide assortment of gloves, hand pads, sleeves and wristlets for protection against various hazardous situations. Before purchasing any chemical protective equipment, contact BE, who will evaluate the hazard and provide the necessary specifications such as material type, thickness and coverage area, then ensure the manufacturer's recommended use for the glove matches the particular application and anticipated hazards involved. **(T-1)** Supervisors shall

select appropriate hand protection based on the characteristics required for the task to be performed, dexterity required, conditions present, duration of use, frequency, physical stresses, limitations of protective clothing and degree of exposure to identified hazards. **(T-0)**

14.3.9. Torso Protection. The torso is the largest exposed area of the body. A variety of protective clothing is available to protect personnel from heat, hot metals, liquids, impacts, cuts, corrosives, caustics and radiation. Items such as vests, jackets, aprons, coveralls and full body suits have been specifically designed for this purpose. Back support belts are only worn with supervisory approval and proper training of safe lifting techniques. They shall not be relied upon solely to protect the back from injury. Back support belts should be unfastened when the individual is not presently involved in a lifting motion, to prevent the possibility of muscle atrophy from prolonged usage.

14.3.10. Foot and Leg Protection (Safety Shoes, Toe Caps, Leggings, etc.). Protective footwear shall be provided and worn when there is a reasonable possibility of foot injuries from heavy or sharp objects and electrical and/or static electricity. **(T-0)** Use appropriate foot guards, safety shoes or boots and leggings for protection of feet and legs from crushing hazards, falling, rolling, sharp objects, molten metal, hot surfaces and wet slippery surfaces. Leggings protect the lower leg and feet from molten metal or welding sparks. Safety snaps permit their rapid removal.

14.3.10.1. Supervisor's safety assessment shall identify those areas, operations and occupations which require protective leg or footwear. **(T-1)** All individually issued safety footwear used in DAF operations shall meet the requirements of ASTM F2412, *Standard Test Methods for Foot Protection*, and ASTM F2413, *Standard Specification for Performance Requirements for Protective (Safety) Toe Cap Footwear*. **(T-0)**

14.3.10.2. Safety shoes shall be sturdy and have an impact-resistant toe. **(T-0)** Only shoes meeting or exceeding the requirements found in ASTM F2412 and F2413 international standards, as incorporated by reference in 29 CFR § 1910.6, *Incorporation by Reference*, are approved for the DAF. Refer to 29 CFR § 1910.136, *Foot Protection*, for additional information. Metal insoles in shoes protect against puncture wounds. Additional protection, such as metatarsal guards, may be necessary for some job tasks. Nonskid shoes shall be worn where floors may be wet or slippery. **(T-0)** Electrical hazard shoes are not designed to be a replacement for electrically-rated matting in high voltage situations. These shoes are designed to be used when working on low voltage circuits and as a secondary means of protection. **Note:** When exposed to cold temperatures and foot crushing hazards, if cold weather footwear which also provides crushing protection is not available, personnel shall be issued footwear which protects against the possibility of frostbite. **(T-0)**

14.3.11. Knee Protection. Knee pads may be used by workers who are required to kneel while performing most of their work or by workers with known knee problems that could be compounded by working in a kneeling position.

14.3.12. Chemical Protective Clothing. The purpose of chemical protective clothing and equipment is to shield or isolate individuals from chemical, physical and biological hazards encountered during hazardous materials operations. Many chemicals pose invisible hazards and offer no warning properties. It is important for employees to realize that no single protective clothing item can protect against all hazards. Other protective methods, such as

elimination, substitution, engineering or administrative controls, shall be used to limit chemical contact before considering use of PPE. **(T-0)**

14.3.12.1. Chemical Protective Clothing Selection. Workplace supervisors shall contact BE to determine the appropriate PPE for all processes involving chemical exposures. **(T-1)**

14.3.12.2. Ensemble Selection Factors:

14.3.12.2.1. Hazard Consideration. Chemicals present a variety of hazards such as toxicity, corrosiveness, flammability, reactivity and oxygen deficiency, or a combination of hazards may be present.

14.3.12.2.2. Requirements. The proper type of chemical protective clothing or equipment depends on job requirements, and includes requirements from TOs, Safety Data Sheets (SDSs) and manufacturer's instructions. Check with BE before purchasing chemical protective clothing or equipment.

14.3.12.3. Chemical Protective Clothing Limitations. Many chemicals can have adverse effects on protective clothing and gloves. Permeation, a process by which a chemical can pass through PPE, and Degradation, a reduction in the physical properties of PPE, are two examples. Chemicals allowed to remain on protective clothing or equipment can be absorbed into the material. Chemical protective clothing that is reused must be cleaned before storage. **(T-0)** In some cases, it may be more cost effective to select chemical protective clothing with a relatively short breakthrough time (see definitions, **Attachment 1**), and decontaminate and discard it properly after one use.

14.3.12.3.1. Duration of Exposure. Maximum duration of exposure to a chemical shall be considered when selecting chemical protective clothing. **(T-0)** Review the SDS and contact BE to determine the appropriate PPE.

14.3.12.3.2. Performance Characteristics.

14.3.12.3.2.1. Resistance to abrasions, cuts, heat, ozone and punctures or tears shall be considered to maintain the integrity of the material. **(T-0)**

14.3.12.3.2.2. Flexibility may be an important factor if inflexible equipment interferes with the worker's ability to successfully accomplish the task.

14.3.13. Welding, Cutting and Brazing Specific PPE. Welding, cutting and brazing PPE requirements and usage shall be in accordance with 29 CFR § 1910.252, *Welding, Cutting and Brazing – General Requirements,* 29 CFR § 1910.132 and AFI 48-137. **(T-0)**

14.3.14. Light Reflective Products.

14.3.14.1. Light reflective and luminescent materials should be utilized during hours of decreased visibility. These items are also available in the primary safety code colors and should be used for standard signs and markings. Reflective or luminescent materials must remain reflective when wet.

14.3.14.2. Personnel exposed to traffic environments or flightline operations during hours of darkness or reduced visibility, or as part of construction, shall be provided and use reflective equipment or shall use organizational clothing with sewn-on reflective tape. **(T-3)** Refer to ANSI/ISEA 107, *American National Standard for High-Visibility Safety Apparel and Accessories,* for additional guidance regarding selection of reflective clothing.

Note: Personnel whose job requires them to perform some function in the traffic/flightline environment shall be provided reflective equipment to enhance their visibility, except as previously stated for Security Forces. **(T-1)**

14.3.15. Heat Reflective and Protective Clothing. Radiant heat is a problem in operations such as heat treating of metals, foundry operations and heating plants. Heat reflective qualities of clothing and other surfaces are considerably affected by color and surface characteristics. Polished metallic aluminum is an effective surface to reflect radiant heat. Helmets, suits, gloves and boots with this type of surface are available and shall be used when necessary to prevent heat stress and physical injury. **(T-0)** Frequent breaks and drinking plenty of water are also critical to prevent heat-related injuries. **Note:** If metallic coating on heat reflective clothing is conductive, it shall not be worn where there is the possibility of electrical shock.

14.3.16. Cold Testing and Clothing. Protective clothing used in cold testing or cold storage areas must be adequate to protect employees from hazards involved with the task and cold temperatures. **(T-0)** Supervisors shall coordinate with the installation occupational safety and BE offices to determine proper equipment for the task. The JHAs should identify approved protection for working in cold temperatures. **(T-1)** Frostbite can be avoided by wearing appropriate protective clothing and by taking frequent breaks to warm extremities. Supervisors shall ensure cold weather clothing is provided when needed for work in cold temperatures. **(T-1)**

14.3.17. Personal Fall Arrest Systems (Safety Harnesses, Lanyards, Lifelines and Straps. Refer to **Chapter 13** of this instruction for guidance on personal fall arrest systems.

14.4. Proper Care and Maintenance. Workers shall maintain all PPE in accordance with manufacturer's instructions to include being kept clean and in good repair. **(T-0)** Previously used PPE shall be disinfected before reissue to another worker. **(T-0)** Contaminated PPE that cannot be decontaminated shall be disposed of in a manner that protects employees from exposure to hazards. **(T-0)** Contact BE to determine the appropriate disposal measures of contaminated PPE. Functional managers shall ensure disposal of contaminated PPE is consistent with applicable environmental regulations. **(T-1)** Reusable PPE that can be decontaminated can be stored in resealable or drawstring type bags. Refer to the PPE manufacturer's instructions, UFC 3-560-01, AFMAN 32-1065, *Grounding and Electrical Systems,* 29 CFR § 1910.137, Table I, and 29 CFR § 1910.141, *Sanitation,* for more information on cleaning specific equipment.

14.4.1. Shop supervisors shall ensure shop personnel use the protective clothing and equipment that will protect them from work hazards. **(T-0)**

14.4.2. Workers shall keep their hands and face clean, change clothes and wash skin contaminated with solvents, lubricants or fuels, and keep hands and soiled objects out of their mouth. **(T-0)** No food or drink shall be brought into or consumed in areas exposed to toxic materials, chemicals or industrial shop contaminants nor shall drinking water sources such as water fountains be located in those areas. **(T-0)** Industrial hygiene surveys will be reviewed for shop hazards. **(T-1)** Refer to 29 CFR § 1910.141 for additional information.

14.4.3. Shop supervisors shall provide on-site laundry and shower facilities in accordance with 29 CFR § 1910.141. **(T-0)** Additionally, showers and laundry facilities shall be provided when the installation occupational safety office or BE determine an occupational hazard warrants them. **(T-0) Note:** Contractors who perform laundry services will comply with 29 CFR § 1910.141.

Chapter 15

TRAINING SYSTEMS

15.1. Scope. This chapter provides guidance on fire protection engineering criteria, fire prevention requirements and housekeeping procedures for the system safety and risk management of all training devices in AFI 16-1007, *Management of Air Force Operational Training Systems.* It also applies to all training systems regardless of the stage of design, development or date of installation. Air Force Civil Engineer Center (AFCEC) shall determine the fire prevention requirements for trainers not covered in AFI 16-1007.

15.1.1. Hazards. Protective measures, such as grounding, conductive floors and benches, humidity control, antistatic packaging of spare components and other controls shall be used as needed to prevent electrostatic discharge. **(T-1)** Refer to **paragraph 1.5** and/or **Chapter 2** for guidance on hazards and human factors.

15.1.2. Fire, Injury and Equipment Damage Hazards. Refer to MIL-STD-1472H, *DoD Design Criteria Standard: Human Engineering,* for additional guidance on damage to training systems equipment.

15.2. General Requirements.

15.2.1. Fire Extinguishers. Listed Class C carbon dioxide, clean agent or water mist fire extinguishers with a minimum rating of 2A10B:C located in accordance with NFPA10, *Standard for Portable Fire Extinguishers,* must be provided with all facility areas containing permanently installed electronic equipment such as motion bays, model boards, visual display rooms, computer bays, etc. **(T-0)** Similar fire extinguishers may be provided in cockpit and/or other crew stations. Dry and wet chemical agent fire extinguishers are prohibited.

15.2.2. Fire and Emergency Procedures. The training system operator and/or instructor shall provide a fire safety briefing to trainees at the start of each training session. **(T-0)** Prompt action during a fire will protect personnel and minimize damage.

15.2.3. Housekeeping.

15.2.3.1. Combustible materials shall be disposed of in suitable noncombustible containers, conspicuously labeled as to contents and with self-closing lids. **(T-0)** These containers shall be emptied when full and at least at the end of each working shift. **(T-0)** Contact the installation Environmental Management office for disposal procedures for combustible hazardous waste. Refer to **Chapter 22** for additional guidance.

15.2.3.2. Building floors, especially raised floors, shall be kept smooth, clean and free of obstructions and slippery materials. **(T-0)**

15.2.3.3. Floors shall not be cleaned with flammable or combustible liquids. **(T-0)** Follow the manufacturer‘s instructions and SDS guidelines when using cleaning agents for floors and facilities.

15.2.3.4. To prevent buildup of trash and foreign objects, sub-floors under raised floors shall be cleaned periodically, but not less than once every 60 days. **(T-1)** Sub-floors shall be inspected once each operational day to ensure no flooding or leaking is present, unless

the sub-floor area is provided with an automatic water leakage detection system. **(T-1)** **Note:** Any change in facility or room use requires reassessment of the cleaning schedule.

15.2.3.5. Utility trenches shall be kept clean of foreign objects and inspected at least every 60 days. **(T-1)** If cleaning history shows a longer period between cleanings is feasible, the Fire Protection Flight may allow extending the time between cleanings. **Note:** Any change in facility or room use requires reassessment of the cleaning schedule.

15.2.3.6. Hot Work. Hot work permits will not be issued until the requirements in NFPA 51B, *Fire Prevention During Welding, Cutting and Other Hot Work*, are met. **(T-0)** Consult with the installation F&ES Flight for additional guidance.

15.3. Facility Requirements.

15.3.1. Planning. Proper layout, spacing and arrangement of equipment and machinery are essential and can best be achieved in the planning stages by considering current and future uses of the facility. The installation Occupational Safety office, CE, Fire & Emergency Services (F&ES) Flight and BE shall coordinate on all plans. **(T-1)**

15.3.2. Location. Training systems shall be located in facilities protected by automatic sprinkler systems. Piloted and unpiloted aircraft flight trainers must be located in spaces with additional ultra-sensitive smoke detection as well. Electronic procedures training must also be located in spaces with additional ultra-sensitive smoke detection.

15.3.3. Existing facilities housing training devices with internal fire detection and alarm systems do not require ultra-sensitive systems but shall be provided with a standard smoke detection system. **(T-1)**

15.3.4. Training system spaces shall be separated from other spaces and/or occupancies and operationally distinct adjacent equipment spaces in the facility by a minimum of 1-hour fire rated construction, extending from structural floor to structural ceiling and/or roof. **(T-0)**

15.3.5. If training system spaces are served by air handling equipment which also serves any other part of the facility, including an adjacent training system space, automatic smoke and fire dampers shall be provided to shut off the space from the remainder of the facility upon any facility fire alarm indication. **(T-0)** Activation of the facility fire detection system shall shut down the air handling system. **(T-0)** An air handling system which serves an individual training system does not have to be deactivated for facility fire alarm indications for conditions originating outside the training system space.

15.3.6. Communications and interconnecting cable and wiring in training system and raised floor spaces shall comply with NFPA 70, Article 645, *Information Technology Equipment.* **(T-0)** Communications and interconnecting cable and wiring in training system spaces and other areas of the facility or other facilities shall comply with NFPA 70, Article 725, *Class 1, Class 2 and Class 3 Remote-Control, Signaling and Power-Limited Circuits.* **(T-0)**

15.3.7. Electrical.

15.3.7.1. Surge protection shall be provided for all incoming power to the training system. **(T-0)** New training system facilities shall have surge protection for the entire facility. **(T-0)**

15.3.7.2. All power and distribution circuits shall comply with NFPA70 and UFC 3-520-01, *Interior Electrical Systems*. **(T-0)**

15.3.8. Drainage. Drainage shall be provided in utility trenches and motion bays. **(T-0)**

15.3.9. Hydraulic Pump Rooms. Hydraulic pump rooms shall be of 1-hour fire rated construction, except rooms which contain more than 250 gallons of hydraulic fluid, which shall be of 2-hour fire rated construction. **(T-0)**

15.3.10. Emergency Lighting. Emergency lighting shall be provided in accordance with NFPA 101, *Life Safety Code.* **(T-0)**

15.3.11. Fire protection features installed in the facility or the trainers must be maintained and comply with the requirements of UFC 3-600-01. **(T-0)**

15.4. Training Systems Requirements.

15.4.1. General Flammability Requirements. Only fire resistant and non-hazardous (when exposed to fire) materials shall be used in cockpits, seats, shrouds, cable ties, cable coverings and auxiliary insulation for heat, electrical, sound, etc. **(T-0)** The flame spread rating for these materials shall not exceed 75 and smoke development shall not exceed 100 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials.* **(T-0)** Alternately, materials shall be considered acceptable that meet one of the following: certification under California State Fire Marshall Title 19; listing under Underwriters Laboratories (UL) 94, *Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances,* or equivalent OSHA-recognized NRTL certification; or successful testing under ANSI/NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.* **(T-0)** Materials not meeting one of these requirements may only be used when the training device application is identical to the aircraft/wheeled vehicle configuration and material.

15.4.2. General Hydraulic System Features.

15.4.2.1. Hydraulic pump controls shall be designed to automatically shut down on sudden or excessive flow in the hydraulic lines when the fluid level is low or when excessive hydraulic fluid temperature is sensed. **(T-0)**

15.4.2.2. Flexible hoses shall be shielded to prevent leaking hydraulic fluid from spraying on potential ignition sources, trainees and staff personnel. **(T-1)** Braided shielding integral to the flexible hoses shall be used whenever the hoses are not located in covered trenches. **(T-1)**

15.4.2.3. Upon loss of power or shutdown of the hydraulic pumps, the training device shall automatically return to the rest position within 10 seconds. **(T-1)**

15.4.2.3.1. For wheeled vehicle egress assistance trainers, it is permitted to provide a manual hand crank feature, or equivalent method, to enable the instructor/operator to manually rotate the trainer to a position that allows safe egress by the trainees. **(T-1)**

15.4.2.3.2. For aircraft fuselage trainers, hydraulically operated doors are not required to be moveable upon loss of power or shutdown of the hydraulic pumps if exit doors are provided for trainee egress from the trainer. **(T-1)** The number of doors and locations shall comply with the requirements in NFPA 101. **(T-0)**

15.4.2.3.3. For aircraft flight and similar high value training systems, access ramps shall automatically deploy after motion is stopped — even when power is removed. **(T-1)**

15.4.2.4. Hydraulic pump controls shall be designed so operation of the facility fire alarm or training system fire alarm system shuts down the pumps. **(T-1)** This feature is not required for wheeled vehicle egress assistance trainers.

15.4.3. Emergency Lighting. Emergency lighting shall be provided in all enclosed occupied training spaces in accordance with NFPA 70, Article 700, *Emergency Systems.* **(T-0)**

15.5. Requirements of Wheeled Vehicle Egress Assistance Trainers.

15.5.1. Safety Zone. A safety zone shall be provided to keep observers at a safe distance when the unit is rotating. **(T-1)**

15.5.2. Head Strike Hazard. Projections inside the unit shall be padded and loose objects secured that could present a head strike hazard to trainees during unit rollover. **(T-0)** Padding shall comply with flammability requirements in **paragraph 15.4.1**. **(T-0)**

15.5.3. Walkways. Walkways shall be padded where the trainees egress to minimize the potential for injury to personnel should a trainee fall from the vehicle doors. **(T-1)** Padding shall comply with flammability requirements in **paragraph 15.4.1**. **(T-0)**

15.5.4. Fire Extinguisher. A portable fire extinguisher with a minimum rating of 2A-10BC shall be located within immediate vicinity of the instructor/operator. **(T-1)**

15.5.5. Power Failure. A means shall be provided to manually-rotate the unit to a safe position for trainee egress in case of loss of power or failure of the powered rotation motor. **(T-1)**

15.5.6. Egress Procedures. Procedures shall be established to provide safe emergency occupant egress from the unit, such as when the unit fails to fully rotate to the design rollover position. **(T-1)**

15.5.7. Loading and Seating. Approved occupant seating and loading limits shall be posted in the immediate vicinity of the unit. **(T-1)** Prohibited seating arrangements shall also be posted, such as any unbalanced seating arrangements that could prevent manual rotation of the unit during an emergency. **(T-1)**

15.5.8. Retractor Mechanisms. Trainee shall not be assigned to any location in the trainer (such as the gunner's hatch in the roof of a HMMWV Egress Assistance Trainer unit) that requires completion of manual actions by the trainee or others to pull/move the trainee to a safe position during a rollover operation. **(T-1)** Automatic retractor mechanisms (such as gunner's restraint retractors) may be used only after they have been tested to successfully operate during all possible operational modes of the trainer, including failure to fully rotate to the design rollover position. **(T-1)**

15.6. Requirements for Aircraft Flight and Similar High Value Training Systems.

15.6.1. Fire Detection and Alarm Systems.

15.6.1.1. New or relocated training systems do not require an internal fire detection and alarm system when located in spaces protected by ultra-sensitive smoke detection in accordance with **paragraph 15.3.2**.

15.6.1.2. Existing training systems in spaces protected by a standard smoke detection system shall have an internal fire detection and alarm system. **(T-1)** This system shall interconnect all detection and annunciation devices with the various training system

components (cabinets, instructor operator station, cockpit, motion base, etc.). **(T-1)** This system shall be either of the dual fixed-temperature type or the ultra-sensitive type. **(T-1)**

15.6.1.2.1. Dual fixed-temperature type fire detectors shall be installed in electrical, electronic, hydraulic and computer cabinets. **(T-1)** Activation of the first detector, e.g., the one calibrated to the lower activating temperature, shall produce a distinctive audible signal. **(T-1)** Activation of the second detector, e.g., the one calibrated to the higher activating temperature, shall activate the facility detection system through the training system fire alarm panel and de-energize the simulator and all peripheral equipment. **(T-1)**

15.6.1.2.2. Ultra-sensitive smoke detection systems shall be provided to protect electrical, electronic/and computer cabinets. **(T-1)** A minimum two-stage warning capability shall be provided. **(T-1)** The first, more sensitive stage shall produce a distinctive audible signal. **(T-1)** Activation of the second, less sensitive stage shall activate the facility detection system through the training system fire alarm panel and de-energize the simulator and all peripheral equipment. **(T-1)**

15.6.1.2.3. If detection equipment is located in an unoccupied area, e.g., computer rooms, a means shall be provided to positively alert operators at the instructor operator station. **(T-1)** If multiple unoccupied computer areas are present, then a means shall be provided to inform the instructor operator station which unoccupied area has the activated alarm. **(T-1)**

15.6.1.3. A fire alarm graphic annunciator or display panel, to identify training system fire detection systems signals, shall be installed in accordance with NFPA 72, *National Fire Alarm and Signaling Code.* **(T-0)** Each detection device shall be identified by light emitting diodes, or other readily visible means, in the graphic annunciator or display panel. **(T-1)**

15.6.1.4. The fire detection system shall be powered by a dedicated circuit with backup battery power and connected to the facility electrical supply ahead of the training system disconnect switch. **(T-1)**

15.6.1.5. The fire detection system shall be capable of operating from both 50 and 60 hertz. **(T-1)**

15.6.1.6. The system fire detection and alarm control panel shall be designed to transmit both coded fire and trouble signals to the fire alarm and receiving center or other monitoring service (when not located on a DoD installation) in accordance with NFPA 72. **(T-0)** This may be through the facility fire alarm transmitter or an independent fire alarm transmitter. Contact the installation Fire Protection Flight for fire alarm and receiving equipment requirements. **(T-1)**

15.6.1.7. Interface of Facility and Training System Fire Protection Systems.

15.6.1.7.1. Required functions upon activation of the facility fire alarm system (without activation of any suppression system in the facility):

15.6.1.7.1.1. Occupants in the training spaces shall be notified of the alarm condition through audible (siren, horn, bell, etc.) and visual (strobe) cues. **(T-1)** Occupants of the facility (including those in the training spaces) shall exit the facility immediately without delay, following the facility's preexisting emergency

evacuation plan. **(T-1)**

15.6.1.7.1.2. For training systems meeting the requirements of **paragraph 15.4,** the instructor may place the training system in a standby mode, system freeze or other appropriate condition prior to evacuation. **(T-1)**

15.6.1.7.1.3. For existing facilities and training systems awaiting upgrade to comply with **paragraph 15.4,** the training system power source shall be shut down. **(T-1)** This shutdown may be accompanied by an automatic emergency power off or by an automatic, rapid, sequenced shutdown. **(T-1)** Also see **paragraph 15.7**.

15.6.1.7.2. Required functions upon activation of the facility fire suppression system (without activation of a suppression system in any training system area):

15.6.1.7.2.1. Occupants in the training spaces shall be notified of the alarm condition through audible (siren, horn, bell, etc.) and visual (strobe) cues. **(T-1)** Occupants of the facility (including those in the training spaces) shall exit the facility immediately without delay, following the facility's preexisting emergency evacuation plan. **(T-1)**

15.6.1.7.2.2. The training system power source shall shut down. **(T-1)** This shutdown may be accomplished by an automatic emergency power off or by an automatic, rapid, sequenced shutdown.

15.6.1.7.3. Required functions upon activation of a training system fire detection system only (without activation of any fire suppression system):

15.6.1.7.3.1. Training staff shall be notified upon activation of the first, less sensitive stage of ultra-sensitive smoke detection systems or upon activation of the first detector in dual fixed-temperature type systems. **(T-1)**

15.6.1.7.3.2. The training system shall automatically emergency power off upon activation of the second, less sensitive stage of ultra-sensitive smoke detection systems or upon activation of the second detector in dual fixed-temperature type systems for training systems meeting the requirements of **paragraph 15.4.**. **(T-1)**

15.6.1.7.4. Required functions upon activation of a training system fire suppression system — the training system power source shall automatically turn emergency power off. **(T-1)**

15.6.1.7.5. Training staff shall be provided with means to manually emergency power off whenever necessary for the safety of the staff, students or the equipment prior to exiting the facility. **(T-1)**

15.6.1.7.6. Following an emergency power off:

15.6.1.7.6.1. The training system fire alarm system shall notify occupants throughout the facility of the alarm condition through audible (siren, horn, bell, etc.) and visual (strobe) cues. **(T-1)**

15.6.1.7.6.2. All personnel throughout the facility, including those in training areas, shall exit the facility immediately without delay, following the facility's preexisting emergency evacuation plan. **(T-1)**

15.6.2. Fire Stops. All cable trays, utility trenches, etc., that connect to spaces outside training system spaces shall have fire stops installed every 25 feet. **(T-1)**

15.6.3. Air Handling Equipment. Training systems served by air handling equipment which also serves any other part of the facility, including any adjacent training system space, shall have automatic smoke and fire dampers to shut off the space from the remainder of the facility on any facility fire alarm indication. **(T-1)** Air handling systems dedicated to an individual training system need not be deactivated upon facility fire alarm indications unless originating within the training system.

15.6.4. Specifications for Cable and Wiring.

15.6.4.1. Polyvinyl chloride coated wire shall not be used in the cockpit areas of non-commercial-off-the-shelf hardware and/or training systems. **(T-1)** Plenum rated cable and wiring meeting the requirements of NFPA 70, Article 300.22, *Wiring Methods*, shall be used. **(T-0) Note:** Polyvinyl chloride coated wire is allowed in the cockpit areas of commercial-off-the-shelf hardware and/or training systems per manufacturer's standard or commercial design practices provided the cockpit is not enclosed or, if enclosed, that smoke detectors are installed and the system design vents any smoke or gases to the exterior of the cockpit.

15.6.4.2. Communications and interconnecting cable and wiring between components within the training system space and raised floor space shall comply with NFPA 70, Article 670, *Industrial Machinery*, and those in the training system space and other areas of the facility or other facilities shall comply with NFPA 70, Article 725. **(T-0)**

15.6.4.3. Power and signal cable groups in which heat cannot quickly dissipate shall contain a heat sensor wire or other heat sensing device. **(T-1)**

15.6.4.4. Cable and wiring for the training system fire alarm system shall comply with NFPA 70, Article 760, *Fire Alarm Systems.* **(T-0)**

15.6.5. Power Disconnect Means. A means to disconnect electrical power to the entire training system shall be provided at all instructor operator stations and at other key locations on the training system. **(T-1)**

15.6.6. Computer and/or Electronic Cabinets.

15.6.6.1. Self-contained air conditioning systems shall include a product of combustion detector capable of sounding an audible alarm and activating the facility detection system. **(T-1)**

15.6.6.2. Cabinets near a motion base water fog or spray deluge system shall be water resistant or shielded from water discharge. **(T-1)** Cabinets near a motion base wet pipe sprinkler system do not require special protection.

15.6.6.3. The acquiring authority may exempt "off-the-shelf" computer and/or electronic devices with internal thermally activated power disconnects from requirements for dual fixed-temperature type thermal fire detectors for computer and/or electronic cabinets. **(T-1)**

15.6.7. Instructor Operator Station.

15.6.7.1. A means to activate the facility fire detection system shall be provided in easy reach of the operators at the instructor operator station. **(T-1)** Normally, a standard manual

fire alarm station shall be provided on the operator's console with provision to interconnect to the facility alarm and detection system, and to initiate a training system emergency power off. **(T-1)**

15.6.7.2. Smoke detection devices shall be provided in the instructor operator station when located in an enclosed container and/or space not part of the facility. **(T-1)** Activation of this system shall alert the training system occupants and the operators at the instructor operator station. **(T-1)**

15.6.7.3. A facility alarm annunciator shall be installed when the instructor operator station is located in an enclosed container and/or space not part of the facility. **(T-1)**

15.6.8. Cockpit and/or Other Crew Stations.

15.6.8.1. Single station smoke detection devices shall be provided in cockpits and other enclosed crew stations. **(T-1)** Battery powered detectors shall not be used.

15.6.8.2. The cockpit shall be designed to preclude or restrict passage of smoke and gases through the cockpit floor or sides. **(T-1)**

15.6.8.3. A means shall be provided to alert cockpit and/or other crew station occupants of a positive activation of the local and facility detection systems. **(T-1)**

15.6.8.4. Training station ventilation shall be shut down if the training system fire detection is activated. **(T-1)**

15.6.9. Motion Base.

15.6.9.1. The motion system shall return to the rest position within 10 seconds of activation of either the system fire detection system or the facility fire suppression system. **(T-1)** Access ramps shall automatically deploy after motion is stopped, even when power is removed. **(T-1)**

15.6.9.2. Hydraulically powered motion bases will comply with **paragraph 15.4.2** and the following:

15.6.9.2.1. Rate-compensated type thermal fire detection devices shall be provided under each motion platform. **(T-1)** These rate-compensated type thermal fire detection devices are not required when all the following conditions are met:

15.6.9.2.1.1. The training system is located in a facility fully protected by a wet pipe sprinkler system.

15.6.9.2.1.2. Flight training devices and associated controls are located in spaces protected by ultra-sensitive smoke detection systems as defined in UFC 3-600-01.

15.6.9.2.1.3. The cockpit/crew stations located on the motion base fully comply with the cockpit/crew station requirements listed in **paragraph 15.6.8**. **(T-1)**

15.6.9.2.2. A wet pipe sprinkler system (sprinkler heads and piping) shall be provided as part of each motion base. **(T-0)** This motion base sprinkler system is not required for training systems when all the following conditions are met: the training system is located in a facility fully protected by a wet pipe sprinkler system; flight training devices and associated controls are located in spaces protected by ultra-sensitive smoke detection systems as defined in UFC 3-600-01; and the cockpit/crew stations located

on the motion base fully comply with the cockpit/crew station requirements listed in **paragraph 15.6.8** The exact position for each sprinkler and number of sprinklers shall be defined for each motion base to ensure complete coverage and prevent interference with each hydraulic actuator's range of motion. **(T-1)** The system shall deliver a minimum of 0.35 gallons per minute per square foot of area under the motion base. **(T-0)** Normally, sprinkler piping is interconnected with the facility sprinkler system, but a separate system riser with separate flow detection is acceptable.

15.6.9.2.3. A pre-action sprinkler system is permitted for the motion base in lieu of the wet pipe sprinkler system listed in **paragraph 15.6.9.2.2** when approved in writing by the DFPE per UFC 3-600-01. The rate-compensated type thermal fire detection devices listed in **paragraph 15.6.9.2.1** shall be used to activate the pre-action functions of the system. **(T-1) Note:** Increased procurement, operational and maintenance expenses are associated with the use of pre-action sprinkler systems.

15.7. Upgrade of Existing Aircraft Flight and Similar High Value Training Systems. Existing facilities and training systems may continue in use while awaiting upgrade to comply with **paragraph 15.4,** if they comply with all the following:

15.7.1. Facilities. No Category I or II fire safety deficiencies exist.

15.7.2. Training Systems. It is assumed existing training system deficiencies have been upgraded or are programmed to be upgraded to comply with previous (superseded) editions of AFOSH standards or previous (superseded) revisions of this AFMAN. Training systems currently identified to be upgraded to previous (superseded) editions of this AFMAN may be upgraded as programmed provided Halon 1301 or other gaseous agents are not part of the upgrade.

15.7.3. Maintenance. All installed fire protection features shall be regularly serviced and maintained in operational condition.

15.7.4. Halon. Existing Halon fire suppression systems shall be placed on manual activation and automatic discharge mechanisms disabled. **(T-1)** Existing Halon fire suppression systems shall not be re-serviced following discharge and the training device shall remain operational. **(T-1)** Training systems developed with Halon fire suppression systems shall transition to current standards during any major modification. **(T-1)**

Chapter 16

MOBILE ELEVATING WORK PLATFORMS AND SCAFFOLDING

16.1. Scope. This chapter establishes DAF-specific vehicle-mounted elevating and rotating platforms, including work platforms and aircraft maintenance equipment used for elevating workers and scaffolding requirements. It also applies to all manually-propelled and self-propelled mobile work platforms (including ladder stands) and rolling (mobile) scaffolds (towers). In some cases, the DAF changes the design of commercially purchased mobile work platforms and scaffolds or builds this equipment; therefore, this chapter includes essential information on loads, rules and requirements for design, construction and use of mobile work platforms and scaffolds.

16.1.1. Refer to 29 CFR § 1910, Subpart D – *Walking-Walking Surfaces,* 29 CFR § 1910, Subpart F – *Powered Platforms, Manlifts and Vehicle-Mounted Work Platforms,* and 29 CFR § 1910.27, *Scaffolds and Rope Descent Systems,* for additional guidance. All fall prevention and protection options must be evaluated and approved by a qualified person before use.

16.1.2. Modifications to mobile elevating work platforms and scaffolding must be approved and certified in writing by the manufacturer. **(T-0)** Authorized modifications include temporary removal of installed equipment not needed for a particular mission or modification to provide a new or improved capability. **Warning**: Any modification which removes or defeats any safety device or feature on an aerial device is prohibited. **(T-0)**

16.2. Hazards. Mobile elevating work platforms and scaffolding hazards examples include:

16.2.1. Falls from elevation.

16.2.2. Getting struck by falling objects.

16.2.3. Electricity.

16.2.4. Faulty/broken equipment, e.g., loose/bad planking.

16.3. Training.

16.3.1. Training shall be provided to each affected employee who is required to perform work on mobile elevating work platforms and scaffolding. **(T-0)** Supervisors shall train each employee:

16.3.1.1. In accordance with 29 CFR § 1910.30, *Training Requirements – Walking-Working Surfaces,* and applicable manufacturer's instructions. **(T-0)**

16.3.1.2. Involved in erecting, disassembling, moving, operating, repairing, maintaining, inspecting or performing work on a scaffold in accordance with 29 CFR § 1926.454, *Training Requirements – Scaffolds.* **(T-0)**

16.3.1.3. Required to use vehicle-mounted elevating and rotating work platforms before using this equipment. **(T-0)** This shall include "hands-on-training" prior to actual "on-the-job" training tasks. **(T-1)**

16.3.2. Retraining. Affected employees shall be retrained in accordance with 29 CFR § 1910.30(c) and/or 29 CFR § 1926.454(c), e.g., change in their job assignments, a change in the work processes that present a new hazards or when there is a change type of PPE used; or other conditions as specified in 29 CFR § 1910.30(c) or 29 CFR § 1926.454(c). **(T-0)**

16.3.3. Supervisor shall document training in accordance with **paragraph 1.9** of this manual and AFI 91-202. **(T-1)**

16.4. Inspections and Maintenance.

16.4.1. Inspection and Test Procedures for Aerial Ladders and Articulating and Extendible Boom Platforms.

16.4.1.1. Prior to performing any mobile elevating work platform inspections, the supervisor or designee must conduct a site assessment to identify and eliminate any hazards that may interfere with the safe operation of the equipment during the required inspections. **(T-1)**

16.4.1.2. Aerial ladders shall be inspected and tested annually or immediately following any activity when it is known, or suspected, to have been loaded beyond its maximum load capacity, or immediately following any repair of any ladder assembly structural or mechanical component. **(T-0)** Inspections are the joint responsibility of the principal operator and vehicle mechanic qualified to perform annual inspections. Document inspections and tests in accordance with AFI 24-302, *Vehicle Management*. **(T-1)** Qualified F&ES Flight personnel may perform many of the tests and inspection actions; however, it is recommended they be performed by a third-party testing company or the aerial device manufacturer. A record of the inspection and tests shall be documented in accordance with AFI 24-302. **(T-1)**

16.4.1.3. Articulating and extendible boom platforms shall be inspected and tested annually. **(T-0)** Special inspections and tests shall be conducted immediately following any use where the work platform may have been loaded beyond the manufacturer‘s rated capacity, or immediately following any repair of a boom or work platform assembly structural or mechanical component. **(T-0)** Refer to the manufacturer’s instruction for inspection requirements. Inspections shall be a joint effort by the principal operator and a vehicle mechanic qualified to perform annual inspections of the vehicle. **(T-1)** The inspection and test shall be documented in accordance with AFI 24-302. **(T-1)** When the personnel platform is attached to a telescoping derrick or crane with a rated capacity higher than that of the work platform, test procedures contained herein shall not apply and testing shall be accomplished in accordance with applicable TOs or manufacturer‘s instructions. **(T-1)**

16.4.1.4. Refer to 29 CFR § 1926.1431, *Hoisting Personnel – Cranes and Derricks in Construction,* for information on use of cranes or derricks to hoist personnel work platforms.

16.4.2. Maintenance and Repair of Powered and/or Mobile Units.

16.4.2.1. If deficiencies affecting safe operation are discovered during the daily operator inspection (or during use), the equipment shall immediately be removed from service until repaired. **(T-0)** The manufacturer’s recommended maintenance procedures shall be followed and tests outlined in **paragraph 16.4.1** shall be conducted prior to returning an aerial device to service following repairs to the ladder, boom or work platform. **(T-1)**

16.4.2.2. All repairs shall be accomplished by qualified personnel. **(T-0)**

16.4.2.3. Users shall inspect and maintain aerial platforms to ensure proper operation. **(T-1)** The frequency of inspection and maintenance shall be based on the manufacturer's instructions and compatible with operating conditions and severity of the operating environment. **(T-1)**

16.4.2.4. Aerial platforms not in safe operating condition shall be immediately removed from service and tagged "do not use" until repaired. **(T-1)** A qualified person shall make repairs in accordance with manufacturer's instructions. **(T-1)** This periodic inspection shall include those requirements in paragraphs **16.6.4.3** and **16.6.4.5**. **(T-1)**

16.5. Vehicle-Mounted Elevating and Rotating Work Platforms.

16.5.1. All vehicle-mounted elevating and rotating aerial devices shall meet the requirements of the ANSI A92.2., *Vehicle Mounted Elevating and Rotating Aerial Devices*. **(T-1)** Modifications shall conform to ANSI A92.2 and 29 CFR § 1910.67, *Vehicle-Mounted Elevating and Rotating Work Platforms*, and shall be documented on the appropriate form. **(T-1)** Authorized modifications include temporary removal of installed equipment not needed for a particular mission or modification to provide a new or improved capability. **Warning**: Any modification which removes or defeats any safety device or feature on an aerial device is prohibited. **(T-0)**

16.5.2. Modifications. Modifications shall conform to ANSI A92.2 and 29 CFR § 1910.67 and shall be documented on the appropriate form. **(T-0)** Authorized modifications include temporary removal of installed equipment not needed for a particular mission or modification to provide a new or improved capability. **Warning**: Any modification which removes or defeats any safety device or feature on an aerial device is prohibited. **(T-0)**

16.5.3. Clearances.

16.5.3.1. Electrical. Maintain the following clearances when operating aerial lifts under, over, by or near electric power lines.

16.5.3.1.1. For lines rated 50 kV or less, the minimum clearance between lines and any part of the aerial lift shall be at least 10 feet (305 centimeter [cm]). **(T-0)**

16.5.3.1.2. For lines rated over 50 kV, the minimum clearance between lines and any part of the aerial lift shall be at least 10 feet (305 cm) plus 4 inches (10 cm) for each 10 kV over 50 kV. **(T-0)** Refer to 29 CFR § 1910.269, *Electric Power Generation, Transmission and Distribution,* for additional information.

16.5.3.2. **Exceptions:** Requirements in **paragraph 16.5.3** do not apply if:

16.5.3.2.1. The aerial device is insulated for the work and work is performed by trained communications outside plant workers, line clearance tree-trimming workers or exterior electric linemen.

16.5.3.2.2. Electric power transmission or distribution lines have been de-energized and visibly grounded at point of work or where insulating barriers (not part of or attached to the aerial lift) have been erected to prevent physical contact with the lines.

16.5.3.2.3. Insulating barriers (rated for the voltage of lines being guarded and not part of or attached to the vehicle or its raised structure) are installed to prevent contact with lines. In this instance, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier. Refer to UFC 3-560-01 for additional information.

16.5.3.2.4. Aerial lift is insulated for voltage involved and work is performed by a qualified person. In this instance, the clearance between uninsulated parts of the aerial lift and power line may be reduced to the distance in UFC 3-560-01, Table 3.1.

16.5.3.2.5. An aerial lift or equipment contacts an electrical conductor. In this instance, the vehicle, equipment and attachments shall be considered energized. Personnel standing on the ground shall not contact any part of the lift unless using protective equipment rated for the voltage. **(T-0)** Refer to **Chapter 28** for additional information.

16.5.3.3. Aircraft. When operating aerial lifts under, over, by or near aircraft, ensure adequate clearance is maintained to allow for slight movement of both the aircraft and aerial equipment caused by light winds. See **paragraph 16.5.5.8**.

16.5.4. Proximity Warning Devices. Proximity warning devices may be installed on aerial platforms, but will not release the operator from assuring safe clearance in accordance with **paragraph 16.5.3**. **(T-0)**

16.5.5. Operations.

16.5.5.1. ANSI A92 standards require aerial device manufacturers provide manuals to dealers and direct sale purchasers. DAF users shall ensure manuals are readily available (stored in weather-resistant compartment provided by manufacturer) to workers. **(T-1)** These manuals shall contain:

16.5.5.1.1. Description, specifications and ratings of the aerial device. **(T-1)**

16.5.5.1.2. Operating instructions for aerial device and its auxiliary systems. **(T-1)**

16.5.5.1.3. Precautions relating to multiple configurations such as performing aerial work from a moving vehicle. **(T-1)**

16.5.5.1.4. Instructions regarding routine maintenance and frequency of recommended maintenance. **(T-1)**

16.5.5.1.5. Replacement part information. **(T-1)**

16.5.5.1.6. Instruction markings per **paragraph 16.5.5.2**. **(T-1)**

16.5.5.2. Each aerial device shall have a clearly visible plate or plates (located in a readily accessible area) stating:

16.5.5.2.1. Make, model and manufacturer's serial number. **(T-1)**

16.5.5.2.2. Rated capacity. **(T-1)**

16.5.5.2.3. Platform height. **(T-1)**

16.5.5.2.4. Maximum recommended operating pressures of hydraulic and/or pneumatic systems. **(T-1)**

16.5.5.2.5. Hazards inherent in operation of an aerial device. **(T-1)**

16.5.5.2.6. Manufacturer's marking which describes the function of each control. **(T-1)**

16.5.5.2.7. Insulated or non-insulated. **(T-1) Note:** Insulating aerial devices do not protect personnel from phase to phase or phase to ground contacts at the platform end.

16.5.5.2.8. Qualification voltage and date of test, if applicable. **(T-1)**

16.5.5.2.9. Year of manufacture. **(T-1)**

16.5.5.2.10. Number of platforms. **(T-1)**

16.5.5.2.11. Category of aerial device. **(T-1)**

16.5.5.2.12. Manufacturer's rated line voltage. **(T-1)** Where alternative configurations are possible, the plate will show by chart, schematic or scale the capacities of all combinations in their operating positions and cautions or restrictions, or both, for operation of all alternate or combinations of alternate configurations. These plates shall not be removed from the device, painted over or otherwise made unavailable for reference by the operator. **(T-1) Note:** If an aerial device does not have a plate attached, contact the manufacturer and do not use the aerial lift until the plate is received.

16.5.5.3. Before a mobile unit is moved for travel, the aerial device shall be secured in the specified lower traveling position (to prevent rotation) by the use of cradles or locking devices in accordance with manufacturer's instructions. **(T-0)**

16.5.5.4. The unit shall be visually inspected and lift controls tested prior to each shift or day's work to determine the unit and controls are in safe working condition. **(T-0)** The override feature explained in **paragraph 16.5.5.5** shall be tested at this time. **(T-0)** in accordance with ANSI A92.2, a record of this test shall only be documented if a discrepancy was found with the unit during the inspection. **(T-1)**

16.5.5.5. Articulating and extendible boom platforms, primarily designed as personnel carriers, shall have both platform (upper) and lower controls. **(T-0)** Upper controls shall be in or beside the platform within easy reach of the operator. **(T-0)** In order to prevent inadvertent actuation of the platform boom positioning controls, operation of an unlocking device shall precede use of the control itself and shall be maintained simultaneously during use of the controls. **(T-0)** The unlocking device may be incorporated into each control. Lower controls shall override upper controls. **(T-0)** Controls shall be plainly marked with their function. **(T-0)** The override mode shall prevent boom movement with the lower control station unattended. Lower level controls shall not be operated without permission from the employee in the lift, except in an emergency. Whenever a worker is in or on an elevated work platform, at least one person qualified to operate the equipment shall act as a safety observer who will maintain visual or voice contact with the operator from a safe location. **(T-0) Exception**: Personnel working in or on an elevated boom without a qualified person near the lower level control panel is permitted if manufacturer's instructions allows for such operations.

16.5.5.5.1. Emergency Stop. The platform shall have an emergency stop control which will stop all platform movement. **(T-0)** This control shall not require continuous operator actuation to stop movement. **(T-0)**

16.5.5.5.2. Outrigger Controls. Aerial device outrigger controls shall be guarded to protect against inadvertent operation, and shall return to neutral when released by the operator. **(T-0)** These controls shall be located so the operator can see the outrigger being operated. **(T-0)**

16.5.5.6. Boom and basket load limits specified by the manufacturer shall not be exceeded. **(T-0)**

16.5.5.7. Aerial lift trucks shall not be moved with the boom elevated and personnel in the basket unless the lift truck is specifically designed for such operation. In all cases, the manufacturer's operating instructions shall be followed. **(T-0)**

16.5.5.8. Vehicle-mounted elevating and rotating work platforms shall not be used during high winds, thunderstorms or any other adverse or mission-limiting weather conditions which could endanger workers using the platform. **(T-0)** Refer to the operator's manual or applicable TO for specified wind limits.

16.5.5.9. Platforms other than buckets or baskets shall include a guardrail system which shall:

16.5.5.9.1. Include a top rail, 42 inches high (plus or minus 3 inches), and at least one rail approximately midway between top rail and platform surface around its upper periphery. **(T-0)** Both rails shall withstand 300 pounds of force applied in any direction without ultimate failure. **(T-0)**

16.5.5.9.2. Include toeboards on all sides of platforms. **(T-0)** Toeboards shall be a minimum of four inches, securely fastened in place and with not more than 1/4-inch clearance above floor level. **(T-0) Exception**: A toeboard is not required at the access opening. Where there is exposure to personnel, electrical wires or equipment below the platform, a Job Hazard Analysis should be performed to determine the best approach to ensure protection from falling objects in accordance with 29 CFR § 1910.28, *Duty to Have Fall Protection and Falling Object Protection.* **(T-0)**

16.5.5.9.3. Include access for personnel entering the platform in the lowered position. **(T-0)** Access steps or rungs shall have a slip-resistant surface. **(T-0)**

16.5.5.10. A full body harness and lanyard (sized to limit free fall distance to six (6) feet or less, or the free fall distance permitted by the system, whichever is less) shall be worn by each bucket or platform occupant. **(T-0)** Each lanyard shall be attached to a designated anchor point on the boom or basket. **(T-0)** Refer to 29 CFR §§ 1910.67 and 1010.140, *Personal Fall Protection Systems—Personal Protective Equipment*, for additional information.

16.5.5.11. Belting off to an adjacent pole, structure or equipment while working from an aerial lift shall not be permitted. **(T-0)**

16.5.5.12. Workers shall stand firmly on the basket floor, not sit or climb on edge of basket or use planks, ladders or other devices for a work position. **(T-0)**

16.5.5.13. Climber's equipment shall not be worn while performing work from an aerial lift. **(T-0)**

16.5.5.14. Aerial devices, including insulated aerial devices, shall not be brought into contact with energized or potentially energized conductors. **(T-0)** Workers shall not rely on dielectric capabilities of aerial devices. **(T-0)**

16.5.5.15. Consult BE prior to work near suspected sources of non-ionizing radiation, e.g., radar and microwave equipment. **(T-1)** Refer to **Chapter 29** for additional guidance.

16.5.5.16. Before using an aerial device, the worksite shall be surveyed for hazards, such as un-tamped earth fills, ditches, drop-offs and floor obstructions, debris, overhead obstructions and electrical conductors, weather conditions and presence of unauthorized persons. **(T-0)**

16.5.5.17. Before and during each use, the operator shall:

16.5.5.17.1. Check for overhead obstructions and electrical conductors. **(T-0)**

16.5.5.17.2. Ensure load weight does not exceed manufacturer's rated capacity. **(T-0)**

16.5.5.17.3. Ensure outriggers and stabilizers are used if required by manufacturer's instructions. **(T-1)**

16.5.5.17.4. Ensure guardrails are properly installed, including bolts, pins or other locking devices on removable railings and attachments, and that gates are closed. **(T-0)**

16.5.5.17.5. Use outrigger pads when necessary to provide firm footing. **(T-0)**

16.5.5.17.6. Set brakes. **(T-0)**

16.5.5.17.7. Chock wheels before using the lift on an incline. **(T-0)**

16.6. Manually-Propelled and Self-Propelled Mobile Work Platform and Scaffolds (Towers).

16.6.1. Work platforms with work levels four (4) feet or higher shall have guardrails, midrails and toeboards in accordance with **paragraph 16.5.5.9** on all four (4) sides of the work platform. **(T-1) Exception**: A toeboard is not required at the access opening.

16.6.2. Working Loads:

16.6.2.1. Work platforms and scaffolds shall carry their designed load under all conditions of use. **(T-0).** Aircraft maintenance work platforms shall support design loads listed in their TOs. **(T-1).** Parts, additions or accessories for safe use of platforms and scaffolds shall be part of the design. **(T-1).**

16.6.2.2. Specific design and construction requirements are not part of this publication due to the wide variety of materials and design possibilities. However, the design used shall produce a mobile ladder stand or scaffold that will safely hold specified loads. **(T-1)** Materials selected shall be strong enough to meet test requirements and protected against corrosion and deterioration. **(T-1)** Work platforms shall be conspicuously marked with the maximum intended load. **(T-1)**

16.6.2.2.1. The design working load of ladder stands shall be calculated based on one or more 250-pound persons with 50 pounds of equipment each. **(T-0)**

16.6.2.2.2. Scaffold design work loads shall be calculated based on:

16.6.2.2.2.1. Light – Designed and constructed for a work load of 25 pounds per square foot. **(T-0)**

16.6.2.2.2.2. Medium – Designed and constructed for a work load of 50 pounds per square foot. **(T-0)**

16.6.2.2.2.3. Heavy – Designed and constructed for a work load of 75 pounds per square foot. **(T-0) Note:** Ladder stands and scaffolds shall support at least four (4)

times the design work load. **(T-0)**

16.6.2.3. Mobile ladder stand and scaffold materials shall meet strength, dimension and weight specifications in this publication to safely support the design work load. **(T-0)**

16.6.2.4. Bolts or other fasteners used to assemble ladders, scaffolds and towers shall be large enough and in sufficient quantity at each connection to develop designed strength. **(T-0)**

16.6.2.5. The operator shall ensure there are no sharp edges, burrs or other hazards to personnel on exposed surfaces. **(T-0)**

16.6.3. Work Levels.

16.6.3.1. Maximum work level height shall not exceed four (4) times the minimum or least base dimension (width) of any mobile ladder stand or scaffold. **(T-0)** Where the basic mobile unit does not meet this requirement, suitable outrigger frames shall be used to obtain this least base dimension or the unit shall be tied with guy wires or braced to keep the unit from tipping. **(T-0)**

16.6.3.2. The minimum platform work level width for mobile scaffolds (towers) shall not be less than 20 inches. Ladder stands shall have a minimum step width of 16 inches. **(T-0)**

16.6.3.3. The supporting structure for the work level shall be rigidly braced, using cross bracing or diagonal bracing with rigid platforms at each work level. **(T-0)**

16.6.3.4. Ladder stand steps shall have slip-resistant treads or a slip-resistant coating. **(T-0)**

16.6.3.5. The work level platform of scaffolds shall be wood, aluminum, plywood planking, steel or expanded metal, for the scaffold's full width, except for necessary openings. **(T-0)** Work platforms shall be secured to the support structure. **(T-0)** Planking shall be 2-inch (nominal) scaffold grade minimum 1,500 fiber (f) (stress grade) lumber or equivalent. **(T-0)**

16.6.3.6. Scaffold work platforms four (4) feet or higher shall have guardrails, midrails and toeboards in accordance with **paragraph 16.5.5.9**. **(T-0)**

16.6.3.7. Scaffolds shall have a climbing ladder or stairway (for access and egress) affixed or built into the scaffold. **(T-0)** The ladder or stairway shall be located so it will not tip the scaffold. **(T-0)** A landing platform shall be provided at intervals not exceeding 30 feet. **(T-0)**

16.6.3.8. Self-propelled elevating work platforms and manually-propelled mobile work platforms shall not be moved with personnel on the working platform unless allowed by manufacturer's instructions. **(T-0)** Locking pins or other devices, as required, shall be in place in accordance with equipment-specific TOs or manufacturer's specifications before anyone is allowed to ascend the stairs or ladder. **(T-0)** If allowed by manufacturer's instructions the following requirements need to be accomplished prior to any movement with personnel on the working platform:

16.6.3.8.1. Guardrails, midrails, and toeboards shall be installed on all exposed sides in accordance with **paragraph 16.5.5.9**. **(T-0)**

16.6.3.8.2. The floor or surface, on which the scaffold is being moved, shall be within 3° (0.6288 inches of rise in 12 inches of run) of level, smooth (the equivalent of broom-finished concrete) and free from pits, holes or obstructions. **(T-0)**

16.6.3.8.3. The minimum dimension of the scaffolding base when ready for rolling shall be at least one-half of the height. **(T-0)** Outriggers, if used, shall be installed on all four sides of the scaffold and then can be included as part of the base dimension. **(T-0) Note:** Measure at the widest width of the base.

16.6.3.8.4. All tools and materials are secured or removed from the platform before the mobile scaffold is moved. **(T-0)**

16.6.3.8.5. Employees on the mobile scaffold shall be advised by a spotter and be aware of each movement in advance. **(T-0)**

16.6.3.8.6. Employees on the work platform of the mobile scaffold may move the scaffold when the mobile scaffold is equipped with a manual system in which the propelling force is applied to the wheels only and cannot exceed normal walking speed.

16.6.3.8.7. The force necessary to move the mobile scaffold shall be applied as close to the base as practicable and provision shall be made to stabilize the tower during movement from one location to another. **(T-0)**

16.6.3.9. When a guardrail system, or a porting of a guardrail system, is to be removed from a mobile work platform, and the platform is elevated to four (4) feet or more, personal fall protection must be used and attached to a designated anchorage point. **(T-0)** Self-propelled work platforms manufactured without an approved structural anchor point shall have protective guardrails, midrails (when required) and toeboards installed on all open sides in accordance with **paragraph 16.6.1** **(T-0)** When within 14 inches of the work surface, e.g., aircraft and buildings, guardrails need not be in place on the side that is within 14 inches of a working surface. Bolts, pins or other locking devices shall be provided and used on all removable railings and attachments. **(T-0)**

16.6.3.10. Personal fall arrest equipment anchorages shall be capable of supporting at least 5,000 pounds (22.2 kilonewton [kN]) per worker attached or shall be designed, installed, and used as part of a complete personal fall arrest system which maintains a safety factor of two, under the supervision of a qualified person. **(T-0)** Refer to Chapter **13** and **29** CFR § 1910.140 for additional guidance.

16.6.3.11. Lanyards, D-rings, snap-hooks and all fall arrest system components shall meet the requirements of 29 CFR § 1910.140. **(T-0)**

16.6.4. Operations.

16.6.4.1. Training requirements in **paragraph 16.3.1** also apply to all manually-propelled elevating aerial platforms and self-propelled elevating work platforms. Operators shall also be trained on the location and use of the manufacturer's instructions. **(T-1)**

16.6.4.2. Aerial platforms shall be given a visual inspection and functional test in accordance with manufacturer's instructions before use each day or at the beginning of each shift. **(T-0)**

16.6.4.3. Inspection deficiencies shall be documented in accordance with applicable TO or local procedure for stands not covered by a TO. **(T-0)** A visible indicator, e.g., AF Form 981, *Out of Order Tag*, or other means shall be affixed to stands removed from service until repaired and returned to service. **(T-0)**

16.6.4.4. Refer to **paragraph 16.5.5.16** for workplace inspection information.

16.6.4.5. The operator shall ensure the following before each elevation of the platform:

16.6.4.5.1. The aerial platform is operated on a surface within the manufacturer's limits. **(T-0)**

16.6.4.5.2. Outriggers, stabilizers, extendable axles or other stability enhancing means are used as required by the manufacturer. **(T-0)**

16.6.4.5.3. Guardrails are installed and access gates or openings are closed per manufacturer's instructions, including bolts, pins or other locking devices on all removable railings and attachments. **(T-0)**

16.6.4.5.4. The load and its distribution on the platform and any platform extensions do not exceed the manufacturer's rated capacity for the specific configuration. **(T-0)**

16.6.4.5.5. There is adequate clearance from overhead obstructions. **(T-0)**

16.6.4.5.6. Minimum safe approach distances to energized power lines and parts are maintained. **(T-0)**

16.6.4.5.7. All personnel on the platform shall wear required fall protection devices and other safety gear. **(T-0)**

16.6.4.6. Controls for manually elevated platforms shall be clearly marked for direction and function. **(T-0)** Controls for platform elevating and lowering mechanisms shall be self-locking and readily accessible from the ground. **(T-0)** Controls at the platform are optional.

16.6.4.7. Upper controls of power elevated platforms shall be:

16.6.4.7.1. Clearly marked as to direction and function. **(T-0)**

16.6.4.7.2. A type that automatically returns to the off or neutral position when released. **(T-0)**

16.6.4.7.3. Protected against inadvertent operation. **(T-0)**

16.6.4.7.4. Readily accessible to the operator. **(T-0)**

16.6.4.7.5. Designed to include a control that must be continuously activated for upper controls to function and that automatically returns to the off position when released. **(T-0)**

16.6.4.8. Aerial platforms with a powered elevating assembly shall have a clearly marked emergency lowering means readily accessible from ground level. **(T-0)**

16.6.4.9. The aerial platform shall have a readily identifiable emergency stop device at upper control and lower control stations that will stop powered functions and platform movement. **(T-0)**

16.6.4.10. The control system shall be designed so a single control system malfunction will not cause unintended platform movement. **(T-0)**

16.6.5. Wheels and Casters.

16.6.5.1. Wheel and casters shall be sized to support four times the design working load. **(T-0)**

16.6.5.2. Scaffold casters shall have a positive wheel and (or) swivel lock to prevent movement. Two of the four casters on ladder stands shall swivel and be lockable. **(T-0)**

16.6.5.3. Screwjacks or other means for adjusting height shall be provided where leveling of the elevated work platform is required. **(T-0)**

16.6.5.4. At least two (2) brakes, wheel locks or permanently installed jacks shall be operable on all mobile work platforms. **(T-0)**

16.6.6. Mobile Tubular Welded Frame Scaffolds:

16.6.6.1. Scaffolds shall be designed to comply with 29 CFR § 1910.27. **(T-0)** The installation BCE office is the authorizing agency for scaffold erection. **(T-0)**

16.6.6.2. Scaffold vertical members shall be properly braced by cross or diagonal braces. **(T-0)** Braces shall automatically square and align vertical members so the erected scaffold is always plumb, square and rigid. **(T-0)**

16.6.6.3. Spacing of panels or frames shall be consistent with loads imposed. **(T-0)** Frames shall be placed one on top the other with coupling or stacking pins to provide vertical alignment of legs. **(T-0)**

16.6.6.4. Panels shall be locked together vertically by pins or equivalent if uplift can occur. **(T-0)**

16.6.7. Mobile Tubular Welded Sectional Folding Scaffolds.

16.6.7.1. General. Scaffolds, including sectional stairway and sectional ladder scaffolds, shall be designed and erected in accordance with paragraphs **16.5.1**, **16.5.2**, **16.5.4** and **(T-0)**

16.6.7.2. Stairway. Each section of folding stairway scaffold shall include a stairway, detachable work platform and a set of pivoting and hinged folding diagonal and horizontal braces. **(T-0)**

16.6.7.3. Sectional Folding Stairway Scaffolds. These are medium duty scaffolds (light duty when equipped with a "high clearance" base section). **Note:** High clearance bases have a greater open space so the scaffold may be placed over obstructions like machinery or shrubbery. When high clearance bases are used to support sectional folding stairway scaffolds, the entire scaffold's load capacity shall be reduced. **(T-0)** Sectional folding stairway scaffolds shall not exceed 4 ½ feet in width and 6 feet in length. **(T-0)**

16.6.7.4. Sectional Folding Ladder Scaffolds. Sectional folding ladder scaffolds are light duty scaffolds (includes special base [open end] sections designed for high clearance over obstructions). For special applications, 6-foot folding ladder scaffolds, except high clearance base sections, shall be designed as medium duty scaffolds. **(T-0)** A sectional folding ladder scaffold shall not exceed 6 feet 6 inches in width for a 6-foot long unit, 8 feet 6 inches for an 8-foot unit, or 10 feet 6 inches for a 10-foot long unit. **(T-0)** End frames

of sectional ladder and stairway scaffolds shall be designed so horizontal bearers provide support for multiple planking levels. **(T-0)**

16.6.8. Mobile Tube and Coupler Scaffolds:

16.6.8.1. Design. Units shall be designed in accordance with 29 CFR § 1910.27. **(T-0)**

16.6.8.2. Material. Couplers shall be made of structural type material, such as drop-forged steel, malleable iron or structural grade aluminum. **(T-0)** Use of gray cast iron is prohibited.

16.6.9. Mobile Work Platforms.

16.6.9.1. Design. Units shall be designed in accordance with paragraphs **16.5.1, 16.5.2** and **16.5.4**. **(T-0)**

16.6.9.2. Base Width. The minimum base width shall conform to **paragraph 16.6.3.2**. **(T-0)**

16.6.9.3. Bracing. Rigid diagonal bracing to vertical members shall be provided. **(T-0)**

16.6.10. Mobile Ladder Stands:

16.6.10.1. Design. Units shall comply with applicable requirements of paragraphs **16.5.1, 16.5.2** and **16.5.4**. **(T-0)**

16.6.10.2. Base Width. Minimum base width shall be in accordance with **paragraph 16.6.3.2** **(T-0)** Maximum base section length shall be the total length of combined steps and top assembly, measured horizontally, plus 5/8 inch per step of rise. **(T-0)**

16.6.10.3. Steps. Steps shall be designed and installed in accordance with 29 CFR § 1910.23, *Ladders.* **(T-0)**

16.6.10.4. Handrails. Units with at least 3 treads and 4 risers, or rising more than 30 inches, shall be equipped with a stair rail and handrails in accordance with 29 CFR § 1910.28 and 29 CFR § 1926.1052, *Stairways.* **(T-0)** Handrails shall be at least 29 inches high and the same height all along the step, measured vertically from the center of the step. **(T-0)**

16.6.10.5. Load design shall meet requirements of **paragraph 16.6.2.2.1**. **(T-0)**

16.6.11. Mobile Work Platforms and Ladder Stands shall:

16.6.11.1. Meet criteria in paragraphs **16.6.9** and **16.6.10** **(T-0)** If these mobile work platforms have steps, they shall meet mobile ladder stand criteria for step dimensions and handrails. **(T-0)**

16.6.11.2. Be maintained free of grease, oil, ice, snow, mud or any other slippery substance or object which could cause slips and falls. **(T-0)** Step treads and walking surfaces shall be in good repair. **(T-0)** Repair worn surfaces with suitable materials or make safe using abrasive or non-slip materials. **(T-0)**

16.6.11.3. Have guardrails on all open sides of aircraft maintenance platforms. **(T-0)** Removable guardrails removed for material handling, shall be replaced as soon as material handling is complete. **(T-1)** Protective guardrails are not required at the platform entrance if there is a ramp or stairway (angle less than 60 degrees) in accordance with **paragraph 16.6.1** Protective guardrails shall only be removed from the side(s) of the platform positioned as close as practical (less than 14 inches) and parallel to aircraft, building or other working surface. **(T-0)** Guardrails shall be installed on all open sides if platform

levels are four (4) feet or higher above ground or floor. **(T-0)** Bolts, pins or other locking devices shall be provided and used on all removable railings and attachments. **(T-0)** Only guardrails and toeboards meeting criteria in **paragraph 7.1.4.1** shall be used. **(T-0)**

16.6.11.4. Ensure prior to any user ascending a raised mobile platform: all locking devices (e.g., pins, collars) shall be installed, hydraulic pressure shall be released, the platform shall be slowly lowered until locking devices are securely engaged and hydraulic pressure valve(s) shall be closed. **(T-0)** If the raisable portion of the platform cannot be elevated from ground level, the user may ascend to that platform portion and adjust platform height. However, requirements for locking devices, pressure release and closing valves shall be met prior to starting any task or work. **(T-0)**

16.6.11.4.1. Ascending/descending work platform. The aerial platform shall include means for personnel to use in entering onto or exiting from the platform when in the lowered position. **(T-0)** When the distance between the access level and the floor of the platform in its access position exceeds inches (0.5 meters), the aerial platform shall be equipped with an access ladder. **(T-0)** The access system shall permit and, by proper placement of components, promote achievements of three-point contact while ascending or descending the access system. **(T-0)** The steps or rungs shall be divided equally over the distance between the first step or rung and the floor of the platform and shall not be more than 12 inches (0.30 meters) apart the height of the first step above the ground shall be a maximum of 20 inches (0.5 meters). **(T-0)** Each step or rung shall be at least 12.5 inches (0.32 meters) wide, at least 1.0 inches (25 millimeters) deep, and shall be slip resistant. **(T-0)** The front steps or rungs shall be at least 6 inches (0.15 meters) horizontally away from the supporting structure or any other component of the aerial platform. **(T-0)** The access ladder shall be symmetrical with the access opening. **(T-0)** Personnel ascending/descending ladders shall face the ladder and maintain a firm hold on the ladder. **(T-0)** Personnel ascending/descending stairs (between 50 and 70 degrees) shall face the direction of travel and use hand rails. **(T-0)**

16.6.11.4.2. Refer to **Chapter 7** for additional guidance on ladder safety.

16.6.11.5. Mark mobile work platforms with reflective materials to the maximum extent authorized by appropriate TOs, such as TO 35-1-3, *Corrosion Prevention and Control, Cleaning, Painting, and Marking of USAF Support Equipment (SE)*. **(T-0)** When not being transported, mobile work platforms shall be secured to prevent collision with aircraft, vehicles or other equipment. **(T-1)** Designated flightline storage areas for mobile work platforms shall be determined by AGE flight commander and airfield manager and approved by the Maintenance Group Commander. **(T-1)** Refer to **Chapter 24** for further guidance.

16.6.11.6. Mobile work platforms shall be operationally inspected per the equipment TO or manufacturer's instructions and TO 00-20-1, *Aerospace Equipment Maintenance Inspection, Documentation, Policies, and Procedures.* **(T-0)** Maintenance work stands shall have four (in any combination) of the following: operational brakes, wheel locks or permanently installed jacks (e.g., two operational brakes and two permanently installed jacks). **(T-1)** No stand will be used unless all brakes are set and all wheels and casters are locked, if so equipped. **(T-1)** Wheel will be locked either 90 or 180 degrees from the caster lock pin if it interferes with the wheel brake handle. **(T-1)** Wheel chocks may be used in

conjunction with these requirements. Vehicle chocks may be constructed or locally manufactured in accordance with TO 00-25- 172, *Ground Servicing of Aircraft and Static Grounding/Bonding.* Platforms shall be locked when not in use to avoid rolling down slanted surfaces or being moved by wind. **(T-1)** Stands with defects shall be tagged as unserviceable. **(T-0) Note:** Some maintenance work stands may only have two operational brakes and no permanently installed jacks. Both brakes are required to be set. **Note:** A daily inspection is not required for days the stand is not used.

16.6.11.7. When mobile work platforms are being moved:

16.6.11.7.1. Personnel and equipment may remain on self-propelled and manually-propelled work platforms when moved if manufacturer's instructions allow such activity and the requirements of **paragraph 16.6.3.8** and subparagraphs are followed.

16.6.11.7.2. Platforms to be towed shall be equipped with hitches designed for such purpose. **(T-0)**

16.6.11.7.3. The following rules apply when platforms are towed by vehicles:

16.6.11.7.3.1. Maximum towing speed for one maintenance stand is 10 miles per hour (MPH) and 5 MPH for 2 or more maintenance stands. **(T-1)** However, when surfaces and terrain make it necessary, speed shall be reduced accordingly. **(T-1)**

16.6.11.7.3.2. No more than four type B1, B4, B5 and similar small stands may be towed as follows: two sets of two in tandem on a double hitch or two in tandem on a single hitch. Type B3, J7 and similar large stands shall be towed singly on a center mounted hitch. **(T-1)** Four-wheeled units shall not be towed behind two-wheeled units. **(T-1)** Large pieces of AGE, when towed in tandem, shall not block the driver's vision of last item being towed. **(T-1)**

16.6.11.7.3.3. Safety pins shall be used to secure pintle hooks and trailer hitches. **(T-1)**

16.6.11.8. Mobile work platforms used where static electricity is hazardous to the work operation, such as fuel cell repair or refueling vehicle maintenance, shall be grounded and equipped with static discharge plates for personnel to dissipate accumulated static electricity. **(T-0)**

16.6.11.9. Maintain mobile work platforms and ladder stands in accordance with appropriate 35-series TOs. **(T-1)**

16.7. Scaffolding. This section applies to all scaffolding used in the DAF, except rolling scaffolds (mobile towers), which are covered in **paragraph 16.6** With the many different brands, categories and varieties of scaffolds, 29 CFR § 1910.27 provides the most practical criteria regarding the assembly, erection, storage and safe use of scaffolding. Refer to **paragraph 16.6** for information on manually-propelled mobile ladder stands, mobile work platforms or mobile towers. Refer to **Table 16.1** for a list of typical types of scaffolding.

16.7.1. General Requirements.

16.7.1.1. Scaffolds shall be provided when work cannot be done safely from the ground or from solid construction and shall be erected, moved, dismantled or altered only under the supervision and direction of a competent person trained in these activities. **(T-0)** Such

work shall only be performed by experienced, trained personnel under the direction of the competent person. **(T-0)** When ladders are used, they will conform to requirements in 29 CFR § 1926.451, *General Requirements – Scaffolds.* **(T-0)**

16.7.1.2. The footing or anchorage for scaffolds shall be designed to support the maximum intended load without settling or displacement. **(T-0)** Unstable objects such as barrels, boxes, loose brick or concrete blocks shall not be used to support scaffolds or planks. **(T-0)**

16.7.2. Guarding requirements. All guarding for scaffolding shall meet the requirements specified in 29 CFR § 1910.27. **(T-0)**

16.7.3. Scaffolds and their components shall be capable of supporting at least four times the maximum intended load. **(T-0)**

16.7.4. Scaffolds shall not be altered or moved horizontally while in use or occupied. **(T-0)**

16.7.5. Scaffolds, their accessories and other devices prescribed in this chapter shall be maintained in good condition. **(T-0)** Scaffold parts shall be inspected by a competent person prior to use. **(T-0)** If any deficiencies are found, the scaffold shall not be used until repaired or replaced. **(T-0)**

16.7.6. A ladder or equivalent safe access shall be provided. **(T-0)**

16.7.7. Where swinging loads are being hoisted onto or near a scaffold, they shall have a tag line or equivalent measures to control the loads and prevent contact with the scaffold. **(T-0)**

16.7.8. Workers shall wear hard hats during erection, while working on maintenance and teardown of scaffolding. **(T-0)** Protective gloves are also recommended.

16.7.9. Clearance Between Scaffolds and Power Lines. Scaffolds shall not be erected, used, dismantled, altered or moved such that they or any conductive material handled on them might come close to exposed and energized power lines. **(T-0) Exception**: Scaffolds and materials may be closer to power lines, if the lines are de-energized, the lines are relocated, or a protective covering is installed to prevent accidental contact with the lines. Verification of de-energization, relocation or insulation installation must be done prior to work beginning on the erecting of scaffolding. **(T-0)**

16.7.10. Adverse weather conditions such as ice, snow, rain and wind can create a hazardous working surface. A plan shall be established addressing adverse weather conditions and measures to be taken to protect workers performing work under adverse weather conditions. **(T-1)** The following rules shall apply to work under adverse weather.

16.7.10.1. Personnel shall not work on scaffolds covered with ice or snow. **(T-0)** If the work surface remains slippery after ice or snow removal, it shall be sanded or otherwise treated to prevent workers from slipping. **(T-0)**

16.7.10.2. Personnel shall not work on scaffolds during storms or high winds. **(T-0)** Due to the many types and uses of scaffolding, it is impractical to determine specific wind criteria for work stoppage. The designated competent persons are responsible for assessing unsafe environmental and climatic work conditions and will take necessary preventive measures to protect workers. **(T-1)**

16.7.11. Tools, materials and debris shall not be allowed to accumulate in quantities that could cause a hazard. **(T-0)** When possible, containers shall be provided on scaffolds for storage of loose materials. **(T-0)** Supervisors shall ensure good housekeeping practices are followed to prevent tripping hazards. **(T-1)**

16.7.12. Chemically-active environments can destroy fiber rope. Rope materials such as polyester, nylon and manila can be damaged when exposed to caustics and acids. When fiber rope is used near corrosive substances or chemicals, the manufacturer shall be consulted for assistance in determining the proper type rope to use. **(T-0)**

16.7.13. Wire or fiber rope used for scaffold suspension shall support at least six (6) times the intended load. **(T-0)**

16.7.14. The use of shore scaffolds or lean-to scaffolds is prohibited.

16.7.15. Lumber sizes, when used in this publication, refer to nominal sizes except where otherwise stated.

16.7.16. Scaffolds shall be secured to permanent structures by anchor bolts, reveal bolts or other equivalent means. **(T-0)** Window cleaners' anchor bolts shall not be used. **(T-0)**

16.7.17. Special care shall be taken to protect scaffold members, including wire or fiber ropes, when using heat-producing processes. **(T-0)**

16.7.18. A covered storage area is recommended to protect scaffolding from damage and deterioration.

16.7.19. Wooden parts of scaffolding shall not be painted as paint can hide defects. **(T-0)** Clear varnish, lacquer, shellac or linseed oil shall be used when wood protection is needed. **(T-0)**

16.7.20. Individual workers shall not attempt to manually lift or move scaffold members which are excessively heavy, or because of their shape or size, cannot be safely handled. **(T-0)** In these cases, assistance shall be obtained from other workers or mechanical handling equipment shall be used. **(T-1)**

16.7.21. Hand tools used to assemble scaffolding shall be in good condition. **(T-0)** When powered hand tools are used, they shall be electrically grounded or of double insulated construction. **(T-0)**

Table 16.1. Types of Scaffolding (not all inclusive).

Tube and Coupler Scaffolds
Tubular Welded Frame Scaffolds
Masons' Adjustable Multiple-Point Suspension Scaffolds
Two-Point Suspension Scaffolds (Swinging Scaffolds)
Stone Setters' Adjustable Multiple-Point Suspension Scaffolds
Single-Point Adjustable Suspension Scaffolds
Boatswains' Chairs
Carpenters' Bracket Scaffolds
Bricklayers' Square Scaffolds
Horse Scaffolds
Needle Beam Scaffolds

Plasterers, Decorators and Large Area Scaffolds
Interior Hung Scaffolds
Ladder-Jack Scaffolds
Window-Jack Scaffolds
Roofing Brackets
Crawling Boards or Chicken Ladders Float or Ship Scaffolds

Chapter 17

MISHAP PREVENTION SAFETY SIGNS, TAGS AND LABELING

17.1. Scope. This chapter outlines DAF requirements for safety, health and fire prevention signs and tags, and for piping systems and compressed gas cylinders safety color coding, labeling and marking. **Table 17.1** lists the regulatory guidance that governs safety signs, tags, labeling and markings. These requirements apply to all work environments, except for the following:

17.1.1. Signs or tags unique to aircraft, motor vehicles, and railroad or marine operations.

17.1.2. Piping system sections buried underground, in concrete or part of vehicles or field mobility equipment/systems, etc.

Table 17.1. Regulatory Guidance for Mishap Prevention Safety Signs, Tags and Labeling.

Specific Area	Regulatory Guidance
Safety color coding	29 CFR § 1910.144, *Safety Color Code for Marking Physical Hazards*
Preventions signs and tags	29 CFR § 1910.145, *Specifications for Accident Prevention Signs and Tags*
Bulk petroleum products systems	MIL-STD-161H, *DoD Standard Practice: Identification Methods for Bulk Petroleum Products Systems Including Hydrocarbon Missile Fuels*
Color code for pipelines, piping systems and compressed gas cylinders	MIL-STD-101C, *DoD Standard Practice: Color Code for Pipelines and for Compressed Gas Cylinders* ASME A13.1, *Scheme for the Identification of Piping Systems*
Signs design	UFC 3-120-01, *Design: Sign Standards*
Exit signs	NFPA 101, *Life Safety Code* UFC 3-600-01, *Fire Protection Engineering for Facilities*
Fire hazards signs	NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*
Electrical equipment labeling	UFC 3-560-01, *Operation and Maintenance: Electrical Safety*
Signs and symbols for explosive materials	DESR 6055.09_AFMAN 91-201, *Explosives Safety Standards*
Laser hazard warning signs	AFI 48-139, *Laser and Optical Radiation Protection Program*
Radio frequency radiation warning signs	AFI 48-109, *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health Program*
Ionizing radiation warning signs	AFMAN 40-201, *Radioactive Materials (RAM) Management* AFMAN 48-148, *Ionizing Radiation Protection* 10 CFR § 20, *Standards for Protection Against Radiation*

Specific Area	Regulatory Guidance
Toxic and hazardous substances warning signs	29 CFR § 1910, Subpart Z – *Toxic and Hazardous Substances*
General environmental controls signs	29 CFR § 1910.145, *Specifications for Accident Prevention Signs and Tags*
Hazardous noise	29 CFR § 1910.95, *Occupational Noise Exposure*

17.2. Hazards and General Information.

17.2.1. Work Hazards. Preventive signs, tags, color coding, labeling or markings shall be used wherever a hazard is present in the workplace. **(T-0)** The following are examples of workplace hazards:

17.2.1.1. Physical hazards, e.g., electricity, radiation, high exposures to sunlight/ultraviolet rays, temperature extremes, noise, flying or falling particles, sharp edges.

17.2.1.2. Chemical and dust hazards, e.g., cleaning products, paints, acids, solvents, welding fumes, gases, flammable materials, pesticides, respirable crystalline silica.

17.2.1.3. Biological hazards, e.g., blood/other body fluids, fungus (mold), bacteria, viruses, plants, insect bites, animal/bird droppings.

17.2.2. Signs, tags, color coding, labeling and markings are an effective means for communicating hazard information to workers to prevent injuries and illnesses.

17.2.2.1. Signs and tags are not substitutes for abatement action using the hierarchy of controls, such as elimination, substitution, engineering controls and administrative controls.

17.2.2.2. Wording on signs and tags shall be concise, accurate, easily read, contain sufficient information to be easily understood. **(T-0)**

17.2.2.3. Interior and other installation specific signs shall be designed in accordance with UFC 3-120-01, where applicable. **(T-1)** Where OSHA has specific requirements, they shall be followed in addition to applicable federal, state or municipal regulations. **(T-0)**

17.2.3. Availability of Safety Signs and Tags. The functional manager or supervisor shall ensure an adequate supply of safety signs and tags is available to workers. **(T-1)**

17.2.4. Other signs or tags prescribed by DAF directives for site-specific hazards shall be brought to the attention of HQ AFSEC/SEG, e.g., signs or tags that may be included in this instruction or clarification of usage. **(T-1)**

17.2.5. Identification of Hazards.

17.2.5.1. Workers shall immediately advise supervisors of unsafe conditions. **(T-0)**

17.2.5.2. Supervisors shall evaluate the situation, ensure an appropriate preventive sign, tag, color coding, labeling and/or marking is attached/applied. **(T-0)**

17.2.5.2.1. The supervisor will coordinate placement of tags and assignment of Risk Assessment Codes with the installation Occupational Safety office, F&ES Flight and/or BE, as appropriate. **(T-1)**

17.2.5.2.2. The supervisor, or person in charge at the time, is responsible for issuing tags. If unavailable, the worker shall contact the installation Occupational Safety office, F&ES Flight or BE, as appropriate. **(T-1)**

17.3. Training.

17.3.1. All exposed affected employees shall be instructed in the classification and use of safety, health and fire prevention signs and tags, to include, when applicable, piping systems safety color coding, labeling and markings in accordance with in accordance with 29 CFR § 1910.144 and 1910.145. **(T-0)** Supervisors shall ensure training is accomplished and that employees are knowledgeable of the requirements. **(T-0).**

17.3.2. Retraining. Employees shall be retrained when changes in their job assignment occurs, such as a change in machinery, equipment or processes that present a new hazard, when changes in the workplace may result in a hazardous condition or inadequacies in an employee's knowledge indicate that the employee has not retained the requisite understanding of the purpose of safety signs, tags and labels. **(T-0)**

17.4. Sign Requirements.

17.4.1. Signs shall be uniform, properly worded and located, with a meaning immediately and clearly understood as an automatic warning, caution or notice to all personnel no matter where they work in accordance with 29 CFR § 1910.145(c) through (e). **(T-0)**

17.4.1.1. To prevent confusion, avoid grouping too many signs together in the same location.

17.4.1.2. Signs shall not be placed on moveable objects or adjacent to moveable objects like wheeled equipment, removable partitions, on doors, etc., which, if moved, will obscure the sign.

17.4.1.3. Signs shall have adequate illumination. If illumination is inadequate under emergency conditions, signs shall be equipped with emergency (battery operated) illumination, be luminescent or both. Consult the local CE facility design section for lighting guidance for specific locations.

17.4.1.4. Multi-lingual Signs. Whenever possible, use international signs and ensure all workers understand warnings. If additional languages are needed on safety signs, it is strongly encouraged to use symbols, in addition to words, to better communicate hazard information across language barriers.

17.4.1.5. Criteria for Color Coding. Safety color coding for warning signs and markers helps alert persons to the presence of hazards. Color schemes for tags should follow standard color schemes of signs. Color specifications in this publication are in accordance with 29 CFR §§ 1910.144 and 1910.145.

17.4.2. Types of Signs – Color Identification and Use.

17.4.2.1. Danger, warning and caution signs shall be follow and used in accordance with 29 CFR § 1910.145. **(T-0)**

17.4.2.2. AF Form 1118, *Notice of Hazard*, is considered a sign. AF Forms 1118 are issued only by Occupational Safety office, F&ES Flight and BE to permanently identify a hazardous condition that could result in serious injury, disability or death. **Note:** AF Form 979, *Danger Tag*, equivalent DoD or commercial Danger Tags may be used temporarily until an AF Form 1118 is issued. These 8" x 10" red bordered forms identify hazardous conditions, any interim control measures in effect and permanent corrective actions underway or programmed. Refer to AFI 91-202 for instructions on Risk Assessment Codes and preparing the AF Form 1118.

17.4.2.3. Signs for Fire Hazards or Materials. A standardized system exists for identifying the hazards of materials. Explained in detail in NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*, and used by Continental United States (CONUS) installations F&ES Flights. The installation F&ES Flight can provide additional information on fire hazards of materials.

17.4.2.4. Signs and Symbols Used to Identify Explosive Materials. The AF and North Atlantic Treaty Organization (NATO) identifies items and substances assigned to United Nations dangerous goods Class I (explosives, munitions, propellants and pyrotechnics) according to the hazard they present in accordance with DESR 6055.09_AFMAN 91-201.

17.4.2.5. Electrical equipment labeling and placarding shall comply with UFC 3-560-01. **(T-0)**

17.4.2.6. Exit signs shall clearly identify the means of egress from facilities when required in accordance with NFPA 101. **(T-0)** Refer to UFC 3-600-01 for further guidance.

17.4.2.7. Directional signs, other than emergency exit signs, indicate the way to stairways, medical offices, health stations, emergency showers, etc., and shall be designed in accordance with UFC 3-120-01. **(T-0)**

17.4.2.8. Instruction and identification signs, designed in accordance with UFC 3-120-01 shall be used to convey general instructions or identify PPE or systems. **(T-0)**

17.4.2.9. Laser hazard warning signs and labels shall conform to and be used in accordance with AFI 48-139. DoDI 6055.01, *DoD Safety and Occupational Health (SOH) Program*, outlines the military exemption for laser hazard communication. **(T-0)**

17.4.2.10. Radio Frequency Radiation Warning Signs. Radio frequency radiation warning signs signify the presence of hazardous electromagnetic energy frequencies from 10 megahertz to 100 gigahertz. These signs shall be followed and used in accordance with AFI 48-109. **(T-1)**

17.4.2.11. Biological hazard signs shall conform to and be used in accordance with 29 CFR § 1910.145. **(T-0)**

17.4.2.12. Ionizing radiation warning signs, placards and forms shall conform to and be used in accordance with AFMAN 48-148 and AFMAN 40-201, *Radioactive Materials (RAM) Management.* **(T-1)** Ionizing radiation warning signs, placards and forms shall also meet the requirements of 29 CFR § 1926.53, *Ionizing Radiation.* **(T-0)** Electrical equipment labeling and placarding shall comply with UFC 3-560-01. **(T-1)**

17.4.2.13. Toxic and hazardous substances warning signs shall conform and be used in accordance with 29 CFR § 1010, Subpart Z, *Toxic and Hazardous Substances,* e.g., asbestos, lead, respirable crystalline silica. **(T-0)**

17.5. Safety, Fire Prevention and Health Tag Requirements. Tags are a temporary means of warning workers of hazardous conditions, defective equipment, etc., including hazards that are out of the ordinary, unexpected or not readily apparent. Tags are not a complete warning method and shall only be used until a positive means can be used to eliminate the hazard. **(T-1)** For example, a "Do Not Start" tag is affixed to a machine until the machine can be locked out, de-energized or inactivated.

17.5.1. The following apply to all DAF tags prescribed by this publication. Requirements unique to a particular tag appear in the tag's instructions. All mishap prevention tags used to warn of specific hazards shall be standardized DAF forms with no variation in design of tags. **(T-1)**

17.5.1.1. Risk Assessment Codes (RAC) shall be assigned by installation Occupational Safety office, F&ES Flight or BE, as appropriate. **(T-1)** A RAC shall not be assigned to equipment issued during routine maintenance or servicing. **(T-1)** For example, TO-directed tagging of the starter switch during engine maintenance does not require a RAC.

17.5.1.2. Notification requirements do not apply when Danger Tags are installed in accordance with applicable TOs, AFIs or other directed requirements, including routine maintenance functions on aircraft or missile systems. For example, occupational safety personnel need not be notified when tagging out the circuit breaker of an air compressor where the motor has been removed for bearing replacement, or when machines or equipment are locked out for maintenance or servicing.

17.5.1.3. Equipment records, when maintained, shall be annotated to reflect current tag status. **(T-1)** Tag logs may be maintained to identify tags currently in use in a work area.

17.5.1.4. Local commanders shall implement internal procedures to ensure coordination of tags between supervisors and installation Occupational Safety office, F&ES Flight and BE. **(T-1)**

17.5.1.5. Removal of Danger and Caution Tags. The supervisor, with coordination from the installation Occupational Safety office, F&ES Flight or BE, as appropriate, is responsible for removing the tag after the hazardous condition has been corrected. Maintenance logs, if maintained, shall be annotated that the hazardous condition has been corrected and tag removed. **(T-1)** The installation Occupational Safety office shall be notified during normal duty hours that the tag has been removed. **(T-1)** Notification shall not be later than the following duty day. **(T-1) Note:** Removal of danger tags prescribed by TOs or AFIs for routine aircraft or missile/munitions maintenance actions need not be coordinated with the installation Occupational Safety office, F&ES Flight or BE.

17.5.1.6. Removal of *Warning: Do Not Start* Tags. The supervisor is responsible for removing the tag after the condition has been corrected.

17.5.2. Mishap prevention tags prescribed below (Danger, Warning, Caution, Out of Order and Do Not Start) shall meet requirements of AFI 91-202 and 29 CFR § 1910.145. **(T-0)** Tag text shall be provided by, and the reverse side completed by, the responsible on-duty

supervisor. **(T-1)** Refer to **paragraph 17.5.2.4** for additional information when using the AF Form 981, *Out of Order Tag,* AF Form 982, *Do Not Start Tag,* equivalent DoD or commercial tag. **Note:** Risk Assessment Codes assigned by the installation Occupational Safety office, F&ES Flight or BE shall be included in the "Hazard" description block on the front side of the tag. **(T-1)**

17.5.2.1. AF Form 979, *Danger Tag.* Danger tags, including equivalent DoD and commercial danger tags, shall only be used where an immediate hazard (RAC 1 through 3) exists and specific precautions are required to protect personnel or property or when required by TOs or other manuals. **(T-1)** A Danger tag shall be placed on damaged equipment and immediate arrangements made to take the equipment out of service until repaired. Tag wording shall read, "DO NOT USE THIS EQUIPMENT" or "DEFECTIVE EQUIPMENT, DO NOT USE." **(T-1)**

17.5.2.2. Warning tags, including equivalent DoD and commercial warning tags, shall identify items which could cause damage to equipment or death or serious injury to personnel. **(T-1)** Some events that pose a hazard to personnel and equipment can also be identified/classified as a warning. Warnings represent a hazard level between "Caution" and "Danger." When in doubt, contact the unit supervisor or installation Occupational Safety office, F&ES Flight or BE for guidance on the appropriate tag to use.

17.5.2.3. AF Form 980, *Caution Tag.* Caution tags, including equivalent DoD and commercial caution tags, shall only be used where a hazard can damage equipment, or a potential hazard or unsafe practice presents a lesser threat of worker injury. **(T-1)**

17.5.2.4. AF Form 981, *Out of Order Tag.* Out of Order tags, including equivalent DoD and commercial tags, shall only be used to indicate a piece of equipment, machinery, utility or system is out of order and its use might be hazardous. **(T-1)** If reparable, a TO-prescribed green tag may be used in place of the Out of Order tag. Applicable equipment records, when available, shall annotated in addition to completing the Out of Order tag. The energy source shall be locked per **Chapter 21** if turning on the equipment could result in an injury or damage. **(T-1)**

17.5.2.5. AF Form 982, *Danger Tag: Do Not Start.* Do Not Start tags, including equivalent DoD and commercial tags, shall only be used to alert personnel of hazards associated with restarting the equipment and only for a very short time until the energy isolating device can be locked out. **(T-1)** Do Not Start tag shall be placed in conspicuous locations or in a manner that they effectively block the starting mechanism should the equipment be energized. **(T-1)** The Do Not Start tag may be used in conjunction with AF Form 979. If a Danger tag is attached to equipment, it is not always necessary to use a Do Not Start tag. It is the on-duty supervisor's responsibility to attach the Do Not Start tag on the equipment in question. If in doubt, contact the installation Occupational Safety office, F&ES Flight or BE, as appropriate.

17.5.2.6. Biohazard tags, including equivalent DoD and commercial tags, shall identify the actual or potential presence of a biological hazard and to identify equipment, containers, rooms, experimental animals or combinations thereof that contain or are contaminated with hazardous biological agents. **(T-1)**

17.5.2.7. Other tags may be used in addition to those required or in situations that do not require tags, provided they do not detract from the impact or visibility of the signal word and major message of any required tags.

17.6. Administrative Devices. Locks/tags used for purposes other than hazardous energy control are considered administrative devices. Administrative devices and tags shall be clearly distinguishable from an issued/assigned authorized lockout device. **Note:** If red band locks are used for LOTO, they shall not be used as an administrative device. The danger or equipment lockout tag shall not be used an as administrative tag. **(T-1)**

17.6.1. Application of Administrative Devices. When machinery/equipment is placed in an "out of service" status for business or production purposes, e.g., poor efficiency, recycled, sold, and not related to servicing or maintenance, an administrative device and tag shall be attached by the work center/shop supervisor or supervisor's appointed employee. **(T-1)** If an appointed employee applies the administrative device, the employee shall inform and transfer the key to the work center/shop supervisor. **(T-1)**

17.6.1.1. The administrative tag (can be integrated on the lock) shall contain the supervisor's contact information, the purpose of the lock and the authorized person's organization. Use appropriate tags for the hazard type, e.g., Danger, Do Not Start or Out of Order.

17.6.1.2. Administrative devices and tags shall not be transferred at shift change. **(T-1)**

17.6.2. Removal of Administrative Devices for Servicing/Maintenance. When servicing/maintenance of machinery/equipment is to begin (active service/hazardous energy control) by an authorized worker, the work center/shop supervisor or appointed employee shall remove the administrative device and the authorized worker shall place the authorized lockout/tagout device on the machinery/equipment in accordance with **paragraph 21.6**. **(T-1)**

17.7. Safety Color Coding, Labeling and Marking for Piping Systems.

17.7.1. This section establishes minimum requirements for positive identification of hazardous material in piping systems except sections buried in the ground, concrete or part of vehicles or field mobility equipment/systems, etc. Piping systems require a color code and lettered legend identification system, positioned in a distinctive manner as a visual aid, for marking. **(T-0)** Color marking shall not be substituted for elimination of hazards by safety engineering, but shall be used to supplement other established mishap prevention practices. **(T-0)**

17.7.2. A uniform system for identification of piping contents shall be used to warn personnel of potentially hazardous piping system contents before turning valves on or disconnecting pipes. **(T-0)**

17.7.3. Essential regulatory requirements are contained in ASME A13.1, *Scheme for the Identification of Piping Systems*, MIL-STD-101C, *DoD Standard Practice: Color Code for Pipelines and for Compressed Gas Cylinders*, MIL-STD-161H, *DoD Standard Practice: Identification Methods for Bulk Petroleum Products Systems Including Hydrocarbon Missile Fuels*, and 29 CFR § 1910, Subpart J – *General Environment Controls.* **Note:** Follow MIL-STD-101C for agents not identified in ASME A13.1.

17.7.4. MIL-STD-101C contains detailed requirements for piping systems. Labels and paint will flake off pipes carrying cryogens (typically liquid oxygen and nitrogen). Metal signs with identification markings shall be attached above or hung below cryogen piping by metal bands. **(T-0)**

Chapter 18

HYRDROCARBON FUELS

18.1. Scope. This chapter covers the hazards, applications and safety protocols associated with hydrocarbon fuels.

18.1.1. Hydrocarbon fuels consist of aviation fuels, rocket propellants, diesel fuels, gasoline and natural gas composites used by the DAF. Hydrocarbon fuels are a fat soluble, which can irritate skin. Fuels such as gasoline, kerosene, diesel and fuel oils have similar characteristics and warrant the same degree of safety as aviation fuels.

18.1.2. TO 42B-1-1, *Quality Control of Fuels and Lubricants*, provides specifications for fuels. Refer to TO 42B-1-1-14, *Fuels for USAF Aircraft*, for a complete description of aircraft fuel classifications, characteristics and use.

18.1.3. Fuel Spill Classifications. Fuel spill classification and emergency procedures are described in TO 00-25-172. Cleaning procedures shall be established in accordance with the installation Environmental Management office guidance. **(T-1)**

18.2. Hazards. Fuel can ignite unexpectedly and cause fires or explosions, which may result in property damage, injury and/or loss of life. Ignition sources include open flames such as matches and cigarette lighters, cutting and welding sparks, static electricity, electrical arcing and lightning. Support equipment being operated in any fuels area shall meet the requirements of AFMAN 24-306 and TO 36-1-191, *Technical and Managerial Reference for Motor Vehicle Maintenance.* **(T-3)**

18.2.1. Chemical Properties. Hydrocarbon fuels are insoluble in water and soluble in many organic components. These fuels are chemically stable and insensitive to shock. Some dyes used in gasoline products are light sensitive and must be handled with minimum exposure to light to prevent change of color. DAF fuels, although stable over a wide range of ambient storage temperatures, oxidize when exposed to extreme temperatures and will react with strong oxidizers, accelerating at higher pressures and/or temperatures.

18.2.2. Ignition Hazard. Oxygen comprises approximately 21 percent by volume of atmospheric air. Oxygen at concentrations of 16 percent or less will not support combustion. Hydrocarbon fuel vapors can create an explosive atmosphere (lower explosive limit 1 percent, upper explosive limit 7 percent, by volume). The ignition susceptibility of the fuel varies with flashpoint, pressure and the specific type of fuel. Hydrocarbon fuel fires may be both air-supported and other-oxidizer-supported. The rate of fuel evaporation increases with a rise in temperature. A mixture below lower explosive limits is too “lean” to burn and a mixture above the upper flammable and/or explosive range is too “rich” to burn.

18.2.3. Sources of Ignition.

18.2.3.1. Static Electricity. Static electricity can occur when fuel is stable (not flowing) or flowing. Static electricity can be generated by the slightest movement in a stable environment, e.g., in a fuel tank or cell, container. Fuel flowing through hoses or pipe systems can generate an electrostatic charge over 20,000 volts, sufficient to cause an arc or spark when touched. A conductivity additive in commonly used aviation turbine fuels minimizes static buildup during fuel flow. **Warning**: The additive does not eliminate static

electricity in fuel flowing through hoses or pipes, but rather facilitates releasing the built up static charge. This is why proper grounding and bonding of fuel systems, components and equipment is necessary to mitigate the ignition risk posed by static discharge.

18.2.3.2. Clothing containing more than 65 percent nylon, rayon, wool or polyester shall not be worn as outer garments when working with or around low flash point fuels. **(T-0)**

18.2.3.2.1. Flak vests shall not be worn during aircraft fuel servicing operations or during fuel operations where low flashpoint vapors may be present. **(T-1)**

18.2.3.2.2. In all cases, a worker wearing a flak vest will always ground or bond him- or herself when approaching an aircraft and prior to beginning work. **(T-1)**

18.2.3.2.3. If no spark occurs during bonding or grounding, normal work may begin. However, if a spark does occur during bonding or grounding, the worker will ground or bond him or herself frequently during all work phases. **(T-1) Note:** Commanders may authorize wear of body armor/flak vests and Gortex-type clothing in combat areas. **(T-2)** Outer garments shall not be removed or put on in the work area. **(T-0)** Matches or lighters shall not be handled or removed from pockets. **(T-0)**

18.2.4. Sources of Static Electricity.

18.2.4.1. Filter separator vessels generate static electricity when fuel flows through filters. Workers should wait at least 30 seconds after flow stops so the static charge can dissipate.

18.2.4.2. Loading Racks and Fillstands. Line strainers and screens with a pore size less than 300 micron with 50 mesh per inch opening generate static charges. Screens with a pore size less than 300 micron with 50 mesh per inch can create static charges. Movement of fuel through piping or hose also generates static charges. Proper grounding and bonding are required to control static buildup and hazards.

18.2.4.3. Avoid top loading refueling tank trucks from an overhead spout, whenever possible. An approved waiver will be obtained from the MAJCOM/FLDCOM Occupational Safety office and Air Force Petroleum Office prior to performing top loading operations. **(T-1)** This method increases electrostatic charges when fuel freefalls through air and agitates fuel in the tank. If top loading is necessary, extend the filling spout to the bottom of the tank and keep submerged during the entire operation to reduce the static generation.

18.2.4.3.1. Bottom loading refuelers minimizes fuel turbulence and is the preferred method. For this reason, ensure permanent fuel storage tanks systems are designed for bottom loading. **(T-2)**

18.2.4.3.2. Regardless of the filling method used, danger signals such as crackling and hissing sounds indicate the presence of dangerous levels of static electricity. If this occurs, immediately stop filling operations and evacuate personnel until the static charge has dissipated. Identify and eliminate the cause of the static buildup before resuming operations. **(T-0)**

18.2.4.4. Support equipment can develop a static charge while parked due to movement of dust particles and air currents or during periods of thunderstorm activity.

18.2.4.5. Grounding and/or bonding requirements in TO 00-25-172, TO 42B-1-1, and TO 37-1-1, *General Operation and Inspection of Installed Fuel Storage and Dispensing Systems*, shall be followed. **(T-1)** Remove or replace all static grounds with resistances of more than 10,000 ohms, and repair and retest damaged static grounds.

18.2.5. Toxicity. Hydrocarbon fuels can irritate skin. Repeated contact can cause scaling, defatting, fissuring and blistering of the skin. Inhalation of vapor can irritate the upper respiratory tract and depress the central nervous system, resulting in depression, dizziness, headaches, anesthesia, coma or death. Aspiration causes severe lung irritation with coughing, gagging and rapidly developing pulmonary edema, which can progress to bronchopneumonia and death. Ingestion causes irritation of mucous membranes of throat, esophagus and stomach, followed by depression of the central nervous system.

18.2.6. Exposure to Fuel Tank Bottoms. DAF fuels may contain benzene. Benzene is present in both gasoline-based and kerosene-based fuels. **Note:** Jet Petroleum (JP) series fuels do not contain tetraethyl lead. All fuels contain benzene to some degree (0.1 to 5 percent by volume). Aviation gasoline (AVGAS) usually contains higher concentrations of benzene than does heavier distillate fuels. However, benzene is toxic even in low concentrations. This is particularly true in confined spaces such as petroleum storage tanks.

18.2.7. Asphyxiation and Confined Space. Hydrocarbon fuel vapors will displace oxygen in enclosed spaces and pits and may cause death due to asphyxiation. Refer to **Chapter 23** for additional guidance.

18.2.8. Servicing aircraft with the wrong fuel or utilizing untrained fuel servicing personnel can be catastrophic. Fueling personnel shall ensure aircraft receive the proper fuel. **(T-0)**

18.2.8.1. All transient alert and maintenance control personnel shall state both the type of aircraft and the fuel desired when requesting support from the fuels service center. **(T-1)**

18.2.8.2. Refueling drivers shall verify, prior to commencing any refueling operation, that the type of aircraft to be serviced is the same type aircraft specified on the refueling dispatch log. **(T-1)**

18.2.8.3. Refueling personnel and the maintenance crew chief shall ensure the fuel in the servicing unit, as indicated on the unit, is the correct type of fuel required for the aircraft to be fueled, as indicated by the TO, aircraft decals or other positive means. **(T-1)** Similar precautions are required when refueling units are refilled from bulk sources.

18.2.9. First Aid. Personnel shall take the following steps if hydrocarbon fuels are splashed or spilled onto them:

18.2.9.1. Remove contaminated clothing as soon as possible and wash affected skin areas with soap and water. **(T-0)** Thoroughly air and launder contaminated clothing before it is worn again. Do not place contaminated clothing in lockers or other confined spaces. Hang clothing in a safe area away from fire and heat, and allow it to air dry.

18.2.9.2. If fuel is splashed into the eyes, immediately flush the eyes with water continuously for at least 15 minutes; then seek medical attention. **(T-0)** Refer to **Chapter 9** for guidance on emergency shower and eyewash units.

18.2.9.3. If fuel is swallowed, do not induce vomiting. **(T-0)** Seek medical assistance as soon as possible.

18.3. Training.

18.3.1. AFI 90-821 provides specific training requirements for personnel engaged in handling or use of hazardous materials. Employees working with fuels shall be trained in accordance with AFI 90-821. **(T-1)**

18.3.2. Ensure individuals exposed to petroleum products understand the hazards of static electricity. **(T-0)**

18.3.3. Ensure fuels handling personnel are trained in fire prevention and protection as it relates to their particular duties. **(T-0)** Refer to **Chapter 6** for additional guidance and information.

18.3.4. Operations involving the handling, transfer or storage of hydrocarbon fuels normally require a minimum of two persons who are knowledgeable of fuel safety and operational procedures. Refer to AFI 23-201 for guidance on the two-person policy.

18.3.5. Ensure personnel are trained to prevent hydrocarbon fuels and propellant oxidizers being spilled in the same area. **(T-0)** If such a spill does occur and if the oxidizer is water soluble, flood the oxidizer with water to dilute it and help reduce the risk of an explosion or fire. Notify the installation F&ES Flight when a fuel spill or oxidizer spill occurs. **(T-1)**

18.3.6. Ensure employees are trained on the hazards of handling toxic reagents. **(T-0)**

18.4. Personal Protective Equipment (PPE). Refer to **Chapter 14** for specific PPE requirements, and the installation BE for occupational and environmental health risk assessments.

18.5. Housekeeping.

18.5.1. Make sure all acid solutions are stored in a double container. **(T-0)**

18.5.2. Ensure labels on containers accurately reflect contents. **(T-0)**

18.5.3. Make sure waste fuel containers are emptied daily. **(T-0)** Contact the installation Environmental Management office for additional guidance and information.

18.5.4. Provide plainly marked metal containers with self-closing lids for combustible waste such as rags, paper towels and other flammable solid materials. **(T-0)** Paint these containers yellow with red letters designating: COMBUSTIBLE SOLID WASTE, unless determined to be hazardous waste, in which case, consult the Environmental Management office for appropriate markings and management.

18.5.5. Fuel spills can cause fires and create slipping hazards. **(T-0)** Spills shall be cleaned up immediately. **(T-0)**

18.5.6. Use only noncombustible absorbent materials to clean up spills of flammable/combustible materials. **(T-0)** Do not use sawdust or wood shavings as an absorbent. **(T-0)**

18.5.7. Do not clean fuels laboratory floors with flammable liquids. **(T-0)** Use nonskid waxes when waxing floors. **(T-0)**

18.5.8. Unplug all lab equipment at the end of the work day, unless instructed by TO, manufacturer's instructions or when allowed by the installation F&ES Flight. **(T-0)**

18.5.9. Keep outside areas, approximately 25 feet, around fuels laboratories free of weeds, trash and other combustible materials. **(T-0)**

18.5.10. Ensure aisles in fuels laboratories are clear and permit unobstructed egress of personnel in case of fire. **(T-0)**

18.5.11. Limit waste fuel containers within the laboratory to five (5) gallons each. Paint containers red with a two-inch yellow band around the center of the container. Stencil the type of fuel in one-inch letters inside the yellow band on the front side of the drum. **(T-0)**

Note: Consult the installation Environmental Management office for appropriate markings and management.

18.5.12. Never pour acids into fuel containers. **(T-0)**

18.5.13. A 55-gallon drum, or an equivalent container, may be positioned outside the laboratory at least 50 feet from the building. Paint the drum red with a four-inch yellow band around the center of the drum. Stencil the grade of fuel in two-inch letters inside the yellow band on the front side of the drum. Ground all waste containers and drums. **(T-0)**

18.6. Fire Prevention and Protection.

18.6.1. Aerospace Ground Equipment (AGE) shall be positioned in accordance with TO 00-25-172 when required for refueling operations. **(T-0)**

18.6.2. Ensure adequate fire protection equipment, e.g., fire extinguishers, grounding/bonding equipment, proper PPE and any other equipment required to prevent these hazards, is available before starting fuel handling operations to protect personnel from fuel vapor and static hazards.

18.6.3. Fuels operators are responsible for performing the mission in a safe manner. The operator shall continually monitor the equipment for sparks and other ignition sources, unusual noises and other indications of possible malfunctions. **(T-0)** Servicing shall be stopped immediately if the operator determines it is unsafe. **(T-0)** When using hydrant systems, all operating personnel shall know the location and proper use of the system emergency shutoff switch. **(T-0)**

18.6.4. Have sufficient firefighting equipment (portable or wheeled units) available and strategically located within the parking areas as required by the installation F&ES Flight.

18.6.5. Refer to TO 00-25-172 for fire guard designation during refueling and defueling operations.

18.6.6. A safety flask (liquid trap) is required between the vacuum pump and the filtration apparatus to prevent fires in laboratory fuel filtration equipment. This prevents fires caused by flammable liquid from being drawn into the vacuum pump. **(T-0)**

18.6.7. Ensure danger signs are posted on the perimeter fence of fuel storage areas. **(T-0)** If unfenced, post signs 50 feet from the dike area or fuel vents of underground storage tanks, or as determined by BE, in conjunction with the installation occupational safety Office. **(T-0)** Signs shall state, "No Open Flame or Ignition Source Beyond This Point," and meet requirements in **Chapter 17**. **(T-0)** Signs may include a second language, if needed.

18.6.8. The installation Fuels Management Office shall develop emergency procedures and coordinate them with the installation F&ES Flight and Occupational Safety office. **(T-1)** These

procedures include, but are not limited to, evacuation, equipment shutdown and notification of the installation F&ES Flight. Emphasize techniques to extinguish clothing fires. **(T-1)**

18.7. Inspection.

18.7.1. Fuels Laboratory. Supervisors shall inspect their facilities and operations to identify and control or eliminate hazards before they cause a mishap. **(T-0)** Personnel shall be instructed to notify their supervisors of potential hazards. **(T-0)** Hazards shall be categorized according to potential severity and probability of occurrence in accordance with AFI 91-202. **(T-1)** Immediate action shall be taken to eliminate those hazards in Categories IA, IB, IIA and IIB. **(T-0)** Refer to 29 CFR § 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*, for additional guidance.

18.7.2. External Support Inspections. Periodic inspections shall be accomplished by the installation F&ES Flight, BE and Occupational Safety office. **(T-1)** BE shall conduct an occupational and environmental health risk assessment whenever there is reason to believe an exposure may be hazardous, as necessary. **(T-1)** Functional managers shall maintain copies of these inspection reports for a minimum of three (3) years or until the next higher headquarters inspection, whichever comes first. **(T-1)**

18.7.3. Internal Inspection of Fuels Laboratory. Internal safety inspections are the responsibility of all assigned personnel. **(T-1)** Potential safety and health hazards must be identified and hazard abatement plans established as outlined in AFI 91-202. **(T-1)** Items requiring special attention during daily, weekly or monthly internal inspections include: **(T-1)**

18.7.3.1. Inspect all electrical connections of equipment for loose or defective connections and frayed insulation. **(T-1)**

18.7.3.2. Visually inspect all ground wires for frays or loose connections. Check electrical continuity monthly with a resistance (ohm) meter. Inspections shall be documented on MAJCOM/FLDCOM or locally devised automated systems. **(T-1)**

18.7.3.3. Inspect electrical grounding of the fuels laboratory building monthly and electrical resistance annually. **(T-1)** Electrode resistance to ground shall not exceed 25 ohms under dry conditions. **(T-1)**

18.8. Fuel Storage Systems.

18.8.1. Safety Features.

18.8.1.1. New construction, alteration and/or modification of petroleum facilities shall conform to UFC 3-460-01, *Design: Petroleum Fuel Facilities*, as well as all other applicable DAF specifications and directives. **(T-0)** Existing facilities, unless hazards are present, are not required to meet current DAF specifications or directives until a modification or alteration is planned. **(T-1)** All systems shall be maintained per UFC 3-460-03, *Petroleum Fuels Systems Maintenance.*

18.8.1.2. Access. Where necessary, pit covers shall be altered or replaced to provide free and unobstructed access. **(T-0)** Fuels Management shall determine which pits are essential to the operation and control of the system. **(T-2)** Nonessential pits, or pits that can be made nonessential, shall be filled with sand to eliminate vapor hazards. **(T-1)** Essential pits shall be kept clean, dry and vapor-free. **(T-0)** Pit covers shall be closed except when in use or work is being done in the pit. **(T-0)**

18.8.2. Ventilation.

18.8.2.1. Adequate ventilation shall be provided in accordance with American Conference of Government Industrial Hygienists and be consistent with BE's occupational and environmental health risk assessment. **(T-0)**

18.8.2.2. Entry into confined spaces will be in accordance with **Chapter 23.** Contact BE for specific ventilation requirements. **(T-1)**

18.8.3. Drainage. Gravity drains or pumps shall be provided to control water in pits. **(T-1)** Drains from pits and/or pump house floors will not be connected to sanitary or storm sewer systems, unless permitted by the installation Environmental Management office. **(T-1)** Contact BE for an occupational and environmental health risk assessment.

18.8.4. Piping System Identification. Piping systems shall be color coded to aid in identifying the contents of piping in fuel storage areas. **(T-0)** Yellow shall be used as a primary warning for all flammable gases and liquids, and black and white shall be used for identification of contents. Refer to MIL-STD-161, *Identification Methods for Bulk Petroleum Products Systems Including Hydrocarbon Missile Fuels*, and **Chapter 17** for additional guidance. **(T-1)**

18.8.5. Petroleum Storage Tank Entry. UFC 3-460-03 covers this subject in detail and shall be used as definitive guidance on all tank entry tasks. **(T-0)** Refer to **Chapter 23** for additional confined space guidance.

18.9. Fuel Servicing Operations.

18.9.1. After changing a filter separator element, slowly fill the filter vessel by partially opening the inlet and outlet valves to displace trapped air. **(T-1)** The slower flow will reduce static charging of the fuel. Refer to TO 37A-1-101, *General Instructions – USAF Fuel, Water and Lubricant Dispensing Equipment,* for complete details on filling filter separators after element change. **(T-1)**

18.9.2. Before starting fuel transfer actions, establish intrinsically safe communications, such as hot line, radio, telephone, etc., between pipeline pump station, barge or tanker, and receipt location. **(T-0)** To ensure emergency shutdown capability, provide communications throughout the entire receipt. **(T-0)**

18.9.3. Keep the dike basin area free of vegetation. Containment dikes and basins shall be constructed and maintained in accordance with UFC 3-460-01 and UFC 3-460-03. **(T-0)**

18.9.4. Watch draining floating roof water drains to ensure no fuel runs out with the water from a leak in the drain pipe. **(T-0)** When possible, secure roof water drains by lock after draining. **(T-0)**

18.9.5. Provide adequate lighting in petroleum areas for safe night operations. In areas classified as NFPA hazardous locations, lighting fixtures and wiring must comply with the requirements of NFPA 30, *Flammable and Combustible Liquids Code,* and NFPA 70, *National Electric Code*. **(T-0)**

18.9.6. Bond the vehicle in accordance with TO 00-25-172. **(T-0)** When a hose cart or hydrant servicing vehicle is used as a fillstand, the hose cart or hydrant servicing vehicle operator shall bond the hose cart or hydrant servicing vehicle to the hydrant outlet piping. **(T-0)** The refueling unit operator shall bond the refueling unit to the hose cart or hydrant servicing vehicle. **(T-0)**

18.9.7. Fuel servicing vehicles that do not have the Scully in cab power switch installed and still have the paddle switch on the bottom loader that activates the Scully system will need to be grounded/bonded to the fillstand using the grounding/bonding reel installed on the vehicle. **(T-0)**

18.9.8. Push the stop switch on the fillstand to ensure the transfer pump is not operating when the system does not have a deadman control installed. This ensures the loading arm or hose is not pressurized prior to connecting to the vehicle and will avoid a possible fuel spill. The operator shall check the bottom loading automatic shutoff device by pushing the test button on refuelers during the first 500 gallons of fuel pumped into the vehicle, if equipped. **(T-0)**

18.9.9. Railroad Tank Car Operations. When unloading tank cars through bottom valve arrangement into installation bulk storage systems:

18.9.9.1. Isolate railroad tank car off-loading tracks (spur) from main tracks and ground them. The offloading header need not be grounded to the tank car since there is electrical continuity through the rail and tank car body. The grounded railroad spur shall be checked to ensure a resistance reading of 10,000 ohms or less. **(T-0)**

18.9.9.2. Tank cars being loaded with aviation fuels or Mogas shall be bonded to the loading facilities. **(T-0)**

18.9.9.3. Insulate the railroad spur from the adjoining railroad track serving the rest of the installation by means of insulation blocks. Bond each of the rails on both sides of the track by electrical connectors. Connect the insulated and bonded tracks and ground them to the same grounding point with the piping at each unloading manifold. **(T-0)** The insulating and bonding of the tracks relaxes any static buildup.

18.9.10. Fueling Equipment Safeguarding.

18.9.10.1. Fuel servicing equipment parking areas shall be treated as above-ground fuels facilities and safeguarded accordingly. **(T-0)**

18.9.10.2. Fuel servicing equipment parking areas shall be paved, lighted and have sufficient slope to control drainage. **(T-0)**

18.9.11. Fuel Barge Operations. Locations that receive fuel by barges over waterways will adhere to requirements in accordance with 33 CFR Part 156, Subpart A, *Oil and Hazardous Material Transfer Operations,* Section 156.120, *Requirements for Transfer,* and UFC 3-460-03. **(T-0)**

18.10. Aircraft Servicing.

18.10.1. Aircraft servicing will be conducted in accordance with TO 00-25-172, and applicable aircraft and equipment/vehicle technical orders.

18.10.2. When practical, mark support equipment parking locations on the ramp.

18.10.3. Powered support equipment that is not explosion-proof but required for aircraft fueling and defueling shall be parked the full length of the approved power cable from the aircraft and kept outside the fuel servicing safety zone. **(T-0)** The full length of the approved cable or air-start duct shall be maintained between the fueling point or vents to fighter aircraft. **(T-0)**

18.10.4. Aircraft Fueling and Defueling From Hydrant Systems.

18.10.4.1. Hydrant system fueling and defueling operations shall be supervised. **(T-1)** Hydrant system pump houses shall be manned in accordance with TO 37-1-1. **(T-1)** The Fuel Servicing Equipment operator shall hold the remote control switch, magnet lanyard or deadman control throughout the refueling operation. **(T-1)** Before fuel delivery begins, aircraft fuel tank caps shall be checked to ensure they are secure. **(T-0)** The Fuel Servicing Equipment hoses and valves are heavy and require more than one person to safely handle, especially during a hose evacuation malfunction. **(T-1)** To prevent damage, do not drag the hose or valve on the ramp. **(T-0)** Other members of the fuel servicing crew shall help the hosecart/hydrant servicing vehicle operator stow the hoses. **(T-1)**

18.10.4.2. The operator shall inspect the remote control cables to ensure they are hermetically sealed and serviceable when used. **(T-0)**

18.10.4.3. All personnel involved in the servicing operations shall know the location of hydrant emergency shutoff switches. **(T-0)**

18.10.5. Fueling New or Recently Repaired Aircraft Tanks or Tanks That Have Been Purged.

18.10.5.1. Aircraft fuel tanks/cells with nitrogen inerting systems may be refueled at the normal rate of flow with the nitrogen system activated.

18.10.5.2. Aircraft without a nitrogen inerting system must be fueled at the slowest possible flow rate until each fuel tank/cell is full or to the level dictated by the mission. **(T-0)**

18.10.6. Fueling From Drums. Refuel from drums in accordance with TO 00-25-172.

Note: Fueling from drums shall be accomplished only as an emergency measure. **(T-0)** Fueling from cans or "topping off" is particularly hazardous due to the potential for spills and static ignition.

18.10.7. Aircraft fuel servicing hazards are also present when servicing support equipment, vehicles and organizational and/or support equipment tanks. Therefore, commanders, supervisors and operators must recognize that ground servicing operations warrant the same degree of attention to safety afforded aircraft servicing operations. **(T-2)** Refueling units in ground servicing operations shall be inspected for safety deficiencies per the locally established maintenance program. **(T-2)** Many aircraft operation procedures that contain fuels, vapors and prevent ignition also apply to ground operations.

18.10.8. Service Station Operations. Loading, storage and handling of fuels shall be in accordance with 29 CFR § 1910.106(g), *Service Stations.* **(T-0)**

18.10.8.1. Static charge may develop when the operator exits and re-enters the vehicle and ignite fuel vapors near the nozzle. Personnel will not re-enter the vehicle during the fueling operation unless they ground themselves prior to re-entering. **(T-0)**

18.10.8.2. Support equipment and vehicles shall be serviced outdoors, with engines turned off and with parking brakes engaged. **(T-0)**

18.10.8.3. During refueling, operators shall ensure the nozzle of the fuel hose is in constant contact with the filler pipe of the support equipment, tank and/or vehicle fuel tank, to provide an electrical bond. **(T-0)**

18.10.8.4. Nozzles used at attended/unattended motor vehicle service stations and fleet fueling sites shall be listed in accordance with NFPA 30A, *Code for Motor Fuel Dispensing Facilities and Repair Garages,* and have automatic-closing type hose nozzles with a latch open device. **(T-0)** Nozzles used at attended/unattended marine motor fuel dispensing facilities/sites shall be listed in accordance with NFPA 30A and have automatic-closing type hose nozzles without a latch open device. **(T-0)** Nozzles used for dispensing by gravity from tanks above the dispensing/delivery point shall only be a manually operated nozzle. **(T-0)**

18.10.8.5. Nozzles used on mobile support refueling equipment shall be automatic-closing type hose nozzles without a latch open device. **(T-0)**

18.10.8.6. Emergency instructions shall also be conspicuously posted in the dispenser area. **(T-0)** The emergency instructions shall incorporate the following or equivalent wording:

18.10.8.6.1. Use emergency stop button. **(T-0)**

18.10.8.6.2. Report accidents by calling (installation FES number) and report location. **(T-0)**

18.10.8.7. Fuel-dispensing systems including dispensers, hoses, nozzles, breakaway fittings, swivels, flexible connectors, dispenser emergency shutoff valves, vapor recovery systems and pumps that are used for alcohol blended motor fuels greater than 15 percent alcohol content shall be listed or approved for the specific purpose. **(T-0)**

18.10.8.8. All compressed natural gas, liquefied natural gas and liquefied petroleum gas refueling dispensers, hoses, nozzles, breakaway fittings, swivels and flexible connectors, dispenser emergency shutoff valves, vapor recovery systems and pumps shall be listed or approved for the specific purpose. All compressed natural gas, liquefied natural gas and liquefied petroleum gas motor vehicle fuel dispensing shall be in an outdoor location. **(T-0)**

18.11. Fuel Laboratory Operations.

18.11.1. Design Requirements. Fuel laboratories shall be designed in accordance with UFC 4-310-03, *DoD Fuels Laboratory Standards,* for new construction. **(T-0)** In case of conflict with national fire codes or building codes, these handbooks take precedence. The installation BCE, F&ES Flight, Occupational Safety office and BE shall make an initial inspection to certify the acceptability of the fuels laboratory. **(T-0)**

18.11.2. Sampling and Analysis Safety. The installation Fuels Management Office shall establish guidance for general safety, sampling safety and laboratory safety during laboratory analyses. **(T-1)**

18.11.2.1. Refer to **Attachment 2** for posted safety instructions in fuel laboratories.

18.11.2.2. Label outside of doors of non-explosion proof refrigerators to indicate "NOT FOR FLAMMABLE STORAGE." **(T-0) Warning**: Do not store food or beverage in the refrigerator.

18.11.2.3. The laboratory supervisor shall ensure ovens are equipped with a temperature limiting automatic shutoff control. **(T-0)** Cooking, eating food or drinking beverages in the fuels laboratory is prohibited.

18.11.2.4. The quantity of test fuel in the laboratory shall not exceed 10 gallons, including fuel awaiting analysis, unless analysis specifies a larger sample size.

18.11.2.5. Do not pour fuel into sinks connected to a sanitary drain. Contact the installation Environmental Management office for disposal guidance. **(T-1)**

18.11.2.6. Inspect waste fuel drums located outside the laboratory daily and empty them when full. **(T-0)**

18.11.2.7. Do not use waste fuel to kill vegetation. **(T-0)**

18.11.2.8. Post "No Smoking Within 50 Feet" signs at all laboratory entrances. **(T-0)**

18.11.2.9. Ensure fire extinguishers are readily available in the laboratory. **(T-0)** Contact the installation F&ES Flight for proper types and sizes. **(T-0)** Refer to **Chapter 6** for additional guidance and information.

18.11.2.10. Ensure at least two people are in the laboratory when tests involving fuels or acids are performed. **(T-0)** One of these people must be a fully qualified lab technician. **(T-0)**

18.11.2.11. Personnel shall not introduce or handle spark-producing materials such as matches, lighters, keys, etc., while in the laboratory. **Exception:** Flashpoint laboratory equipment.

18.11.3. When sampling, ensure personnel ground themselves prior to climbing tank ladders by grasping the guardrail with a bare hand. **(T-0)** In extremely cold weather, they shall grasp a warm metal object such as a coin and touch it to the guardrail and ensure the coin contacts the guardrail's metal surface. **(T-0)**

18.11.3.1. Do not overfill sampling containers. Allow adequate space for fuel expansion.

18.11.3.2. Be careful when taking fuel samples from crashed aircraft to prevent ignition of residual fuel vapors.

18.11.3.3. Electrical equipment is grounded to the building electrical service ground system when plugged in with a serviceable 3-rong (ground) electrical plug; therefore, no other ground wires are required. **(T-0)** Ground waste fuel containers by extending a ground wire with clamps from the container to the laboratory common ground system. **(T-0)**

18.11.3.4. Do not use fuel analysis thermometers for other purposes.

18.11.3.5. Do not leave waste fuel in the laboratory overnight unless properly stored.

18.11.3.6. Employees shall not siphon fuels by mouth.

18.11.3.7. Do not conduct laboratory analyses or allow fuel in the laboratory unless exhaust systems are functioning.

18.11.3.8. Wear approved eye protection when performing or observing fuels analyses. Make sure an approved emergency shower/eyewash is provided in accordance with **Chapter 9**. **(T-0)**

18.11.3.9. Ensure all facility and equipment electrical repairs meet NFPA 70, *National Electric Code*, requirements. **(T-0)**

18.11.3.10. Electrical receptacles in fuels laboratories shall be at least four (4) feet above floor level or working surface. **(T-0)**

18.11.4. Ensure laboratory personnel use correct PPE when handling acids. **(T-0)**

18.11.5. Ensure only authorized personnel are in the laboratory when testing fuels. **(T-0)**

Chapter 19

COMPRESSED GASES

19.1. Scope. This chapter pertains to all employees who store, handle or use compressed gas cylinders. Mandatory compliance information for each specific gas is contained within its product labeling and Safety Data Sheet. Refer to 29 CFR § 1910, Subpart H, *Hazardous Materials*, 29 CFR § 1910.101 *Compressed Gases (General Requirements)*, NFPA 55, *Compressed Gases and Cryogenic Fluids Code*, 29 CFR § 1910.253, *Oxygen-Fuel Gas Welding and Cutting*, Defense Logistics Agency Instruction (DLAI) 4145.25, *Storage and Handling of Liquefied and Gaseous Compressed Gases and Their Full and Empty Cylinders*, and the Compressed Gas Association (CGA) for additional guidance.

19.2. General Requirements.

19.2.1. For cylinder inspections and tagging, refer to CGA C-6, *Standards for Visual Inspection of Steel Compressed Gas Cylinders.* Employees shall ensure valves, hoses, pipes, etc., are compatible with the compressed gases being used and non-compatible with breathing air. **(T-0) Warning**: Valves, hoses, pipes, etc., used with breathing air will not be interchanged with other compressed gases under any circumstances, even though the parts may be physically compatible. **(T-0)** The employee shall ensure the cylinder and attached equipment are in proper working condition and any discrepancies are fixed or reported to the supervisor. **(T-0)**

19.2.1.1. Employees shall store the cylinder with the newest delivery behind older deliveries to ensure cylinders are used in the sequence received. **(T-0)** Department of Transportation (DOT)-8 and 8AL cylinders must have the cylinder shell and porous filler requalified in accordance with CGA C-13, *Guidelines for Periodic Visual Inspection and Requalification of Acetylene Cylinders.* **(T-0)** Requalification of cylinders, including DOT-8 cylinders will be in accordance with 49 CFR § 180.209, *Requirements for Requalification of Specification Cylinders.* **(T-0)**

19.2.1.2. Cylinders shall be hydrostatically tested in accordance with DoD and DOT regulations. **(T-0)** Refer to MIL-STD-1411C, *DoD Standard Practice: Inspection and Maintenance of Compressed Gas Cylinders*, and DLAI 4145.25 for additional guidance on inspection and requalification criteria for cylinders.

19.2.2. Do not use a cylinder if you cannot determine its contents either by wording on the cylinder or a tag securely attached to the cylinder. If the tag has become detached or the label defaced, do not use the cylinder. Color codes vary by manufacturer; therefore, do not rely solely on color coding to determine contents.

19.2.2.1. DAF or DoD-owned cylinders will be color-coded and contents stenciled on the cylinder in accordance with MIL-STD-101C. **(T-0)** Color codes for commonly used gases will be posted in the cylinder storage area. **(T-1)**

19.2.2.2. Two DD Form 1574s, *Serviceable Tag—Materiel*, shall be placed on all cylinders. **(T-1)** The first tag is used to identify the contents of the cylinder and the second tag will identify the cylinder. **(T-1)** Additional label requirements can be found in DLAI 4145.25. Refer to TO 42B5-1-2, *Gas Cylinders (Storage Type) Use, Handling, and Maintenance*, for additional guidance and information.

19.2.3. Install valve and dust covers when cylinders are not in use. Use cylinders for no purpose other than containing compressed gases; handle them with the same care whether full or empty.

19.2.4. Secure all cylinders, whether in use or in storage, full or empty, by using a chain or other fastening device to a solid fixture (wall, stanchion, etc.) to prevent cylinders from falling over. Non-metallic or synthetic straps may be used to secure non-flammable gases, except oxygen.

19.2.5. Moving Cylinders. Appropriate dollies or hand trucks shall be used to move cylinders weighing more than 50 pounds. **(T-1)** The cylinder shall be secured to the hand-truck prior to and during movement. **(T-1)** Refer to DLAI 4145.25 for guidance on moving cylinders.

19.2.6. Keep all cylinders in a vertical position at all times, unless the cylinders are designed to work in a horizontal position. **(T-0)**

19.2.7. Do not tamper with cylinder valves or any part of a valve, such as a safety nut or stem-packing nut. **(T-0)**

19.2.8. Use cylinders only with the appropriate equipment. **(T-0)** Do not force connections or use unauthorized adapters. **(T-0)** Never use a cylinder without a regulator. **(T-0)**

19.2.9. Always close the cylinder valve when the cylinder is not in use or when it is empty. Replace safety covers and dust caps. **(T-0)**

19.2.10. Flammable materials, such as oil, paint or grease, may ignite if exposed to pressurized oxygen gas.

19.2.10.1. Most compressed oxygen is not intended for breathing and shall not be substituted for air used in ventilation systems. **(T-0)** Oxygen will not be used as a substitute for compressed air. **(T-0)**

19.2.10.2. Never oil or grease an oxygen regulator. **(T-0)** If oil or grease is found on an oxygen cylinder or regulator, it must be taken out of service immediately and the cylinder returned to the supplier. **(T-0)**

19.2.11. Before attempting to place regulators or other fittings on a cylinder, ensure the threads on the cylinder match those on the fittings. **(T-0)** The type of thread, number of threads per inch and the hand of the thread must match to ensure a satisfactory seal. **(T-0)** If the fittings are hard to turn, do not force them; instead, check the threads. **(T-0)**

19.2.12. Open cylinder valves slowly (cracking) so the gas is not released suddenly into the regulators. **(T-0)** Operate valve hand-wheels only by hand. Do not use cheaters or pipes. **(T-0)** Cylinders without fixed hand-wheels shall be equipped with keys, handles or nonadjustable wrenches on the valve stems during the time they are in service. **(T-0)**

19.2.13. Before removing a regulator from a cylinder, close the control valves and allow the gas to escape from the regulator. **(T-0)** Welders shall not leave an area with regulators or lines pressurized. **(T-0)**

19.2.14. On oxygen cylinders, do not use a regulator previously used for oil-pumped gases or any combustible gases. **(T-0)** Gauges on oxygen regulators shall be marked, USE NO OIL. **(T-0)**

19.2.15. A mixture of acetylene with oxygen or air in a confined area will explode on contact with a flame or other ignition source. A pressure-reducing regulator must be used when drawing acetylene from a cylinder. **(T-0)** Refer to 29 CFR § 1910.253 for additional guidance.

19.2.15.1. Avoid contact between acetylene and copper, silver and mercury, their salts, compounds and high-concentration alloys. **(T-0)**

19.2.15.2. Acetylene cylinders will never be placed on their sides, or laid down for any reason. **(T-0)**

19.2.16. Only cylinders that are in use should be located in the lab or work area. **(T-0)** Spare or empty cylinders shall only be stored in a designated storage area. **(T-0)**

19.2.17. Compressed gas cylinders represent a hazard because the gases may be flammable, asphyxiates, oxidizers, corrosives, toxic or cryogenic.

19.3. Storage.

19.3.1. All cylinders shall be secured by a metal chain, straps, braces or other restraining devices to a solid fixture (wall, stanchion, etc.) to prevent cylinders from falling over. **(T-0)** Synthetic straps shall not be used to secure cylinders of flammable gases or oxygen. **(T-0)** While in storage, cylinder valve protection caps shall be firmly in place. **(T-0)**

19.3.1.1. Doors or gates for gas cylinder supply areas shall be locked. **(T-0)**

19.3.1.2. Enclosures for gas supply systems shall not be used for storage purposes other than for cylinders. **(T-0)**

19.3.1.3. Cylinders attached to a manifold shall also be secured to solid fixtures to prevent the cylinder from falling over. **(T-0)**

19.3.1.4. The enclosure shall be posted as a "No Smoking Area." **(T-0)**

19.3.2. Do not store cylinders in locations where temperatures may exceed 125 ºF (51.7º C) or near other sources of heat to prevent excessive pressures in the cylinders. **(T-0)**

19.3.2.1. Do not store cylinders where there is danger of accidental damage or in areas where they will be subject to corrosive chemicals. **(T-0)** Do not store flammable gases near electrical wires, batteries or other conductors or sources of electricity. **(T-0)**

19.3.2.2. Empty cylinders must be plainly marked "EMPTY". **(T-0)** When full and empty cylinders are stored in the same location, cylinders must be stored so that the older cylinders (old stock) can be removed first with minimum handling of other cylinders (newer stock). **(T-0)** Refer to TO 42B5-1-2 for additional guidance and information.

19.3.2.3. Metallic or synthetic nylon straps shall not be used to secure cylinders of flammable gases or oxygen. **(T-0)**

19.3.2.4. Cylinders stored in the open shall be adequately protected from extreme heat and cold. **(T-0)** Cold weather usually increases the brittleness of the cylinder metal, and can rupture if handled roughly. Remove accumulated ice or snow to prevent cylinders from rusting. **(T-0)**

19.3.2.5. When gas cylinders are stored indoors, ventilate the area to prevent accumulation of flammable or asphyxiating gases in the atmosphere. **(T-0)** Cylinders shall not be kept in unventilated enclosures. **(T-0)**

19.3.3. Cryogenic cylinders shall be fitted with stainless steel or other suitable plumbing only. **(T-0)**

19.3.4. Stored cylinders (either inside or outside) shall not obstruct exit routes or other traffic areas. **(T-0)**

19.3.5. All stored cylinders shall have their valves closed. **(T-0)** Valve protection caps shall always be in place and hand tight except when cylinders are in use or connected for use. **(T-0)**

19.3.6. Oxygen cylinders shall not be stored within 20 feet of combustible material (especially oil and grease). **(T-0)** The only exception is when oxygen and acetylene cylinders are secured on a welding cart with regulator and hoses attached. If the cart is not used several times a week, the regulators shall be removed and the cylinders properly stored. **(T-0)**

19.3.7. Storage facilities shall be prominently labeled/posted with the types of gases being stored. **(T-0)** Where gases of different types are stored at the same location, cylinders shall be grouped by type of gas and the groups arranged to take into account the gases contained. **(T-0)** Cylinders shall be prominently labeled in accordance with DOT regulations. **(T-0)**

19.4. Disposal and Shipping.

19.4.1. Disposal of Compressed Gas Cylinders. Disposal of compressed gas cylinders shall be accomplished in accordance with DoDM 4160.21, Volume 1, *Defense Materiel Disposition: Disposal Guidance and Procedures.* Refer to TO 42B5-1-2, Section 10.4, *Disposition of Cylinders,* for additional guidance.

19.4.1.1. Non-government owned cylinders shall be returned to the owner. **(T-0)** If the owner cannot be determined, cylinders shall be processed in accordance with DoDM 4160.21, Volume 1. **(T-0)**

19.4.1.2. Cylinders rejected for failure to pass hydrostatic testing or any other reason shall be disposed of as condemned property after the identification numbers, symbols and cylinder contents have been destroyed. **(T-0)**

19.4.1.3. Acetylene cylinders are filled with a porous mass and a solvent that keeps the acetylene in solution. An unserviceable cylinder may retain varying quantities of solvent and gas. Prior to attempting to destroy one of these cylinders, it is important every precaution be taken to de-energize the cylinder.

19.4.2. Prior to shipment, empty cylinders shall be inspected for dents, bulges, oxidation pits or other damage. **(T-0)** Faulty cylinders shall be handled as required by the latest DOT regulations. **(T-0)** Cylinders shall be shipped by military airlift in accordance with the instructions in AFMAN 24-604, *Preparing Hazardous Materials for Military Air Shipments.* **(T-1)** Ensure cylinders (especially oxygen) will not be contaminated with oil, grease, paint, etc., by the shipper while en route to or from the filling agency. **(T-0)**

Chapter 20

WELDING, CUTTING AND OTHER HOT WORK

20.1. Scope. This publication covers the safety requirements for welding, cutting and other hot work in DAF operations. General industry operations must comply with 29 CFR § 1910, Subpart Q, *Welding, Cutting and Brazing*, and construction operations under 29 CFR § 1926, Subpart J, *Welding and Cutting*. In addition, fire prevention requirements will follow NFPA 51B, *Fire Prevention During Welding, Cutting and Other Hot Work*.

20.2. Hazards.

20.2.1. Welding, cutting and brazing operations present hazardous situations which can lead to serious injuries and/or death if the proper precautions are not taken. Workers have received injuries and occupational illnesses when they fail to follow safety precautions to include the appropriate use of personal protective equipment. Protective equipment should be used in conjunction with guards, engineering controls and sound manufacturing practices. If any process has not already been evaluated, contact BE for an occupational and environmental health risk assessment and guidance of ventilation requirements. **(T-1)**

20.2.2. Numerous hazardous chemicals and metals are used in fluxes, paints, coatings and fillers, and release toxic fumes and/or gases during welding, cutting and brazing operations. All filler metals and fusible granular materials carry the following caution: *CAUTION - WELDING MAY PRODUCE FUMES AND GASES HAZARDOUS TO HEALTH. AVOID BREATHING THESE FUMES AND GASES. USE ADEQUATE VENTILATION*.

20.2.3. Brazing and welding filler metals containing cadmium carry the following warning: *WARNING - CONTAINS CADMIUM - POISONOUS FUMES MAY BE FORMED ON HEATING*.

20.2.4. Brazing and gas welding fluxes containing fluorine compounds carry the following precautionary wording on tags, boxes or other containers: *CAUTION CONTAINS FLUORIDES*. This flux, when heated, gives off fumes that may irritate eyes, nose and throat.

20.2.5. Cleaning and other operations involving chlorinated hydrocarbons may generate toxic vapors or mists.

20.2.6. Fires, explosions and injuries can occur from welding, cutting, brazing and other hot work operations that are:

20.2.6.1. In the proximity of combustible solids, liquids or dusts.

20.2.6.2. In the presence of possible explosive mixtures of flammable gases and air.

20.2.6.3. In the presence of an oxygen-enriched atmosphere, where hot work is performed.

20.2.6.4. In close proximity of explosive hydrogen gas, which is formed when sulfuric acid comes in contact with mild steel.

20.2.7. Hexavalent Chromium. Welding or cutting on materials containing chromium, such as stainless steel and painted surfaces, to include the use of welding rods, may generate hazardous levels of hexavalent chromium. Contact BE for an occupational and environmental health risk assessment.

20.2.8. Cylinders or welding sets in excess of 40 pounds total weight shall be transported to and from work sites by cart or motorized vehicle to prevent injury. **(T-1)**

20.2.9. To prevent fire or explosion, if a leak is found around the valve stem when the valve is opened on a fuel-gas cylinder, the valve shall be closed and the gland nut tightened. **(T-1)** If this does not stop the leak, discontinue the use of the cylinder, remove it to the outdoors, and mark it with a DD Form 1577-2, *Unserviceable (Reparable) Tag.* **(T-1)** Place the cylinder in an upright manner well away from an ignition source and secure it to prevent falling. **(T-1)** In the immediate area within a 50 foot radius of the leaking cylinder, place a sign warning personnel not to approach the leaking gas cylinder with any ignition source, such as a lighted cigarette or lighter. **(T-1)** In addition, place similar signs in locations which shall notify personnel of the danger before entering into the area. **(T-1)** These signs are intended to prevent personnel from entering into a danger zone while attempting to read the sign on the cylinder. Refer to **Chapter 17** for danger signs specifications. Immediately notify the installation F&ES Flight of any fuel gas leaks. **(T-0)**

20.2.10. Other hot work covers any use if open flames not specifically identified, such as flame applied roofing application and vegetation control.

20.3. Acquisition.

20.3.1. Only American Welding Society approved apparatus such as torches, regulators, pressure reducing valves, acetylene generators, machines, manifolds, cables and hoses, etc., shall be used. **(T-0)** In locations where the acquisition of such apparatus is not feasible, contact the installation occupational safety office or CE for guidance.

20.3.2. Compressed gases may be purchased in either government-owned or supplier-owned cylinders. In either case, the purchase agreement shall specifically indicate that the compressed gas cylinders meet the marking requirements of 29 CFR § 1910.253, *Oxygen-Fuel Gas Welding and Cutting*. **(T-0)** In addition, they shall be inspected and shall have a safety relief device installed per the requirements in 29 CFR § 1910.101, *Compressed Gases (General Requirements)*. **(T-0)** Government-owned cylinders which are not in compliance with the above requirements shall not be used and shall be removed from service. **(T-0)** Gaseous systems and containers shall be color coded in accordance with TO 42B5-1-2 to ensure contents of the system or container are known. **(T-1)** In locations where the adherence of OSHA requirements is not feasible, contact the installation occupational safety office or CE for guidance.

20.4. Training and Qualification.

20.4.1. Trainees may perform welding only under the direct supervision of an instructor. **(T-0)** Trainees will be considered qualified to perform welding operations when they have satisfactorily demonstrated their skill or proficiency to their supervisor/instructor.

20.4.2. Welders performing work on aircraft, aircraft components, missile or missile components shall be certified in accordance with TO 00-25-252, *Intermediate and Depot Level Maintenance Instructions – Aeronautical Equipment Welding.* **(T-0)**

20.4.3. Commanders and supervisors shall ensure employees are trained in the requirements of the Air Force Hazard Communication Program and specific hazards they are exposed to during welding, cutting and brazing work. **(T-0)** Refer to AFI 90-821 for additional guidance.

20.5. Precautions.

20.5.1. Operating Precautions. The information listed below provides minimum guidance on operating precautions and procedures. It shall be used in conjunction with 29 CFR § 1910, Subpart Q on all matters involving DAF welding operations. **(T-0)** Information in 29 CFR § 1910, Subpart Q may be obtained by contacting the installation occupational safety office or visiting the OSHA website: **https://www.osha.gov.** Additional information is also available in NFPA 51B.

20.5.1.1. Follow manufacturer's instructions with respect to the sequence of operations in lighting, adjusting and extinguishing torch flames. **(T-0)** Purge hoses in open spaces and away from ignition sources. **(T-0)** Light the torch with a friction lighter or stationary pilot flame, keeping a safe distance between the torch and the welder's hands. **(T-0)** Point the torch away from persons or combustible materials when lighting. **(T-0)** Do not attempt to light a torch from hot metal.

20.5.1.2. Do not place work to be welded or heated on a concrete floor. **(T-0)** Concrete, when heated, may spall and produce projectiles, exposing the welder to injury from flying hot particles.

20.5.1.3. Provide appropriate fall protection for welders and helpers when on elevated surfaces. Keep welding areas neat, clean and free from tripping hazards. **(T-0)** Provide protection for personnel on the ground or rope off area directly below the operation. **(T-0)** Refer to **Chapter 13,** Chapter **16** and **29** CFR § 1910.28, *Duty to Have Fall Protection and Falling Object Protection,* for additional guidance.

20.5.1.4. Do not perform welding, cutting, brazing or other hot work operations:

20.5.1.4.1. In indoor areas not approved by the installation F&ES Flight, Occupational Safety office and BE. **(T-1)** This shall ensure fire, safety and health protection are considered in the selection of indoor welding, cutting, brazing or other hot work operations.

20.5.1.4.2. In buildings with installed sprinkler systems when the system is inoperable, unless other means of fire detection, reporting and extinguishing have been approved by the installation F&ES Flight. **(T-0)**

20.5.1.4.3. In explosive atmospheres or where explosive atmospheres may develop. **(T-0)**

20.5.1.4.4. Within 50 feet of flammable liquids, e.g., flashpoint below 100° F. **(T-0)**

20.5.1.4.5. When unable to comply with the above requirements, interim procedures must be established through the installation Occupational Safety office, F&ES Flight and BE. **(T-1)**

20.5.1.4.6. Outdoor areas within six (6) feet of combustible structures or combustible exterior finish materials without approval by the installation F&ES Flight.

20.5.2. Welding Equipment Precautions.

20.5.2.1. Protect welding torch hoses from damage caused by contact with hot metal, open flames, corrosive agents or sharp edges. **(T-1)** Release pressure on hoses at the end of each workday, during lunch or break periods, when not in use for extended periods or when

unattended (no one in the vicinity for observation). **(T-1)** Visually inspect the entire length of welding hose once per shift and prior to use. This inspection is not required when equipment shall not be used during that shift. **(T-1)**

20.5.2.2. Welding hoses are color coded: oxygen hoses are green, fuel gases are red and inert-gases or air are black. Hose connections are usually marked STD-OXY for oxygen, and STD-ACET for acetylene. The acetylene union nut has a groove cut around the center to indicate left-hand threads. Make-shift repairs to oxygen/acetylene hoses or connections are not authorized.

20.5.2.3. In case of an emergency, ensure a means to quickly extract the welders is provided. **(T-1)** Refer to **Chapter 14, Chapter 23** and AFI 90-821 for additional guidance.

20.5.2.4. When controls such as mechanical or natural ventilation fail to reduce air contaminants to allowable levels or when the implementation of such controls are not feasible, respiratory protective equipment shall be used to protect personnel from hazardous concentrations of airborne contaminants. **(T-0)** Consult BE and AFI 48-137 for additional guidance.

20.5.2.5. Workers with pacemakers and other electrically-active implanted medical devices must not be allowed to work in areas where the function of their device may be adversely affected by exposure to known non-ionizing radiation or electromagnetic fields. **(T-0) Note:** Workers with pacemakers and other electrically-active medical devices engaged in this type of work shall inform their supervisor. **(T-1)**

20.5.2.6. Magnesium-Thorium Welding, Cutting and Grinding. Coordinate proposed welding, cutting or grinding operations on magnesium-thorium and other potentially radioactive materials in advance with the installation Radiation Safety Officer (usually a member of the BE staff). **(T-1)** All personnel must comply with DAF requirements for handling and processing radioactive materials. Refer to AFMAN 40-201 for additional guidance.

20.5.3. Purging and Inert.

20.5.3.1. Purging with Steam. Steam may be introduced into the tank or container through a pipe inserted through an opening and bonded to the container, or by connecting a steam hose directly to one of the vessel nozzles. The rate of supply of steam should be sufficient to exceed the rate of condensation so the whole tank or container is heated close to the boiling point of water. The vessel must be steamed long enough to vaporize the residues from all portions of the walls (shell and heads). **(T-1)** When testing the atmosphere in the vessel with a combustible gas indicator, the sample should be drawn through a drying tube filled with calcium chloride or other drying agent to ensure that water vapor does not enter the instrument. If a drying agent is not available, the container must be allowed to cool off until excess water vapor has condensed. **(T-1)** Hazards inherent with steam operations require the use of personal protective equipment. **(T-0)** Refer to NFPA 326, *Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair*, for additional guidance. **Warning**: Steam cleaning, chemical cleaning and high pressure water blasting can generate static electric charges.

20.5.3.2. Purging with Water. Where the liquid or gas previously contained is known to be readily displaced or easily soluble in water, it can be removed by completely filling the

container with water and then draining, repeating this operation several times until clean. When hot work is performed on containers filled with water, extreme care shall be used to eliminate any possible vapor accumulation by the proper venting or positioning of the container during the filling operation. Consult the installation Environmental Management office for disposal guidelines of purged materials. **(T-2)**

20.5.3.3. Purging with Air. Hazardous vapors may be displaced from inside containers by purging with air. A safe atmosphere shall be maintained by continuous ventilation. **(T-0)** Every precaution shall be taken to ensure all ignition sources have been removed from the vicinity since the concentration of vapor in the tank or container might reach the flammable range before a safe atmosphere is obtained. **(T-0)** The air mover shall be electrically bonded to the tank or container being cleaned. **(T-0)**

20.5.3.4. Inert with Gas. Inert gas may be used to displace flammable gas from the container. Adequate ventilation shall be maintained during the operation to ensure gas concentrations remain below hazardous levels. **(T-0)** Supervisors of this operation shall be thoroughly familiar with the limitations and characteristics of the inert gas being used. **(T-0)** Examples of inert gases are carbon dioxide, nitrogen and argon.

20.5.3.5. Venting. All hollow spaces, cavities or containers shall be vented to permit the escape of air or gases before preheating, cutting or welding. **(T-0)**

20.5.3.6. Atmospheric Monitoring. In all cases, during welding or cutting operations, continuous monitoring of the vessel's atmosphere with a properly calibrated combustible gas indicator is mandatory. **(T-0)**

20.6. Personnel Protective Equipment (PPE). When other hazard controls are not effective or feasible, personnel engaged in or exposed to welding, cutting or brazing activities shall be provided and use the appropriate PPE to protect themselves from injury. **(T-0)** The appropriate protective clothing required for specific welding operations shall vary with the size, nature and location of the work to be performed. **(T-0)** Supervisor shall determine the required PPE after conducting a JHA. All personal protective clothing and equipment will be approved by the installation BE and occupational safety office prior to purchase and use. **(T-1)** Refer to 29 CFR § 1910, Subpart Q, 29 CFR § 1910, Subpart I, *Personal Protective Equipment*, AFI 48-137 and **Chapter 14** for additional guidance.

20.7. Types of Welding Equipment.

20.7.1. Oxygen-Fuel Gas Welding and Cutting. This is one of the most common and widely used welding processes available. It can be used for fusion welding, brazing, soldering, cutting and hard surfacing. Oxygen-fuel gas equipment shall meet the requirements found in 29 CFR § 1910.253, *Oxygen-Fuel Gas Welding and Cutting*. Both oxygen and acetylene cylinders are stored in accordance with TO 42B5-1-2.

20.7.2. Arc-Welding and Cutting. Arc-welding equipment shall conform to the design and installation criteria of 29 CFR § 1910.254, *Arc-Welding and Cutting.* **(T-0)** The frame or case of the welding machine, except engine driven machines, shall be grounded in accordance with 29 CFR § 1910, Subpart S, *Electrical.* **(T-0)**

20.7.2.1. Electric Arc-Welding. Arc-welding is the fusion process based on the principle of generating heat with an electric arc jumping an air gap to complete an electrical circuit.

When an electrode is touched to metal, the electrical circuit is completed and the current flows. Tremendous heat is concentrated at the point of contact.

20.7.2.2. Gas-Shielded Welding. Gas-shielded welding is a fusion-welding process that uses the heat produced by an electric arc between a metal electrode and the work. An inert gas (helium or argon) is used to shield the electrode. The shielding gas flowing from the orifices in the torch head forms a protective blanket over the weld area. This prevents the air from coming in contact with the molten metal and contaminating the weld.

20.7.2.2.1. Tungsten-Inert Gas Welding. Tungsten-inert gas welding is a type of gas-shielded welding especially adapted for light gage metal because of its good concentration of heat, precise heat control and the ability to weld with or without filler metals. It is generally used with such metals as aluminum, magnesium and titanium.

20.7.2.2.2. Metal-Inert Gas Welding. Metal-inert gas welding is a type of gas-shielded welding similar to tungsten-inert gas, except it uses a wire fed electrode and is used for heavier gage metals.

20.7.2.2.3. Resistance Welding. Where electric current is passed through metal to generate heat to melt them together. Also known as spot or seam welding. Resistance-welding equipment shall conform to the design and installation criteria of 29 CFR § 1910.255, *Resistance Welding.*

20.7.2.2.4. Stir Welding. Friction stir welding is a solid state joining process that uses frictional heat generated by a rotating tool to join materials. The non-consumable tool, with a profiled probe and shoulder, is rotated and plunged into the interface between two work pieces.

20.8. Hot Work Locations.

20.8.1. Permits. Daily hot work permits (AF Form 592, *Hot Work Permit*) are required where welding, cutting, brazing and other hot work are conducted excepted in **paragraph 20.8.1.1**.

20.8.1.1. Approved Hot Work Industrial Shop/Area. A specific area shall be designated and approved by the installation F&ES Flight, Occupational Safety office and BE for welding and cutting operations. **(T-1)** It shall be of fire resistant or noncombustible construction appropriate for its hazard classification, free of combustible and flammable materials, and segregated from adjacent areas. **(T-0)** This area shall be exempt from requiring an AF Form 592 on a daily basis. **(T-1)**

20.8.1.2. Maintain a copy of the signed AF Form 592 in the immediate area of the welding, cutting and brazing operations for immediate access. **(T-1)**

20.8.1.3. When fire watchers are required, they shall sign Line 12 of the hot work permit and return it to the issuing authority upon completion of their duties. **(T-1)** If work continues for more than one day, the area shall be inspected prior to each day's operation to ensure that no conditions have changed and requirements of the original permit are in effect. **(T-0)** The permit shall be signed and dated daily in Block 12 at the completion of each day's work until completion of operations or as required by local policy. **(T-1)** Only the tasks authorized by the original permit shall be accomplished. Additional tasks shall require a new permit to be issued. **(T-1)**

20.8.1.4. Outside Areas.

20.8.1.4.1. The welding operation shall be roped off or segregated by physical barrier whenever possible. **(T-1)** Placards reading *"WELDING OPERATIONS IN PROGRESS"* shall be prominently displayed for warning purposes. **(T-1)** Protective screens, when possible, shall be placed around welding operations. **(T-1)** When screens are not feasible, workers and other personnel adjacent to the welding areas shall be required to wear appropriate personal protective goggles. **(T-1)**

20.8.1.4.2. Authorization, including an AF Form 592, to perform welding, cutting or brazing shall be obtained from the installation F&ES Flight prior to the start of operations. **(T-1)** Coordinate with BE when welding, cutting or brazing operations involve hazardous task(s) that will require additional worker protection. **(T-1)**

20.8.1.4.3. MAJCOMs/FLDCOMs/installations having activities involved in numerous daily welding, cutting and brazing operations are permitted to have a certification process whereby qualified and/or certified welding personnel (other than F&ES Flight personnel) may issue welding permits. If work continues for more than one day, the area shall be inspected prior to each day's operation to ensure no conditions have changed and requirements of the original permit are in effect. **(T-1)** The permit shall be signed and dated daily in Block 12 at the completion of each day's work until completion of the operations or as required by local policy. **(T-1)** Only tasks authorized by the original permit shall be accomplished. **(T-1)** Additional tasks shall require a new permit to be issued. **(T-1)** The following procedures are applicable:

20.8.1.4.3.1. Personnel certified by the installation F&ES Flight may authorize welding, cutting and brazing operations, using AF Form 592 for this purpose. **(T-1)**

20.8.1.4.3.2. The installation F&ES Flight shall instruct and qualify welding shop supervisors and other selected personnel. **(T-1)** Upon completing the required training, the installation F&ES Flight shall certify the individuals in writing. **(T-1)** Upon certification, trained personnel shall be qualified to issue permits. **(T-1)**

20.8.2. Confined Spaces.

20.8.2.1. When a welder must enter and/or perform a welding, cutting or brazing operation in a confined space, the requirements for confined space entry in NFPA 51B, 29 CFR § 1910.146, *Permit-Required Confined Spaces*, 29 CFR § 1910.252, *Welding, Cutting and Brazing*, Chapter 23 of this instruction and AFI 48-137 shall be strictly adhered to. **(T-0)** An AF Form 592 shall be obtained from the installation F&ES Flight, with coordination by the installation Occupational Safety office and/or Bioenvironmental Engineering as applicable. **(T-0)** All welding, cutting or brazing equipment shall be inspected for leaks, abrasions or defective equipment prior to inserting into the confined space. **(T-1)** Unserviceable equipment shall not be authorized within the space. **(T-0)**

20.8.2.2. Hot work permits (AF Form 592) will not be issued until the requirements in NFPA 51B and 29 CFR § 1910.252 are met. **(T-0)** Consult with the installation F&ES Flight for additional guidance.

20.8.2.3. Where it is impossible to provide the necessary ventilation inside a confined space, Bioenvironmental Engineering shall determine the appropriate level of respiratory protection required. **(T-1)**

20.8.2.4. When a welder must enter a confined space through a manhole or other small opening, a mean shall be provided for quickly removing the welder in case of emergency. **(T-0)** When safety belts and lifelines are used for this purpose, they shall be so attached to the welder's body that their body cannot be jammed in a small exit opening. **(T-0)** An attendant with a preplanned rescue procedure shall be stationed outside to observe the welder at all times and be capable of putting rescue operations into effect. **(T-0)** Refer to Chapter **23**, **29** CFR § 1910.252 and NFPA 51B for additional guidance.

20.8.3. Aircraft Welding.

20.8.3.1. Gas shielded tungsten arc-welding is the approved method for welding on aircraft. Welding on aircraft should be performed outside of hangars, if possible. An AF Form 592 shall be issued prior to all aircraft welding operations. **(T-1)** Welding shall only be performed on aircraft system components specified in the appropriate aircraft technical data. **(T-1)** Specific hazards associated with the task and emergency procedures shall be listed in Block 13 of the welding permit. **(T-1)** If more space is required to list all precautions, a welding fire safety checklist shall be prepared and attached to the form. **(T-1)** The welding supervisor shall ensure identified precautions and/or checklist items are followed. **(T-1)** The welding supervisor shall ensure the senior flightline supervisor (line chief and/or production supervisor) is cognizant of the restrictions in paragraphs **20.8.3.2** through **20.8.3.11** below. **(T-1)**

20.8.3.2. Ensure the senior flightline supervisor (production supervisor) is thoroughly briefed on the planned welding operation. **(T-1)** This supervisor is responsible for informing other senior flightline supervisors if aircraft from different units are on the ramp.

20.8.3.3. Do not weld on an aircraft while work is in progress on any system or component that contains or has contained fuel or other flammable or combustible liquids. **(T-1)**

20.8.3.4. Prior to the start of welding operations, fuel tank, engine fuel vents and any fuel tank opening shall be closed/plugged on all aircraft within 50 feet from the point of any welding. **(T-1)** All fuel lines, valves, manifolds and other fuel components on the aircraft where welding is being performed shall be in place, secured or capped prior to the start of and during such welding operations. **(T-1)**

20.8.3.5. Do not perform any other work within a 25 foot radius of any gas-shielded arc-welding operation. **(T-1)**

20.8.3.6. Do not weld on an aircraft while work is in progress on the fuel system of any other aircraft within 50 feet from the point of welding. **(T-1)**

20.8.3.7. Whenever welding is being performed in the vicinity of flammable vapors, a trained worker shall conduct an atmosphere analysis with a combustible gas analyzer to assure that flammable vapors do not reach 20 percent of the lower explosive limit. **(T-1)** Such analysis shall be conducted prior to the start of welding and at least every 15 minutes during the welding operation. **(T-1)** For confined spaces the lower explosive limit is lowered to 10 percent. Additionally, when welding in a hangar, check floor drains in the same manner. Refer to NFPA 410, *Standard on Aircraft*, and 29 CFR § 1910.146 for additional guidance. National Fire Protection Association standards are normally available for review at the installation occupational safety office or installation fire department.

20.8.3.8. Rope off or segregate the welding operation by physical barriers. **(T-1)** Prominently display warning signs reading: "WELDING OPERATIONS IN PROGRESS." Place screens, when possible, around welding operations. **(T-1)**

20.8.3.9. Keep electrical welding equipment components (other than flexible lead cables) at least 18 inches above the floor. **(T-1)** Position all ground leads or cables as close as possible to the area being welded. **(T-1)** The ground leads shall be as close to the weld area as possible, and clamps used on such ground leads shall be of the "C" clamp type. **(T-1)**

20.8.3.10. Assign a trained fire guard to monitor the welding operation and halt the welding operation if a hazardous condition develops. **(T-0)** Provide the fire guard a 2A10B:C (minimum) rated fire extinguisher in the immediate area and a back-up wheeled extinguisher of 80B:C rating. **(T-1)** Ensure the fire watch is maintained for at least 30 minutes after completion of the welding operation to detect and extinguish smoldering fires. **(T-0)** Operations on combustible metals shall include the availability of a Class D fire extinguisher. **(T-1)**

20.8.3.11. Aircraft welding operations performed in hangars shall conform to **Chapter 6** and NFPA 410. **(T-1)**

20.8.4. Vehicle Equipment Shops. Welding or cutting in vehicle maintenance activities shall only be conducted in areas approved by the installation F&ES Flight. **(T-1)** Maintenance shop supervision shall evaluate each welding or cutting task to determine if batteries or fuel tanks require removal and/or need to be made inert. **(T-1)**

20.9. Contractors. The contracting officer, in coordination with the Occupational Safety office and F&ES Flight, shall determine the necessity to include specific references to OSHA standards, DAF fire, safety and health standards, and other guidance as necessary in the contract. **(T-1)**

20.10. Hot Work Permit. An AF Form 592 is required whenever there is cutting, welding or brazing being accomplished outside of the designated shop area. The hot work permit must be obtained from the installation F&ES Flight prior to starting welding operations. **Note:** BE assistance and coordination may be required, e.g., BE survey report, PPE listing/recommendation.

Table 20.1. How To Fill Out AF Form 592, Hot Work Permit.

Block 1.	Control Number. Control numbers should be kept in a log so duplicate numbers are not assigned. A control number consists of the year, a dash, and the number from the log. Example: 03-001 would be the first control number assigned in the year 2016.
Block 2.	Date Permit Issued. (Self-Explanatory)
Block 3.	Time Permit Issued. (Self-Explanatory)
Block 4.	Organization/Contractor/Company: Name and Contact Information
Block 5.	Location: Is it located in a Facility? What Floor? Is work being done on an Aircraft? What is the Aircraft Tail Number? Is the Aircraft Inside or Outside a Hangar? Are munitions present?
Block 6.	Description of Work: Give a brief description of work.
Block 7.	Is Fire Watch required? See chart on back of form. Answer Yes or No. Performed by: Who is performing the Fire Watch?

Block 8.	Permit Authorizing Individual fills out Inspection Checklist prior to execution of hot work. If work is to be performed in a confined space, coordinate with SEG/BE/F&ES Flight & attach to the AF Form 1024, *Confined Space Entry Permit.*
Block 9.	PAI signature granting permission to execute work.
Block 10.	Operator/On-scene supervisor signature stating understanding of responsibilities under AFMAN 91-203 and National Fire Protection Association 51B.
Block 11.	Installation BE signature confirming coordination, as required.
Block 12.	Fire Watch signature confirming Final Check completion.
Block 13.	Any additional information.

Chapter 21

HAZARDOUS ENERGY CONTROL

21.1. Scope. This chapter establishes DAF-specific hazardous energy control program requirements in addition to the OSHA requirements found in 29 CFR § 1910.147, *The Control of Hazardous Energy (Lockout/Tagout)*, 29 CFR § 1910.331, *Scope*, 29 CFR § 1910.332, *Training*, 29 CFR § 1910.333, *Selection and Use of Work Practice*, 29 CFR § 1910.334, *Use of Equipment*, 29 CFR § 1910.335, *Safeguards for Personnel Protection.* When conducting servicing and maintenance of machinery/equipment, hazardous energy control procedures will be developed to protect against the various sources of hazardous energy. **(T-0)** Refer to **Table 21.1** for a list of common hazardous energy sources. Exceptions to the hazardous energy control program can be found in accordance with 29 CFR § 1910.147(a)(2).

Table 21.1. Common Hazardous Energy Categories and Corresponding Sources.

Category	Hazardous Energy Sources
Electrical	Power Transmission Lines Generators Machine Power Cords Conductors Motors Capacitors Solenoids Batteries
Mechanical	Blades Materials in supply lines of bins or silos Springs Actuators Counterweights Raised Loads Top or movable part of a press or lifting device Augers Reciprocating Motions Pinch Points
Pressurized Liquids and Gases	Supply Lines Storage Tanks and Vessels
Hydraulic	Presses Rams Cylinders Hammers Shears Punches Drives Hose and Line Failure
Pneumatic	Air Lines

Category	Hazardous Energy Sources
	Pressure Reservoirs Accumulators Air Surge Tanks Rams Cylinders Tools
Note: This table is not all-inclusive and only represents common examples. Wind, gravity and kinetic energy need to be considered when controlling hazardous energy. Hand-operated machinery/equipment may store hazardous energy or pose hazards to employees if broken or defective and require the use of this program. **(T-0)**	

21.2. Hazardous Energy Control Program. Work center/shop supervisors shall:

21.2.1. Establish a hazardous energy control program. **(T-0)** When required, develop procedures for tagout only processes. **Note:** The employer shall demonstrate that the tagout program will provide a level of safety equivalent to that obtained by using a lockout program. **(T-0)**

21.2.2. Perform and document an annual hazardous energy control program self-inspection. **(T-1)** Refer to paragraphs **21.4.1** and **21.4.2** for additional guidance.

21.3. Training.

21.3.1. Authorized and affected employees as defined by OSHA will receive training in accordance with 29 CFR § 1910.147(c)(7). **(T-0)** Supervisors shall verify training for authorized and affected employees is accomplished. **(T-0)**

21.3.2. Retraining. Authorized employees and affected employees shall be retrained, e.g., change in their job assignments, a change in machinery, equipment or processes that present a new hazard, when there is a change in the energy control procedures or other conditions as specified in 29 CFR § 1910.147(c)(7)(iii). **(T-0)**

21.3.3. Documentation. All related training shall be documented in accordance with AFI 91-202. **(T-1)**

21.4. Program Self-Inspections.

21.4.1. Shop hazardous energy control program periodic inspections shall be conducted by authorized employees, one acting as an inspector and one performing the maintenance/servicing activity, at least annually, to ensure compliance with all program elements. **(T-0)** Periodic inspections shall be designed to identify and correct any deviations or inadequacies observed. **(T-0)** The inspection shall be documented to include the date of the inspection and the unit representative conducting the inspection. **(T-0)** The organization shall certify that the periodic inspections have been performed. **(T-0)** The certification shall identify the machine or equipment on which the energy control procedures was being utilized, the date of the inspection, the employees included in the inspection, and the person performing the inspection. **(T-0)** An authorized employee other than the one(s) utilizing the energy control procedure shall conduct periodic inspections of the energy control procedure in accordance with 29 CFR 1910.147(c)(6)(i)(A). **(T-0)** The inspection shall include, as a minimum:

21.4.1.1. Identification of equipment and machinery for which the hazardous energy control program applies. **(T-0)**

21.4.1.2. A review of each employee's responsibilities under the program. **(T-0)**

21.4.1.3. Verification that training has been conducted is current and properly documented. **(T-0)**

21.4.1.4. A review of hazardous energy control procedures with authorized employees to include demonstration by the employee of the required practices. **(T-0)**

21.4.1.5. An out-brief to the shop or unit supervisor, as appropriate, and documented in the written report. **(T-0)**

21.4.2. A qualified occupational safety inspector shall review the annual self-inspection hazardous energy control report during the organization's safety assessment to ensure compliance. **(T-1)**

21.5. Authorized Lockout and Tagout Devices. Authorized lockout and tagout devices shall be used in accordance with 29 CFR § 1910.147(c)(5), 29 CFR § 1910.333(b)(2)(iii)(D), and in the paragraphs below. **(T-0) Note:** When using tags, a tag is required to be supplemented with at least one additional safety measure that provides a level of safety equipment to that obtained by the use of a lock.

21.5.1. Be singularly keyed with only authorized employees retaining the key(s) to the lock(s) when in use. **(T-0)**

21.5.2. AF Form 983, *Danger – Equipment Lockout Tag*, or DoD tag or commercial equivalent tags, shall be used in conjunction with energy-isolating devices. **(T-1)** The functional manager or supervisor shall ensure an adequate supply of energy-isolating devices are available. **(T-1)**

21.6. Hazardous Energy Control Procedures. Develop and document specific procedures for each piece of equipment identified in the hazardous energy control program unless exempted in 29 CFR § 1910.147(a)(2). **(T-0)** Procedures will include all steps from **Figure 21.1** and **Figure 21.2**. **(T-0)** Additional information for procedure development can be found in 29 CFR § 1910.147(c)(4). **Note:** NFPA 70E, Article 120.2, defines the two (2) forms of hazardous electrical energy controls permitted as simple lockout/tagout and complex lockout/tagout. For the simple lockout/tagout, the authorized person shall be in charge. For the complex lockout/tagout, the person in charge shall have overall responsibility. **Exception**: The employer need not document the required procedure for a particular machine or equipment, when all elements identified in 29 CFR § 1910.147(c)(4)(i) exist.

Figure 21.1. Eight-Step Hazardous Energy Control Procedure Checklist.

The authorized employee shall:	
1. Preparation	Determine if written hazardous energy control procedures for the machinery/equipment are applicable to the task. **(T-0)** If so, the authorized employee shall review hazardous energy control procedures and ensure they are followed correctly. **(T-0)**
	Prior to shutting down machinery/equipment, the authorized employee must have knowledge of and assess the type (e.g.,

The authorized employee shall:	
	electrical, mechanical, hydraulic), magnitude (e.g., 120 volts, 60 psi) and hazards of the energy to be controlled, including hidden energy sources such as springs, capacitors, elevated parts, etc. **(T-0) Warning**: Machinery/equipment may contain more than one type of energy.
	Determine in accordance with written procedures, appropriate methods for controlling the hazardous energy. **(T-0)** Methods for energy-isolation may include, but are not limited to, circuit breakers, disconnect switches or valves.
2. Notification	Notify all affected employees of the impending shutdown and that they shall not touch hazardous energy control devices or attempt to restart the machinery/equipment until informed it is safe to resume normal operations. **(T-0)**
3. Shutdown	Verify it is safe to shut down the machinery/equipment. **(T-0)**
	The machinery/equipment shall be turned off or shut down using normal stopping and shutdown procedures (depress stop button, open toggle switch, close shut off valve, etc.). **(T-0)**
4. Isolation	Isolate all energy sources by operating (switch off, valve off, etc.) energy-isolating device(s). **(T-0)**
	All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated in such a manner as to isolate the machine or equipment from the energy source(s). **(T-0)**
5. Authorized LOTO Device Application	Affix lockout device to hold energy-isolating devices in an "off" or "safe" position that physically prohibits normal operation of the device. **(T-0)** If possible, both locks and tags shall be installed. **(T-1)**
	Tags shall indicate date, time, reason and name of the authorized employee installing device. **(T-0)**
	To prevent inadvertent or accidental detachment, tags shall be securely attached with a self-locking and non-releasable attachment (e.g., a nylon or plastic cable tie-off strap) with a minimum unlocking strength of 50 pounds. **(T-0)**
	For group hazardous energy control procedures, conduct in accordance with **paragraph 21.6.1.**
6. Verification	Once the system is locked/tagged out, all potentially hazardous stored or residual energy shall be relieved, disconnected, restrained or otherwise rendered safe. **(T-0)** Insert physical restraints (blocks, chocks) for moving or raised parts, blind flanges for pressurized piping, disconnect springs (if safe to do so), etc., to ensure moving parts are physically restrained or disconnected. **(T-0)** Machinery/equipment shall be in a zero energy state. **(T-0)**
	When the equipment to be worked on does not have normal controls, e.g., energy-isolating device, on/off switch, use the

The authorized employee shall:	
	following procedure for isolation confirmation. Test potential energy sources using appropriately rated and calibrated instruments or testers. **(T-0)** Instruments used to test voltage, pressure or temperature shall be checked for proper operation both before and after use. **(T-0)** If the authorized employee is not qualified to test the energy being isolated, he or she shall ensure the energy is tested by a qualified person. **(T-0)**
	Physically attempt to operate energy-isolating devices and attempt to restart the equipment or machinery using normal controls. **(T-0) Caution**: Return energy-isolating devices to "safe" or "off" position after the test.
7. Keep Authorized Hazardous Energy Control Devices in Place	The LOTO device shall remain in place until work on the machinery/equipment is complete. **(T-0)**
	When circumstances require testing, adjustment or repositioning of machinery/equipment, it may be necessary to temporarily remove LOTO devices before work is complete in order to verify functionality. The following sequence of actions shall be used when LOTO devices must be temporarily removed from the energy-isolating device:
	1. Notify all affected employees and supervisors. **(T-0)**
	2. Clear machinery/equipment of tools and materials. **(T-0)**
	3. Remove all employees from machinery/equipment area and ensure required tools are safely and properly positioned. **(T-0)**
	4. Remove all repositioning and blocking devices and return all vents and valves to normal operating positions. **(T-0)**
	5. Remove all grounding/shorting conductors, hooks or wands.
	6. Don any required PPE. **(T-0)**
	7. Energize and proceed with testing or positioning. **(T-0)**
	8. De-energize all systems; reapply hazardous energy control measures; notify all affected employees and supervisors; and continue servicing, maintenance or modification of equipment or machinery. **(T-0)**
8. Before Restoring Machinery/Equipment to Service	The authorized employee will ensure the steps in **Figure 21.2** are followed in order. **(T-0)** **Note:** When the authorized employee is unavailable, follow 29 CFR § 1910.147(e)(3). **(T-0)**

Figure 21.2. Three-Step Release from Hazardous Energy Control Procedure Checklist.

1. Preparation and Notification	Before removing LOTO devices and reenergizing machinery/equipment, the authorized employee shall:
	1. Notify all affected employees the system is ready for return to service. **(T-0)** Ensure all personnel are clear of the equipment point of operation and other hazard zones. **(T-0)**

	2. Inspect the work area and ensure all tools, debris and non-essential personnel are removed or are a safe distance from the machinery/equipment. **(T-0)**
	3. Replace safety guards, inspect machinery/equipment and ensure guards are operational. **(T-0)**
2. Removal of Additional Devices	Remove any additional devices applied in accordance with hazardous energy control application. (**Figure 21.1**). **(T-0)**
	Remove all safety grounding devices. **(T-0)**
	Verify the work for which hazardous energy control was applied is complete and it's safe to reenergize the machinery/equipment.
3. Removal of all LOTO Devices	Each LOTO device shall be removed only by the authorized employee who applied it. **(T-0)** When the authorized employee who applied the device is not available to remove it, their supervisor may remove the device in accordance with **paragraph 21.6.3. (T-0)** This is considered an emergency procedure, undertaken only in extreme circumstances, e.g., use of machinery/equipment is required immediately.
	Authorized employees shall remove all LOTO devices and restore the energy-isolating device to the "ON" position. **(T-0)**
	Notify all employees the hazardous energy control condition has been cleared (LOTO devices removed) and machinery/equipment is ready for service. **(T-0)**
	Energize the machinery/equipment and restore to normal operating condition. **(T-0)**

21.6.1. Group lockout/tagout will be in accordance with 29 CFR § 1910.147(f)(3) and its subordinate paragraphs. **(T-0)**

21.6.2. Group Hazardous Energy Control Verification Procedure. Group hazardous energy control procedures will be developed to ensure authorized employees walk through the affected work area to verify isolation at each LOTO device. **(T-0)** After verification, each authorized employee participating in the group LOTO shall affix their personal LOTO devices to the group LOTO box prior to performing servicing/maintenance. **(T-0)** If there is a potential for the release or re-accumulation of hazardous energy, verification of isolation must be continued. **(T-0) Note:** All group LOTO authorized employees must be informed of their right to verify the effectiveness of the hazardous energy control procedure and verify that hazardous energy sources have been effectively isolated. **(T-0)**

21.6.3. Authorized Employee Requirements. No employee may attach or remove another person's LOTO device, including signing on or signing off for another person, unless the provisions of the exception to 29 CFR § 1910.147(e)(3) are met. **(T-0)** Individual employee device removal indicates that employees are no longer exposed to the hazards from the servicing or maintenance operation.

21.6.4. Shift Changes. Specific, written procedures shall be developed and used during shift or personnel changes to ensure continuity of hazardous energy control protection. **(T-0)** This includes provision for orderly transfer of authorized LOTO devices between off-going and on-coming supervisors and authorized employees to minimize exposure to hazards from

unexpected energization, start-up or release of stored energy from machinery/equipment. Refer to 29 CFR § 1910.147(f)(4) for more information.

21.7. Hazardous Energy Control Procedures When Establishing An Electrically Safe Work Condition. When establishing an electrically safe work condition in accordance with NFPA 70E, *Electrical Safety in the Workplace,* Article 120, hazardous energy control program shall meet the requirements of this chapter and procedures listed below.

21.7.1. Simple Lockout/Tagout Procedure. All lockout/tagout procedures that involve only an authorized person(s) de-energizing one set of conductors or circuit part source for the sole purpose of safeguarding employees from exposure to electrical hazards shall be considered to be a simple lockout/tagout. **(T-0)** Simple lockout/tagout procedures shall not be required to be written for each application. Each authorized employee shall be responsible for their own lockout/tagout. **(T-0)**

21.7.2. Complex Lockout/Tagout.

21.7.2.1. A complex lockout/tagout procedure shall be required where one or more of the following exists:

21.7.2.1.1. Multiple energy sources, e.g., electrical and other sources. **(T-0)**

21.7.2.1.2. Multiple crews. **(T-0)**

21.7.2.1.3. Multiple crafts. **(T-0)**

21.7.2.1.4. Multiple locations. **(T-0)**

21.7.2.1.5. Multiple employers. **(T-0)**

21.7.2.1.6. Multiple disconnecting means. **(T-0)**

21.7.2.1.7. Particular sequences. **(T-0)**

21.7.2.1.8. Job or task that continues for more than one work period. **(T-0)**

21.7.2.2. The complex lockout/tagout procedures shall require a written plan of execution in accordance with 29 CFR § 1910.147 and identifies the person(s) in charge. **(T-0)**

21.7.2.3. The complex lockout/tagout procedure shall vest primary responsibility in an authorized employee for employees working under the protection of a group lockout or tagout device, such as an operation lock or lockbox. **(T-0)** The person(s) in charge shall be held accountable for safe execution of the complex lockout/tagout. **(T-0)**

21.7.2.4. Each authorized employee shall affix a personal lockout or tagout device to the group lockout device, group lockbox or comparable mechanism when he or she begins work and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained. **(T-0)**

21.7.2.5. All complex lockout/tagout plans shall identify the method to account for all persons who might be exposed to electrical hazards in the course of the lockout/tagout. **(T-0)**

21.8. Contractors. Interaction with contractors will be in accordance with DoDI 6055.01, AFI 91-202 and 29 CFR § 1910.147(f)(2). **(T-0)** These details will be specified in the contract. **(T-0)**

Chapter 22

FLAMMABLES AND COMBUSTIBLES

22.1. Scope. This chapter addresses criteria for storage, use and handling of flammable and combustible liquids and gases, and implements 29 CFR § 1910.106, *Flammable Liquids*, and NFPA 30. Refer to 29 CFR § 1910.101, *Compressed Gases (General Requirements)*, and NFPA 55 for additional guidance. Use of these gases shall also comply with requirements in this chapter and other parts of this publication, along with requirements in NFPA 70, *National Electric Code*, and other National Fire Codes related to use and storage of flammable materials. **(T-1) Note:** There are a few chemicals with a flashpoint outside these limits, such as anhydrous ammonia, that are still considered flammable liquids. Refer to **Table 22.1** for additional information.

22.2. Hazards. Flammable and combustible liquids require careful handling at all times. Many of these liquids are used by the DAF daily, and mishandling is a significant cause of injury, occupational illness or catastrophic failure. Hazards associated with use of flammable or combustible liquids include explosions, burns from fire, chemical burns, asphyxiation, inhalation of vapors, absorption through the skin, skin irritation and eye damage from direct contact or exposure. The volatility of flammable or combustible liquids is increased by exposure to temperatures higher than the flashpoint. The best means of employee protection is to engineer hazards out of the job so the employee is not exposed. If this is not possible, PPE may be required. A documented job hazard analysis (JHA) shall be conducted to determine if hazards are present and take actions necessary to protect employees from injury, illness or death. **(T-1)** Refer to **paragraph 1.5** and AFI 91-202 for additional guidance on JHA.

22.2.1. Solvents with flammable characteristics must be handled with care. **(T-0)** Solvents can burn or explode if handled or used improperly.

22.2.2. Flammable and combustible liquids can be highly reactive with other substances, subject to explosive decomposition or have other properties that dictate extra safeguards. Review the safety data sheet(s) and/or contact the installation Occupational Safety office, F&ES Flight or BE when in doubt or for additional guidance. **Note:** Water-reactive materials shall not be stored where fire protection sprinklers are in place. **(T-1)** These materials shall not be stored with flammable or combustible liquids. **(T-1)** Refer to 29 CFR § 1910.106 and the latest edition of the Emergency Response Guidebook. Ensure emergency response personnel are advised that water-reactive materials are present. **(T-0)**

22.2.3. Sparks resulting from accumulation of static electricity can ignite flammable vapors or gases. The flow of flammable liquids through non-conductive hoses or passages can also produce static charges. Unless safely conducted to a ground, these charges accumulate and become an ignition source. Refer to NFPA 30 for additional guidance.

22.2.4. Operations where fuels, solvents or other flammable liquids are used must be constantly observed to avoid unsafe practices. **(T-0)** It is hazardous to use fuels (such as gasoline) to clean floors or clothing, or use open solvent or gasoline containers near electrical equipment or pilot lights. The use of low-flashpoint petroleum solvents shall be avoided, when possible. **(T-0)** Open flames, heaters, equipment not properly grounded and non-explosion proof electrical equipment shall not be used in the presence of flammable or combustible liquids. **(T-0)** Refer to NFPA 30 for additional guidance.

22.3. Training.

22.3.1. Functional Managers and/or Supervisors shall ensure:

22.3.1.1. All employees and handlers of flammable or combustibles have accomplished appropriate training associated with tasks and hazards related to the work environment. **(T-0)**

22.3.1.2. Personnel handling, storing or using hazardous materials are trained in accordance with AFI 90-821. **(T-1)**

22.3.1.3. Individuals involved in dispensing of flammable or combustible liquids are instructed on hazards of static electricity. **(T-0)**

22.3.1.4. Employees handling and storing flammable or combustible liquids are trained in fire prevention and protection as it relates to their duties. **(T-0)**

22.3.2. Job safety training shall include, as a minimum, information on the need for and use of approved PPE, maintenance and care of PPE, review of safety data sheets, safe chemical handling procedures, Emergency Response Guidebook and emergency treatment practices in case of exposure, ingestion or inhalation of liquids or vapors. **(T-0)** Refer to **paragraph 22.4, Chapter 14** and AFI 90-821 for additional guidance.

22.4. Personal Protective Equipment (PPE).

22.4.1. PPE shall be used whenever there are hazards that can do bodily harm through absorption, inhalation or physical contact. **(T-0)** This equipment includes respiratory protective devices, special clothing and protective devices for the eyes, face, head, torso and extremities. All PPE shall be approved for the work performed and shall be maintained in satisfactory condition. **(T-0)** Refer to **Chapter 14** for additional requirements.

22.4.2. Functional Managers and/or Supervisors shall ensure PPE is available and appropriately worn when handling flammable or combustible liquids. **(T-0)**

22.4.3. DAF personnel shall comply with all PPE requirements when handling flammable or combustible liquids. **(T-0)**

22.5. Housekeeping. Where flammable and combustible liquids are used or handled, except in closed containers, means shall be provided to dispose promptly and safely of leakage or spills. **(T-0)** Refer to the appropriate safety data sheets for spill clean-up procedures and PPE required.

22.5.1. Leaking containers shall be removed to a safe location outside the building, and the contents transferred to an undamaged container in accordance with guidance from the installation F&ES Flight and Environmental Management office. **(T-1)**

22.5.2. Functional Managers and/or Supervisors shall ensure:

22.5.2.1. Appropriate spill and containment control materials are readily available at storage or dispensing areas. **(T-1)**

22.5.2.2. Leakage and spills are cleaned up in a timely manner. **(T-0)**

22.5.2.3. All containers are clearly labeled to identify contents and indicate hazards. **(T-0)**

22.6. Fire Protection.

22.6.1. Facility Pre-Fire Plans. Facility pre-fire plans shall be developed for flammable and combustible liquid warehouses, laboratory and storage buildings. **(T-0)** These plans shall be

maintained in the installation F&ES Flight and on vehicles designated by the fire chief. **(T-1)** Refer to AFI 32-2001, *Fire and Emergency Services Program*, for additional information. The plans include the hazardous materials contained in installation facilities, their locations and emergency procedures to be followed.

22.6.2. Inside Storage Room Requirements. For inside room storage capacity and required fire resistive ratings refer to 29 CFR § 1910.106, Table H-13. Storage rooms shall not have an opening into any portion of a building used by the public. **(T-0)** At least one clear 3-foot wide aisle shall be maintained in all inside storage areas. **(T-0)** Containers in excess of 30-gallon capacity shall not be stacked. **(T-0)** Dispensing shall be in accordance with **paragraph 22.7.1.3** for Class I flammable liquids. **(T-1)** All other dispensing shall be by approved pump or self-closing faucet only. **(T-0)** Refer to NFPA 30 for additional information.

22.6.2.1. At least one portable fire extinguisher having a rating of at least 40-B shall be located outside of, and within 10 feet of, the door opening into an inside liquid storage area. **(T-0)**

22.6.2.2. At least one portable fire extinguisher rated at least 40-BC shall be located within 30 feet of any Class I or Class II liquid storage area outside of a storage room but inside a building. **(T-0)**

22.6.2.3. Installed fire suppression systems shall be approved in accordance with UFC 3-600-01. **(T-1)** Additionally, consult the installation F&ES Flight for further guidance.

22.6.3. Storage Inside Buildings.

22.6.3.1. Storage shall not physically obstruct a means of egress from the building or area and not be placed in such a manner that a fire would prevent safe egress from the area. **(T-0)**

22.6.3.2. If a flammable and combustible liquids storage building is used, it shall be one-story and devoted principally to handling and storing of flammable or combustible liquids. **(T-0)** The building shall have a 2-hour fire-rated exterior wall with no openings within 10 feet of stored material. **(T-0)**

22.6.3.3. At least one portable fire extinguisher shall be located outside of, but not more than 10 feet from, the door opening into any room used for storage of flammable or combustible liquids. **(T-0)** Coordinate with the F&ES Flight on the proper type, quantity and placement of extinguishers for size and layout of the facility.

22.6.4. Storage Outside.

22.6.4.1. At least one portable fire extinguisher rated at least 20-B shall be located 50 feet travel distance from any Class I or Class II liquid storage area outside of a storage room. **(T-0)** Coordinate with the F&ES Flight on the proper type, quantity and placement of extinguishers for size and layout of the facility.

22.6.4.2. Installed fire suppression systems shall be approved in accordance with UFC 3-600-01. **(T-0)** Contact the installation F&ES Flight for further guidance.

22.6.4.3. Welding, cutting or brazing shall be accomplished in accordance with **Chapter 20. (T-1)** Refer to 29 CFR § 1910.252, *Welding, Cutting and Brazing*, for additional guidance.

22.6.5. All laboratories shall have fire protection appropriate for their fire hazard classification. **(T-0)** Fire protection shall include, as a minimum, portable fire extinguishers, an alarm system and an evacuation and emergency plan. **(T-0)** For additional details regarding required fire protection requirements, refer to NFPA 45, *Standard for Fire Protection for Laboratories Using Chemicals*.

22.7. Building and Equipment Requirements.

22.7.1. Electrical.

22.7.1.1. Electrical wiring and equipment located in inside storage rooms used to store Class I liquids shall meet requirements for Class I, Division 2 hazardous classified locations. **(T-0)** Refer to 29 CFR § 1910.106 and NFPA 70 for additional guidance.

22.7.1.2. Electrical equipment and wiring in inside storage rooms used to store only Class II and Class III liquids shall be suitable for general purpose use. **(T-0)**

22.7.1.3. Containers and portable tanks used for Class I liquids shall be electrically grounded and bonded during liquid transfer. **(T-0)** Positive measures shall be taken to eliminate any source of ignition: open flames, electrical, smoking, cutting and welding, hot surfaces, static, mechanical sparks, radiant heat or spontaneous ignition sources. **(T-0)**

22.7.2. Ventilation. Liquid storage areas where dispensing is conducted shall be provided with either a gravity or continuous mechanical exhaust ventilation system. **(T-0)** Areas in which flammable or combustible liquids are transferred from one container to another tank or container in quantities greater than 5 gallons shall be separated from other similar operations by 25-feet or by construction with a fire resistance of at least one (1) hour. **(T-0)** Drainage or other means shall be provided to control spills. **(T-0)** Adequate natural or mechanical ventilation shall be provided to maintain the concentration of flammable vapors at or below 10 percent lower explosive limit (LEL). **(T-0)** Mechanical ventilation shall be used if Class I liquids are dispensed within the room. **(T-0)** Refer to 29 CFR § 1910.106 for additional information.

22.7.2.1. Exhaust air shall be taken from a point near a wall on one side of the room and within one (1) foot of the floor with one or more make-up inlets located on the opposite side of the room within one (1) foot of the floor. **(T-0)** The location of both the exhaust and inlet air openings shall be arranged to provide air movement across all portions of the floor to prevent accumulation of flammable vapors. **(T-0)** Exhaust from the room shall be directly to the exterior of the building without re-circulation. **(T-0)** Refer to NFPA 30 for additional guidance.

22.7.2.2. Mechanical ventilation systems shall provide for a complete change of air within the room at least six (6) times per hour. **(T-0)** If a mechanical exhausting system is used, it shall be controlled by a switch located outside the door. **(T-0)** The ventilating equipment and any lighting fixtures shall be operated by the same switch. **(T-0)** The switch shall be illuminated or an electric warning pilot light shall be adjacent to the switch if flammable liquids are dispensed within the room. **(T-0)** The mechanical ventilation system for dispensing areas shall be equipped with an airflow switch or equally reliable method interlocked to sound an audible alarm upon failure of the ventilation system. **(T-0)**

Note: Coordinate with the installation BE to assist in the proper selection of a ventilation system.

22.7.2.3. Ventilation ducts and airflow requirements shall comply with UFC 3-410-04, *Industrial Ventilation,* and NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids,* and 29 CFR § 1910.106, Table H-11, for vent line diameters. **(T-0)**

22.7.3. Storage Cabinets. All flammable/combustible storage cabinets shall be listed/approved for the specific class of storage. **(T-0)** Refer to 29 CFR § 1910.106 and NFPA 30 for additional information. **Note:** Metal storage cabinets and wooden cabinets will be constructed in accordance with 29 CFR § 1910.106(d)(3)(ii). **(T-0)**

22.7.3.1. HAZMAT Storage Warehouses and Other Areas that may Exceed Maximum Allowable Quantities Limit. In HAZMAT Pharmacies, buildings and/or portions of buildings where liquids are stored that may exceed maximum allowable quantities per control area shall be classified as High-Hazard Level 2 or High-Hazard Level 3, as established by NFPA 30. **(T-0)**

22.7.3.1.1. High-Hazard Level 2. Contents that present a deflagration hazard or a hazard from accelerated burning. This includes Classes I, II and IIIA liquids that are used or stored in normally open containers or systems, or in closed containers or systems at gauge pressures 15 psi or greater.

22.7.3.1.2. High-Hazard Level 3. Contents that readily support combustion or that present a physical hazard. This includes Classes I, II and IIIA liquids that are used or stored in normally closed containers or in closed containers or systems at gauge pressures of less than 15 psi.

22.7.3.2. Cabinets shall be labeled with conspicuous lettering, "Flammable — Keep Fire Away." **(T-0)** Additional guidance for marking storage containers is contained in **Chapter 17.** Refer to NFPA 30 for additional guidance.

22.7.3.3. The cabinet is not required to be vented for fire protection purposes. However, the following shall apply:

22.7.3.3.1. If the cabinet is vented, for whatever reasons, the cabinet inlet shall be vented outdoors in a manner that will not compromise performance of the cabinet. **(T-0)**

22.7.3.3.2. If the cabinet is not required to be vented, the vent opening, as applicable, shall be sealed with bungs supplied with the cabinet or specified by the manufacturer of the cabinet. **(T-0)**

22.7.3.4. Storage cabinets that meet at least one of the following sets of requirements shall be acceptable for the storage of liquids. Storage cabinets designated and constructed to limit the internal temperature at the center of the cabinet and 1 inch (2.5 centimeter [cm]) from the top of the cabinet to not more than 325º F (162.8º C), when subjected to a 10-minute fire test that simulates the fire exposure of the standard time-temperature curve specified in ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials,* shall be acceptable. **(T-0)** All joints and seams shall remain tight and the door shall remain securely closed during the test. **(T-0)**

22.7.3.5. Grounding or bonding of flammable/combustible liquid storage cabinets is not required whenever the cabinet meets national fire codes and OSHA requirements for design materials and for quantities of liquids stored.

22.7.4. Inside Storage Rooms. Refer to NFPA 30 for additional guidance.

22.7.4.1. Inside storage rooms shall meet specifications of 29 CFR § 1910.106(d)(4), *Design and Construction of Inside Storage Rooms,* and NFPA 251, *Standard Methods of Tests of Fire Resistance of Building Construction and Materials,* and the required fire-resistive rating for their use. **(T-0)** Openings to other rooms or buildings shall have noncombustible liquid-tight raised sills or ramps at least four (4) inches in height or, as an alternative, the floor in the storage area shall be at least four (4) inches lower than the surrounding floor. **(T-0)** Rooms shall be liquid-tight where walls join the floor. **(T-0)** An additional alternative to the sill or ramp is an open-grated trench inside the room draining to a safe location. Self-closing fire rated doors meeting requirements of NFPA 80, *Fire Doors and Other Opening Protectives*, shall be used. **(T-0)** Where other portions of the building or other properties are exposed, windows shall be protected as required by NFPA 80. **(T-0)** Wood of at least 1-inch nominal thickness may be used for shelving, racks, dunnage, scuff boards and floor overlay.

22.7.4.2. Class I liquids shall not be stored or handled within a building having a basement or pit where flammable vapors can travel, unless such area is provided with ventilation that will prevent the accumulation of flammable vapors. **(T-0)**

22.7.5. Storage Inside Buildings. When storage of flammable or combustible liquids is required and the storage is incidental and not the primary purpose of the area, storage shall comply with NFPA 30. **(T-1)** Refer to 29 CFR § 1910.106 for additional information. **(T-0)**

22.7.5.1. Storage shall not physically obstruct a means of egress from the building or area and not be placed in such a manner that a fire would prevent safe egress from the area. **(T-0)**

22.7.5.2. Water reactive materials shall not be stored in the same room with flammable or combustible liquids. **(T-0) Exception**: Small quantities may be stored in laboratories. Refer to **paragraph 22.6.1** and NFPA 30 for additional guidance.

22.7.5.3. Base supply warehouses, Army and Air Force Exchange Service (AAFES) storage rooms and commissary storage areas shall be in accordance with 29 CFR § 1910.106, Table H-14. **(T-0)** Buildings or portions of such buildings utilized for flammable and/or combustible storage shall be isolated by standard fire walls approved for the type and quantity of liquids being stored. **(T-0)** Materials which create no fire hazard may be stored in the same area.

22.7.5.4. When flammable or combustible liquid warehouse or storage is within 50 feet of a building or adjoining property line that may be built upon, the wall facing the building or property lines shall be a blank wall having a fire-resistance rating of at least 2 hours. **(T-0)**

22.7.5.5. The total quantity of liquids within a building is not restricted, but arrangement of storage shall comply with 29 CFR § 1910.106, Table H-14 and Table H-15. **(T-0)**

22.7.5.6. Stacked containers of flammable liquids shall be separated by pallets or dunnage, where necessary, to provide stability and to prevent excessive stress on container walls. **(T-0)** Refer to **paragraph 22.6.2** for guidance on stacking containers.

22.7.5.7. Portable tanks stored over one tier high shall be designed to nest securely, without dunnage. **(T-0)** Adequate materials handling equipment shall be available to handle tanks safely at the upper tier level. **(T-0)**

22.7.5.8. No stack shall be closer than three (3) feet to the nearest beam, chord, girder or other construction member and shall be at least three (3) feet below sprinkler deflector or discharge orifice of water spray or other installed fire protection systems. **(T-0)**

22.7.5.9. Aisles at least three (3) feet wide shall be provided for clear access to all doors, windows or fire department standpipe connections. **(T-0)**

22.7.6. Outside Storage. 29 CFR § 1910.106, Table H-16 and Table H-17 provide maximum quantities and separation criteria for outside storage of flammable and combustible liquids. Refer to 29 CFR § 1910.106 for additional information.

22.7.6.1. Maximum storage of 1,100 total gallons may be located adjacent to other buildings provided: (Reference NFPA 30.)

22.7.6.1.1. A minimum distance of 10 feet is maintained between buildings and nearest container. **(T-0)**

22.7.6.1.2. The storage area is graded in accordance with **paragraph 22.7.6.3**. **(T-0)**

22.7.6.1.3. The storage area is protected against tampering or unauthorized entry where necessary and kept free of weeds, debris and other combustible material not necessary to the storage. **(T-0)**

22.7.6.2. Where the quantity stored exceeds 1,100 gallons, refer to 29 CFR § 1910.106, Table H-17 for quantities and separation distances.

22.7.6.3. The storage area shall be graded to divert possible spills away from buildings or other facilities or shall be surrounded by a curb at least six (6) inches high. **(T-0)** When curbs are used, provisions shall be made for draining accumulations of ground or rainwater or spills of flammable or combustible liquids. **(T-0)** Drains shall terminate at a safe location and shall be accessible and operate under fire conditions. **(T-0)**

22.7.7. Incidental Storage of Flammable Liquids in Industrial Areas. Incidental storage shall be authorized only after the following requirements are met: (Reference NFPA 30.)

22.7.7.1. Incidental storage shall be in industrial areas only. **(T-0)**

22.7.7.2. Storage shall be in metal cabinets stenciled, "FLAMMABLE—KEEP FIRE AWAY" (metal wall lockers meet this requirement). **(T-0)**

22.7.7.3. Storage shall be limited to 1 gallon (4 liters) of Class I or 10 gallons (40 Liters) of Class II and Class III liquids, not to exceed 10 gallons (40 liters) total per cabinet, in closed containers. **(T-0)** Storage shall be limited to a five-day supply of flammables in a metal cabinet, and in closed containers not to exceed limits specified in paragraphs **22.6.2** and **22.7.6** **(T-0)** Each work center shall be limited to one cabinet. **(T-1)**

22.7.7.4. The installation F&ES Flight shall be consulted prior to establishing incidental storage areas in industrial shops. **(T-1)**

22.7.8. Laboratories. Many laboratory operations require special control flammable and combustible liquids to protect personnel and equipment. Two types of laboratories are covered

by this section: general laboratories and health-related laboratories. Refer to NFPA 30 for additional guidance.

22.7.8.1. A list of working supplies and operating instructions on handling flammable and combustible liquids shall be published. **(T-0)** The aggregate total outside of storage cabinets in any laboratory shall not exceed 10 gallons. **(T-0)** All quantities of flammable and combustible liquids in one laboratory in excess of 10 gallons shall be stored in an approved storage cabinet or in an approved storage room. **(T-0)** Flammable or combustible liquids shall not be stored or transferred from one vessel to another in any exit way, corridor or passageway leading to an exit. **(T-0)** A minimum of one approved storage room shall be available within any building housing a laboratory which regularly maintains a reserve storage capacity in excess of 300 gallons. **(T-0)** Refer to NFPA 45 for additional guidance.

22.7.8.2. Flammable or combustible liquids shall not be brought into a laboratory, receiving area, storage area or storage facility unless design, construction and fire protection requirements are suitable for the hazard and quantity involved. **(T-0)** Container types and maximum capacities shall comply with NFPA 45. **(T-1)** Plastic containers, if used to avoid breakage problems posed by glass containers or contamination problems with metal containers, must be approved for the liquid used. **(T-0)** Containers used to draw from an original container must be marked to identify their contents. **(T-0)** Refrigerators or cooling equipment used to store or cool flammable liquids shall be approved for the material being stored or cooled and labeled or stenciled, "Approved for Flammable Liquid Storage." **(T-0)**

22.7.9. Military Exchanges, Commissaries and Associate Retail Stores. In rooms or areas accessible to the public, storage of flammable and combustible liquids shall be limited to quantities needed for display and normal merchandising purposes, not to exceed two (2) gallons per square foot of gross floor area. **(T-0)** The gross floor area used for computing the maximum quantity permitted is that portion of the store actually being used for merchandising flammable and combustible liquids. Refer to NFPA 30 for additional guidance.

22.7.9.1. Storage of Class IA liquids shall be prohibited in basement display areas and limited to one (1) gallon per square foot on any other floor. **(T-0)** In areas not protected, storage of Class IB, IC and II liquids on other than the ground floor shall be limited to one (1) gallon per square foot of gross floor area. **(T-0)** Protected shall mean protected with automatic sprinklers installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems.* **(T-0)**

22.7.9.2. On floors above ground level, storage or display of Class I and Class II liquids shall be limited to 60 gallons in unprotected occupancies and 120 gallons in protected occupancies. **(T-0)**

22.7.9.3. Containers in a display area shall not be stacked more than three (3) feet or two (2) containers high, whichever is greater. **(T-0)**

22.7.9.4. Shelving shall be capable of supporting the load and containers on shelves must be arranged so they are not easily knocked off the shelves to the floor. **(T-0)**

22.7.9.5. Storage shall be in accordance with 29 CFR § 1910.106, Table H-14. **(T-0)** Buildings or portions of such buildings utilized for flammable and/or combustible storage shall be isolated by standard fire walls approved for the type and quantity of liquids being

stored. **(T-0)** Materials which create no fire hazard to the liquids may be stored in the same area.

22.7.9.6. If the storage building is located 50 feet or less from a building or adjacent property line that may be built upon, the wall facing the building or property lines shall be a blank wall having a fire-resistance of at least two 2 hours. **(T-0)** Refer to 29 CFR § 1910.106 for additional information.

22.7.9.7. The total quantity of liquids within the building is not restricted, but the arrangement of storage shall comply with 29 CFR § 1910.106, Table H-14. **(T-0)**

22.7.9.8. Stacked containers of flammable liquids shall be separated by pallets or dunnage, where necessary, to provide stability and to prevent excessive stress on container walls. **(T-0)**

22.7.10. Small Gasoline Engine Powered Equipment. This section applies to lawnmowers, snow blowers, generators, outboard marine motors, portable water pumps, small watercraft, powered gardening tools and other implements powered by gasoline engines, typically 5-horsepower or less. Refer to NFPA 30 for additional guidance.

22.7.10.1. Equipment shall be serviced after use and prior to extended off-season storage. **(T-0)**

22.7.10.1.1. Equipment shall be stored in accordance with manufacturer's instructions. **(T-0)**

22.7.10.1.2. Storage facilities shall be protected against tampering or unauthorized entry and area around the facility shall be kept free of weeds, debris and other combustibles. **(T-0)**

22.7.10.1.3. Workplace storage facilities shall be inspected monthly by supervisor and/or building custodian. **(T-1)** The supervisor and/or building custodian shall document each inspection. **(T-1)**

22.7.10.2. Gasoline powered equipment shall not be stored in military family housing living areas, including basements, unless the storage room or area has walls and is separated from the living area by an un-pierced 1-hour rated fire-resistant partition and ceiling. **(T-1)** All storage areas must be inspected (one-time inspection) and approved by the installation F&ES Flight. **(T-1)** Subsequent inspections shall be accomplished in accordance with manufacturer's inspection and on an as required basis as determined by the installation F&ES Flight. **(T-1)**

22.7.10.3. Custodians of dormitories, multiple living quarters, assembly, institutional, military exchange, commissary and warehouse facilities shall store small gasoline powered equipment in an enclosed 1-hour fire-rated storage room. **(T-1)** Boiler rooms and other utility rooms shall not be utilized as storage areas for flammable or combustible liquids. **(T-0)**

22.7.10.4. Storage in theaters, conference facilities, open messes, clubs, recreation facilities, dormitories, temporary quarters or multiple unit family housing buildings containing more than three dwelling units, and hotels is limited to 10 gallons or less of Class I and II liquids and 20 gallons or less of Class III liquids stored in an approved storage

container or in safety cans. Refer to 29 CFR § 1910.106, Table H-13 for additional guidance on storage in inside rooms.

22.7.10.5. Storage of Class I, II and III liquids is limited to 10 gallons per resident unit. Included are single residences and those dwellings containing not more than three (3) dwelling units with attached or detached garages.

22.8. Handling and Dispensing.

22.8.1. Containers. Containers and portable tanks shall meet handling, storage and dispensing requirements specified in this publication for the product concerned. **(T-1)** Refer to NFPA 30 for additional guidance. Tanks and vats shall be installed so rupture or overflow is contained or controlled through dikes, sumps, etc., per 29 CFR § 1910.106. **(T-0)**

22.8.1.1. The capacity of flammable and combustible liquid containers shall be in accordance with 29 CFR § 1910.106, Table H-12. **(T-0)**

22.8.1.2. Flammable liquids shall be kept in covered containers when not in use. **(T-0)** Refer to NFPA 30 for additional information.

22.8.1.3. Storage of flammable and combustible liquids shall be prohibited in office occupancies, except when required for maintenance and operation of buildings and equipment. **(T-0)** Such storage shall be the smallest quantity required, in approved self-closing metal containers stored in a storage cabinet or in safety cans or an inside storage room not having a door that opens into that portion of the building used by personnel. **(T-0)** Maximum quantities shall meet the requirements of the storage cabinet, container or room in accordance with **paragraph 22.7.3** and NFPA 30, Table 9.6.1. **(T-1)**

22.8.2. Storage Inside Building.

22.8.2.1. Containers shall remain tightly sealed except when transferred, poured or applied. **(T-0)** Workers shall remove from the storage container only that portion required to accomplish a particular job. **(T-0)**

22.8.2.2. Flammable paints, oils and varnishes in 1 to 5 gallon containers, used for building maintenance purposes, may be stored temporarily in closed metal containers outside approved storage cabinets or rooms if kept at the job site for less than 10 calendar days.

22.8.3. Outside Storage. All containers having flammable or combustible materials shall be protected from heat sources to prevent the contents expanding and pressurizing the container, which could rupture the container. **(T-0)** Open flame or smoking shall not be permitted within 50 feet of flammable or combustible liquid storage areas. **(T-0)**

22.8.4. Laboratories.

22.8.4.1. Flammable and combustible liquids shall not be positioned near Bunsen burners, hot surfaces, steam pipes, valves or other sources of heat. **(T-0)**

22.8.4.2. Refer to AFI 90-821 for additional information regarding flammable, combustible and hazardous materials handling in laboratories.

22.8.5. Small Gasoline Engine Powered Equipment.

22.8.5.1. Fueling operations shall be conducted in outside areas free from ignition sources. **(T-0)** Fuel tanks shall not be filled or drained inside buildings or other facilities where fuel vapors or other explosive gases can accumulate. **(T-0)**

22.8.5.2. Operators shall not refuel a running engine or one that is hot from recent use. They shall allow a minimum of five (5) minutes cooling off time before starting refueling operations. **(T-1)**

22.8.5.3. Fueling and/or refueling operations shall be accomplished using a safety can with pouring spout or an appropriate sized funnel. **(T-1)** Care shall be taken not to spill fuel onto hot surfaces. **(T-0)** Spilled fuel shall be cleaned up before attempts are made to start equipment. **(T-0)**

22.8.5.4. Equipment shall be serviced after use and prior to extended off-season storage to ensure equipment is:

22.8.5.4.1. Thoroughly cleaned. **(T-0)**

22.8.5.4.2. Functioning properly. **(T-0)**

22.8.5.4.3. The fuel tank is drained. **(T-0)**

22.8.5.5. Cleaned and drained small gasoline powered equipment may be stored during the off-season in inspection and testing facilities, munitions maintenance facilities, fire stations, shops and maintenance facilities. However, this equipment shall not be stored in hangars, nose docks, corrosion control, fuel cell repair or missile assembly and repair facilities. **(T-1)** When stored, the equipment shall be isolated from potential ignition sources. **(T-0)**

22.8.6. Handling Flammable and Combustible Liquids at Final Point of Use. Flammable and combustible liquids shall be drawn from or transferred into vessels, containers or portable tanks within a building only through a closed piping system, from safety cans, by means of a device through the top, or from a container or portable tanks by gravity through an approved self-closing valve. **(T-0)** Transferring by means of air pressure on the container or portable tanks is prohibited. Refer to 29 CFR § 1910.106 for additional information.

22.8.6.1. Only approved safety containers shall be used for transporting and dispensing flammable liquids in quantities of five (5) gallons or less. **(T-0)**

22.8.6.2. Flammable liquids shall be kept in covered containers when not actually in use. **(T-0)**

22.8.6.3. Means shall be provided to clean up and remove spills. **(T-0)** Refer to the appropriate SDS for spill clean-up procedures and PPE required.

22.8.6.4. Class I liquids shall be used only where there are no open flames or other sources of ignition within the area or possible path of vapor travel. **(T-0)**

22.8.6.5. Safety cans or other portable containers of flammable liquids having a flashpoint at or below 80° F shall be red in color with additional clearly visible identification in the form of a yellow band around the container and the contents conspicuously stenciled or painted in black. **(T-0)** If the contents are stenciled or painted in yellow, then the yellow band is not required to be around the container. **Exception**: Shipping containers. Refer to National Fire Protection Association 30 for additional guidance.

22.8.6.6. Disposal. Consult the installation Environmental Management office for proper guidance regarding disposal of any excess or unneeded hazardous materials. Also refer to AFMAN 32-7002 for additional information.

Table 22.1. Classifications of Flammable and Combustible Liquids.

Designation	Class	Subclass Definition
Flammable	Class I	Any liquid with flashpoint below 100° F; 37.8° C.
	Class IA	Includes liquids having flashpoints below 73° F; 22.8° C and having a boiling point below 100° F; 37.8° C.
	Class IB	Includes liquids having flashpoints below 73°F; 22.8° C and having a boiling point above 100° F; 37.8° C.
	Class IC	Includes flashpoints at or above 73°F (22.8°C), but below 100°F (37.8°C).
Combustible	Class II	Includes those liquids with flashpoints at or above 100°F; 37.8° C and below 140° F; 60° C.
	Class III	Includes those liquids with flashpoints at or above 140° F; 60° C.
	Class IIIA	Includes those liquids with flashpoints at or above 140° F; 60° C and below 200° F; 93.3° C.
	Class IIIB	Includes those with flashpoints at or above 200° F; 93.3° C.
Note: Refer to 29 CFR § 1910.106 for additional guidance.		

Chapter 23

CONFINED SPACES

23.1. Scope. This chapter establishes DAF-specific confined space program requirements based on OSHA required program elements found in 29 CFR § 1910.146, *Permit-Required Confined Spaces*, and 29 CFR § 1926, Subpart AA, *Confined Spaces in Construction*, as required. Units that have personnel who enter confined spaces will comply with 29 CFR § 1910.146, 29 CFR § 1926, Subpart AA, this chapter, and other applicable standards. **(T-0)** Industries excepted in 29 CFR § 1910.146(a) and 29 CFR § 1926.1201(b) will use the cited standard as it applies. **(T-0)** Using the Construction standard versus 29 CFR § 1910.146 ensures consistent compliance where construction and general industry activities happen concurrently or intermittently during confined space entries. OSHA has recognized this as an acceptable practice and consider compliance with 29 CFR § 1926, Subpart AA as compliance with 29 CFR § 1910.146 during these situations.

23.2. Definitions.

23.2.1. Confined space is defined as a space that:

23.2.1.1. Is large enough and so configured that a worker can bodily enter and perform assigned work.

23.2.1.2. Has limited or restricted means for entry or exit.

23.2.1.3. Is not designed for continuous occupancy. **Note:** Examples of confined spaces include, but are not limited to, aircraft fuel cells, silos, tanks, pits, manholes, vaults, storage bins, etc. **Note:** All three (3) conditions in paragraphs **23.2.1.1** – **23.2.1.3** must be present to constitute a confined space. **(T-0)**

23.2.2. There are two (2) classifications of confined spaces:

23.2.2.1. Permit-required confined space is defined as a space that has one or more of the following characteristics:

23.2.2.1.1. Contains or has a potential to contain a hazardous atmosphere.

23.2.2.1.2. Contains a material that has the potential for engulfing an entrant.

23.2.2.1.3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.

23.2.2.1.4. Contains any other recognized serious safety or health hazard.

23.2.2.2. Non-permit confined spaces are defined as a space that do not contain, or with respect to atmospheric hazards, do not have the potential to contain any hazard capable of causing death or serious physical damage.

23.2.3. Serious physical damage is defined as an impairment or illness in which a body part is made functionally useless or is substantially reduced in efficiency. Such impairment or illness may be permanent or temporary and includes, but is not limited to, loss of consciousness, disorientation, or other immediate and substantial reduction in mental efficiency. Injuries involving such impairment would usually require treatment by a physician or other licensed

healthcare professional. Such physical damage would impair an entrant's ability to conduct self-rescue.

23.3. Hazards. Personnel entering or working in confined spaces may encounter any number of serious hazards that can affect their ability to safely work in or evacuate from a confined space. Refer to **Table 23.1** for common atmospheric and serious physical hazards found in permit-required confined spaces.

Table 23.1. Common Hazards Involving Confined Spaces (Not all-inclusive).

Category	Confined Space Hazard
Atmospheric	• Oxygen Deficiency (<19.5%) • Displacement of air by another gas • Various biological processes or chemical reactions, such as rotting of organic matter, rusting of metals, burning, etc. • Oxygen Enrichment (>23.5%) • An excess of oxygen, in the presence of combustible materials, results in an increased risk of fire and explosion • Some materials, which do not burn in air, may burn vigorously or even spontaneously in an enriched oxygen atmosphere • Flammable or Explosive Atmospheres • A flammable atmosphere presents a risk of fire or explosion • Such an atmosphere can arise from the presence in the confined space of flammable liquids or gases or of a suspension of combustible dust in air • If a flammable atmosphere inside a confined space ignites, an explosion may occur, resulting in the expulsion of hot gases and the disintegration of the structure • Toxicity – An atmospheric concentration of any chemical substance (e.g., hydrogen sulfide (H2S), carbon monoxide (CO), welding fumes) which is capable of causing death, incapacitation, impairment of ability to self-rescue, injury or acute illness due to its health effects or which could result in an exposure or does in excess of its occupational and environmental exposure limit
Serious Physical	• Limited or restricted means for entry or exit • Cramped working conditions • Temperature extremes • Rotating or moving equipment • Reactive or corrosive residues • Entrapment hazards • Electrical hazards • Wildlife • Poor light levels

23.4. Responsibilities.

23.4.1. Major Commands (MAJCOMs), Field Commands (FLDCOMs), Direct Reporting Units (DRUs) and Field Operating Agencies (FOAs) with a safety staff shall:

23.4.1.1. Ensure program oversight through a variety of means that includes evaluations, Staff Assistance Visits and assistance with resolution of identified deficiencies. **(T-1)**

23.4.1.2. Formally review Confined Space Programs as part of Safety Program Evaluations. **(T-1)** The review shall include the number and type of confined spaces, the installation's best practices and/or major challenges, cancelled entry permits and approved Master Entry Plans. **(T-1)**

23.4.1.3. Standardize Master Entry Plan documentation to fit command needs, as required. **(T-1)**

23.4.1.4. Approve installation safety office developed train-the-trainer materials. **(T-1)**

23.4.2. The installation occupational safety office will:

23.4.2.1. Manage the installation confined space program and lead the Confined Space Program Team (CSPT). **(T-1)**

23.4.2.2. Identify a safety representative to the CSPT. This representative shall: **Note:** It is the responsibility of the occupational safety manager (OSM) to assign a representative.

23.4.2.2.1. Be competent in confined space program requirements and be trained according to **paragraph 23.10**. **(T-1)** Training and appointment will be in writing, to show the safety certifies the representative's competency in the program. **(T-1)**

23.4.2.2.2. Maintain consolidated confined space inventories provided by each organization for all confined spaces, whether located on or off the installation, e.g., geographically separated units. **(T-1)** The inventory, at a minimum, shall include organization, classification, data supporting the classification and location of all identified confined spaces and updates provided to them by each organization. **(T-1)** A map of the confined space may be included to support the inventory list, but is not mandatory.

23.4.3. Tenant units with assigned safety staff will appoint a representative to the installation CSPT to serve as an agent for confined spaces program responsibilities within their organization and codified in the applicable host-tenant support agreement. **(T-1)** The tenant safety representative will provide documentation to the installation OSM, when appointed to represent the tenant unit on the CSPT, to show competency in the confined space program. **(T-1)**

23.4.4. Installation fire chief shall identify, in writing, to the OSM the appointed Fire Emergency Services (FES) Flight representative(s) to the CSPT and certify the representative(s) is/are competent in confined space program requirements. **(T-1)**

23.4.5. Installation Bioenvironmental Engineer (BE) shall identify, in writing, to the OSM the appointed BE representative(s) to the CSPT and certify the representative(s) is/are competent in confined space program requirements. **(T-1)**

23.4.6. Commanders and/or Functional Managers shall:

23.4.6.1. Identify, in writing, to the OSM their designated representative(s) to the CSPT and certify the representative(s) is/are competent in confined space program requirements and are trained according to **paragraph 23.10**. **(T-1)**

23.4.6.2. Ensure the workplace is evaluated for permit and non-permit required confined spaces. **(T-1)** Require the designated representative to compile an inventory of the identified confined spaces in the organization and provide a copy to the installation CSPT. **(T-1)** In addition to items listed in **paragraph 23.4.2.2.3,** the inventory shall include, at a minimum, the number of spaces (quantity), type (with every entry point uniquely identified and listed) and exact location (e.g., grid coordinates, Global Positioning Satellite coordinates, if available, highlighted maps, if necessary). **(T-1)** Newly identified confined spaces or changes to any spaces on the inventory will be immediately reported to the CSPT to ensure proper testing, evaluation and classification of each confined space within the organization. **(T-1)**

23.4.6.3. Require that all exposed personnel are informed of the identified permit-required spaces. **(T-0)**

23.4.6.4. Ensure a written confined space program, developed and approved by the CSPT, is implemented IAW 29 CFR § 1910.136 and this chapter. **(T-0)** Master Entry Plan(s), when required, shall be routed through the CSPT for approval. **(T-1) Note:** The requesting unit, not the CSPT, will lead the development of the unit's Confined Space Program and Master Entry Plan(s). **(T-1)**

23.4.6.5. Ensure all personnel assigned duties and responsibilities that support confined space program tasks are properly trained according to **paragraph 23.10**. **(T-0)** All equipment and training will be approved by the CSPT prior to purchase or implementation. **(T-1)**

23.4.7. Commander's designated representative(s) shall:

23.4.7.1. Coordinate between each shop in the organization who enters confined spaces and the commander. **(T-1)** Ensure required equipment needed to conduct safe entry into a permit-required space is purchased and properly maintained. **(T-0)**

23.4.7.1.1. Obtain CSPT approval when selecting and purchasing equipment for confined space entries. **(T-1)**

23.4.7.1.2. Identify confined spaces program shortfalls, e.g., equipment, manning, funding, and ensure they are up-channeled to the commander and the CSPT. **(T-1)**

23.4.7.2. Develop the inventory of organizationally-controlled confined spaces with all information required in **paragraph 23.4.5.2** and submit the confined space inventory to the commander for review prior to submission to the installation occupational safety office. **(T-1)** Initially, annually and as changes occur, review the confined spaces inventory and immediately incorporate any newly identified confined spaces and/or changes to existing classification of the confined spaces inventory when discovered during (re)evaluation and (re)classification by the CSPT. **(T-1)**

23.4.7.3. Be knowledgeable of the general hazards, conditions and layouts of each confined space under their program. **(T-1)** The representative(s) shall have experience with the confined spaces (or similar spaces) they manage. **(T-1)**

23.4.7.4. Designate the appropriate number of entry supervisors needed to cover all permit-required confined space entries. **(T-1)**

23.4.7.5. Ensure personnel entering non-permit confined spaces receive the same initial confined space training as personnel entering permit-required spaces found in **paragraph 23.10.1.1**. **(T-1)**

23.4.7.6. Develop, with the assistance of each shop supervisor, a written confined space program, if required, that includes a structured and effective training program that establishes safe work practices and techniques specific to the confined spaces they enter. **(T-0)** Ensure all developed training meets the requirements found in **paragraph 23.10** **(T-1)** Training will be approved by the CSPT prior to implementation. **(T-1)**

23.4.7.7. Notify the occupational safety member of the CSPT when the organization plans to contract work in confined spaces. **(T-1)** It is the organization's responsibility to provide required information known about permit-required spaces under their organizational control to contractors working in permit-required spaces. **(T-1)** Notification to the installation occupational safety office ensures the CSPT members can be made aware of all permit-required space entries and notify affected organizations of any cross-tell necessary to ensure all employees are aware of any generated hazards due to activities by other organizations. **(T-0)**

23.4.7.8. Be a CSPT member. **(T-1)**

23.4.7.9. Be trained according to **paragraph 23.10**. **(T-1)**

23.4.8. Entry supervisor will:

23.4.8.1. Be knowledgeable of all their confined space duties. **(T-1)**

23.4.8.2. Issue entry permits consistent with the organizational written confined space program or the Master Entry Plan, when applicable. **(T-1)**

23.4.8.3. Cancel the entry permit after becoming aware of a prohibited or unexpected condition. **(T-0)** Use of suspending an entry permit under 29 CFR § 1926.1205(e)(2) will not be allowed in DAF confined space entry operations. **(T-1)**

23.4.8.4. Ensure workers are aware that work on energized electrical equipment is prohibited unless approved by the installation base civil engineer (BCE) in accordance with AFMAN 32-1065, *Grounding and Electrical Systems.* **(T-1)**

23.4.8.5. With assistance from Occupational Safety, BE or the F&ES Flight, as appropriate, determine and evaluate newly identified hazardous condition source(s) found at the time of entry, e.g., residue from the space, leaking valve or pipe in the space, etc. **(T-0)**

23.4.8.6. Ensure all members of the rescue team are trained and current in cardiopulmonary resuscitation (CPR) for permit-required confined space entry operations. **(T-1)**

23.4.8.7. Ensure DAF workers enter a permit-required confined space only after an AF Form 1024, *Confined Spaces Entry Permit*, or other entry permit, approved by the CSPT that meets the minimum documentation requirements, has been completed. **(T-0)**

23.4.8.8. Maintain the entry permit and a copy of the written confined space program and Master Entry Plan, when applicable, at the permit space entry to provide personnel fulfilling confined space entry duties with a reference to required procedures applicable to the confined space entered. **(T-0)**

23.4.8.9. Request assistance from the CSPT, as needed, to ensure all program requirements are met. **(T-1)**

23.4.8.10. Be trained according to **paragraph 23.10**. **(T-1)**

23.4.9. Confined space attendants will perform duties in accordance with 29 CFR § 1926.1209, *Duties of Attendants,* and be trained according to **paragraph 23.10**. **(T-0)**

23.4.10. Confined space entrants will perform duties in accordance with 29 CFR § 1926.1208, *Duties of Authorized Entrants,* and be trained according to **paragraph 23.10**. **(T-0)**

23.4.11. Rescue teams will perform duties in accordance with 29 CFR § 1926.1211, *Rescue and Emergency Services.* **(T-0)**

23.4.12. The Confined Space Program Team (CSPT) shall:

23.4.12.1. Assist commanders and/or functional managers in the development and administration of their organizational confined space program. **(T-1)**

23.4.12.2. When notified, test and evaluate identified confined spaces to classify them. **(T-0) Note:** Obvious hazardous spaces, e.g., sanitary sewer manholes, may automatically be classified as permit-required without the need for initial testing only to designate the confined space classification. Prior to any confined space entries, further testing will be accomplished to identify all hazards and develop effective controls prior to the start of permit-space entry operations. **(T-0)**

23.4.12.3. Validate that the organization, who maintains the confined space, has ensured all exposed personnel are informed of the permit-required space hazards. **(T-0)**

23.4.12.4. Assist the organization in the development of the written confined space program to ensure the program meets OSHA requirements and this chapter. **(T-0)**

23.4.12.5. Evaluate all equipment for use by entrants to ensure effectiveness against identified hazards. **(T-0)**

23.4.12.6. When requested by the unit, assist in the development of the Master Entry Plan. **(T-1)** Evaluate and approve Master Entry Plans that meet requirements in **paragraph 23.7.2**. **(T-1)**

23.4.12.7. Review and approve all entry permits not contained in a Master Entry Plan. **(T-1)**

23.4.12.8. Meet annually to conduct a review of the installation Confined Space Program. **(T-1)** Include all approved written confined space programs, Master Entry Plans, training plans, rescue team evaluations/training, changes to OSHA standards, DAF or MAJCOM/FLDCOM confined spaces guidance, issues discovered during surveillance, cancelled permits and any fire, safety or health inspection findings over the past year. **(T-1)**

23.4.12.9. Establish procedures with the appropriate agencies, e.g., contracting office, United States Army Corp of Engineers, to review all construction projects to identify, evaluate and classify new confined spaces, or changes to current confined spaces. **(T-1)**

23.4.12.10. Allow the installation occupational safety office to directly coordinate with the contractor to fulfill requirements in 29 CFR § 1926.1203(h), *Permit Space Entry Communication and Coordination*, for government-owned, contractor-operated confined spaces, where no DAF personnel enter. **(T-1)**

23.4.12.11. Review and assess unit and rescue team training program at least annually. **(T-1)** The review/assessment will include lesson plans, hands-on training methodology, exercises and documentation of training completion. **(T-1)** The completed annual assessment will be provided to the assessed unit. **(T-1)** Incorporate findings from annual reviews into other reports, such as annual safety reports. **(T-1)**

23.4.12.12. Convene after a confined space mishap to ensure all hazards are identified to protect other members and to collect any quantifiable data for the mishap investigation. **(T-1)**

23.5. Written Confined Space Program.

23.5.1. This program will include All required elements outlined in 29 CFR § 1910.146 and 29 CFR § 1926, Subpart AA, as required. **(T-0)**

23.5.1.1. Testing and classification of confined spaces shall be done by the installation CSPT. **(T-1)**

23.5.1.2. Only explosion-proof or intrinsically safe equipment may be used where flammable or explosive atmospheres are present. **(T-0)** Additionally, NFPA 70, Article 504, *Intrinsically Safe Systems*, and Article 501, Class I Locations, provide additional guidance. **(T-1)**

23.5.1.3. Atmospheric monitoring shall be continuously conducted for atmospheric hazards in permit spaces unless the organization can demonstrate that continuous monitoring for the identified atmospheric hazard is not commercially available. **(T-0)** Final determination will be documented in the written permit confined space program. **(T-0)** Where continuous monitoring is proven to be unavailable, procedures for periodic evaluation will be developed by the supervisor and approved by the CSPT. **(T-0)** If isolation of a permit space is not possible because the space is large or is part of a continuous system (e.g., a sewer), pre-entry testing must be performed to the extent feasible and entry conditions must be continuously monitored in areas where authorized entrants are working. **(T-0) Note:** For aircraft fuel cell/tank confined space monitoring, follow requirements in TO 1-1-3, *Inspection and Repair of Aircraft Integral Tanks and Fuel Cells.*

23.5.1.4. Monitoring equipment used to evaluate confined spaces shall be calibrated by the Testing, Measurement, Diagnostic and Evaluation (TMDE) laboratory at an interval established by manufacturer's instructions or applicable technical orders. **(T-1)**

23.5.1.4.1. Some monitoring equipment, e.g., colorimetric tubes, do not require calibration. Equipment that comes with manufacturer-approved calibration devices and does not require TMDE calibration is also acceptable.

23.5.1.4.2. Monitoring equipment that requires calibration, but cannot be calibrated by TMDE, shall be sent to the manufacturer for calibration. **(T-1)**

23.5.1.5. The user shall be required to field check and span gas test equipment in accordance with the manufacturer's instructions immediately before testing the confined space. **(T-0)** Workers will not use equipment that cannot be calibrated or which fails the

field check or span gas test, until it is repaired and the calibration and/or field check is successfully accomplished. **(T-0)**

23.5.2. When workers perform hot riveting, welding, cutting or burning, or heating operations within a confined space, they will obtain an AF Form 592, *Hot Work Permit*, from the installation F&ES Flight. **(T-0)** Refer to **Chapter 20** for additional information. If hazards may be introduced into the confined space by the hot work, BE shall be contacted to evaluate the potential hazards and recommend ventilation procedures. **(T-1)** Workers will inspect, test, operate and maintain welding and cutting equipment such as hoses, connections, torches, etc., in accordance with provisions of **Chapter 20,** applicable TOs and manufacturer' instructions. **(T-0)**

23.5.3. Entry into telecommunications only controlled spaces are governed by 29 CFR § 1910.268, *Telecommunications*, and **Chapter 28. Note:** The requirements of this chapter can also apply to telecommunications confined spaces. Contact the CSPT for assistance.

23.5.4. Aircraft fuel systems personnel will follow this publication and applicable technical data for responsibilities, qualifications, training and rescue procedure requirements for working in permit-required confined spaces. **(T-0) Note:** Any conflict between this instruction and applicable technical data will be addressed to AFSEC/SEG for resolution.

23.6. Entry into Immediately Dangerous to Life and Health (IDLH) Conditions. Entry supervisors will not permit entry into and work in known IDLH conditions under normal operations. **(T-0)** Entry into known IDLH conditions is only authorized in cases of extreme emergencies such as rescue efforts or emergency repairs. **(T-0)** The entry supervisor will continuously work to reduce the hazard(s) within the confined space. **(T-0)** The CSPT will authorize entry only when the following conditions are met:

23.6.1. Continuous monitoring is conducted. **(T-0)**

23.6.2. A knowledgeable BE and occupational safety representative shall be present at all times to serve as consultants to the entry supervisor. **(T-1)**

23.6.3. An experienced on-site supervisor shall be present. **(T-0)**

23.6.4. Personnel will be equipped with respirators in accordance with 29 CFR § 1910.134, *Respiratory Protection.* **(T-0) Note:** Additional guidance can be found in AFI 48-137.

23.7. Master Entry Plan. This part of the written confined space program serves as approval for recurring entries into permit-required spaces to conduct work under routine conditions. The Master Entry Plan is developed by the organization and approved by the CSPT to allow the commander's designated representative(s) to identify entry supervisor(s) that will issue entry permits without the need for the CSPT to come out.

23.7.1. Recurring basis is defined, for the purpose of this manual, as occurring at least once a month or more frequently.

23.7.2. The Master Entry Plan will:

23.7.2.1. Require the commander's designated representative(s) or shop supervisor to brief entry supervisor(s) on their duties prior to performing the entry. **(T-1)**

23.7.2.2. Describe the acceptable entry conditions, including atmospheric conditions, under which permits may be issued. **(T-0)**

23.7.2.3. Designate as many entry supervisors as needed. **(T-0)**

23.7.2.4. Identify the specific type and location of permit spaces to be entered and specific types of tasks or operations to be performed. **(T-0)**

23.7.2.5. Describe the purpose of the entry and list either by reference or direct statement, the procedures to be used for entry, e.g., shop Operating Instruction (OI) that cover specific tasks. **(T-0)**

23.7.2.6. Account for around-the-clock operations, when appropriate. **(T-1)**

23.7.2.7. List PPE, atmospheric monitoring and rescue equipment, and conditions under which they shall be used. **(T-0)**

23.7.2.8. Require continuous atmospheric monitoring. **(T-0)** When continuous monitoring is not possible, or determined by the CSPT to not be necessary, based on test data verifying that acceptable entry conditions are being maintained in accordance with 29 CFR § 1910.146(d)(5)(ii), documentation must be maintained. Documentation will include: why continuous monitoring is not possible or needed, what procedures will be used to periodically evaluate for atmospheric hazards, and the evaluation frequency to be used that will ensure exposed entrants will have adequate time to escape the permit space will be described. **(T-0)**

23.7.2.9. List other controls required, e.g., hazardous energy control, ventilation, that will eliminate or isolate identified hazards for safe entry. **(T-0)**

23.7.2.10. List chemicals and quantities authorized for use. **(T-1)** List expected exposure levels based on air sampling results. **(T-1)** Based on exposure levels, perform reassessments of the confined spaces. **(T-1)** The installation Bioenvironmental Engineering (BE) office is the subject matter expert for determining appropriate PPE. BE surveys or assessments shall be used to identify concerns and necessary PPE in case of exposure.

23.7.2.11. List conditions under which the space may or will be reclassified. **(T-0)**

23.7.2.12. Establish communication procedures and identify communication equipment to be used during entries between the attendant and entrants. **(T-1)**

23.7.2.13. Document emergency rescue procedures for each permit-required confined space covered under the Master Entry Plan. **(T-0)** Procedures will include:

23.7.2.13.1. Self-rescue training and equipment. **(T-0)**

23.7.2.13.2. Retrieval lines must be used to conduct non-entry rescue. **(T-0)** However, when a formal risk assessment determines retrieval lines themselves may constitute an increased risk to the entrant and not contribute to the rescue of the individual, another means will be identified and approved by the CSPT. **(T-0)** Results will be documented and maintained with the written confined space program. **(T-0)**

23.7.2.13.3. Rescue Teams. Determine and evaluate the source of rescue services (unit organized, contracted, installation F&ES Flight) to be used for permit-required confined space entries. **(T-0)**

23.7.2.13.3.1. Identify how rescue services will be notified to ensure prompt response. **(T-0)** 23.7.2.13.3.2. Entry shall not be made until the rescue team has

been notified and their availability is verified. **(T-0)**

23.7.2.13.3.3. When the identified rescue service is not available, the operation shall be halted, unless a secondary trained team is available. **(T-0) Note:** Within aircraft maintenance, the fuel systems shop/work center may maintain a rescue team capability in accordance with TO 1-1-3. **(T-1)**

23.7.2.13.3.4. Specify the method that will be used for reliable summoning of the rescue team, e.g., telephone, radio, and ensure it is operable, on hand and easily accessible. **(T-0)**

23.7.2.14. Ensure the inspection, testing, maintenance and documentation of safety and rescue equipment is accompanied in accordance with **Chapter 14**, TO 00-25-245, *Operations Instructions – Testing and Inspection Procedures for Personnel Safety and Rescue Equipment*, and manufacturer's instructions. **(T-0)** If a conflict exists between these guidance documents, use the most restrictive guidance. **(T-1)** Contact the CSPT for additional assistance.

23.7.2.15. Describe the procedure to retain the canceled permit for one year to facilitate the review of the permit-required confined space program, as required by 29 CFR § 1910.146(e)(5). **(T-0)**

23.7.2.16. Procedure to amend the Master Entry Plan, as needed. **(T-1)**

23.8. Non-permit Confined Space Entry. These spaces are defined as confined spaces because they meet the definition of a confined space and after evaluation and testing prove they do not contain hazards and do not have any reasonable probability to become hazardous. **(T-0**) Permit spaces can be reclassified as non-permit spaces where the hazards in the space can be effectively isolated or eliminated from the space. **(T-0)**

23.8.1. Entries into a permit-required space for the purpose of reclassifying the space will follow permit-required entry requirements while conducting those activities until the permit-space hazards are completely isolated or eliminated. **(T-0)**

23.8.2. Confined spaces classified as non-permit required will be assessed by the shop supervisor to determine if work to be conducted could or will introduce hazard(s) that will change its classification, e.g., welding, sanding, use of chemicals. **(T-0)**

23.8.2.1. Similar confined spaces that will have the same types of work conducted in them may be combined. **(T-1)**

23.8.2.2. Results will be provided to the CSPT for review and concurrence. **(T-1)**

23.8.2.3. Work differing from that identified in the formal risk assessment will be identified to the installation occupational safety representative for evaluation by the CSPT. **(T-1)**

23.8.3. Prior to entry into a non-permit confined space, visually inspect in and around the space to determine if any previously unidentified potential hazards are present or if conditions have changed. **(T-0)**

23.8.3.1. Non-permit required spaces will have atmospheres tested prior to entry when conditions or operations change after the space was originally classified. **(T-1)**

23.8.3.2. When atmospheric monitoring reveals hazardous condition or results are uncertain, contact the CSPT for assistance prior to entry. **(T-1)**

23.9. MAJCOM/FLDCOM Mandatory Aircraft Confined Spaces. Refer to AFSEC SharePoint® (**https://usaf.dps.mil/teams/AFSEC-SEG/pages/seghomev2.aspx**) for the most current listing.

23.10. Training.

23.10.1. General Information. Each organization shall develop a structured and effective training program, to include a hands-on portion that establishes safe work practices and techniques. (T-1) A computer-based training (CBT), titled Confined Space Series General Worker: Entrant, Attendant and Supervisor Course, the OSHA Course 2264, Permit-Required Confined Space Entry, or other MAJCOM-approved CBTs are available for personnel who have not attended a formal training course. Each MAJCOM may develop and present training using methods (PowerPoint presentations, training plans, etc.) other than CBT, if approved by the installation occupational safety office and BE. This will allow for type specific training for each weapons system. Personnel assigned duties as entry supervisors, attendants and entrants will complete general permit-required confined space program hands-on training in addition to AFCEC's CBT, 367 TRSS's "The Griffin" Confined Space CBT (Course code: A1AKU00TVT0002), or OSHA Course 2264, Permit-Required Confined Space Entry.

23.10.1.1. Commanders and functional managers only need to take the CBT on Advanced Distributed Learning Service for awareness understanding, unless acting as the commander's designated representative.

23.10.1.2. The Occupational Safety, BE and F&ES Flight representatives will receive additional on-the-job training through each career field's applicable training program. **(T-1)**

23.10.1.2.1. On-the-job training should be with an experienced member (Civilian GS-09 or Military 7-Level) and include time observing confined space entries.

23.10.1.2.2. Any additional training required by the MAJCOM/FLDCOM/DRU/FOA safety office, OSM, installation F&ES Flight and BE.

23.10.2. Commander's designated representative(s) and/or supervisor will be trained with initial, train-the-trainer and unit specific training. **(T-1)** They shall ensure training is provided to those with active roles in the confined space program on initial training and unit-specific procedures. **(T-0)** Training will ensure that personnel receive classroom and hands-on training to develop proficiency in their expected duties. **(T-0)**

23.10.2.1. Personnel required to test the atmospheric conditions in a confined space shall be trained using manufacturer's instructions or other information to develop effective training. **(T-0)** Supervisors shall contact the BE representative for assistance in developing training. **(T-1)** If unable to support this requirement, the BE representative will assist in identifying a training resource. **(T-1)**

23.10.2.2. Training will ensure that the individual, with atmospheric testing duties, are proficient in the use, calibration (user level and manufacturer requirements) and care of atmospheric testing and monitoring equipment. **(T-0)** This includes testing and calibration

of direct reading portable gas monitors. In addition, if entry is required to conduct tests the tester shall also meet the training requirements of an entrant. **(T-0)**

23.10.2.2.1. Annual training on the use, calibration and care of atmosphere testing and monitoring equipment will be conducted to maintain proficiency. **(T-1)**

23.10.2.2.2. Supervisors will maintain a list of personnel trained and knowledgeable to conduct atmospheric testing and monitoring of confined spaces for their shop by name, name of trainer and date completed training; and provide a copy to the commander's designated representative. **(T-1)**

23.10.3. Supervisors shall develop rescue training that covers rescue methods that the organization will use, e.g., self-rescue, non-entry rescue, entry rescue. **(T-0)** Contact the F&ES Flight representative(s) for assistance in developing the training. **(T-1)** The F&ES Flight representative(s) will validate that all organizationally-developed rescue training, equipment and procedures meet requirements. **(T-1)**

23.10.4. Train-the-Trainer. The CSPT will develop a train-the-trainer program to provide entry supervisors with the initial program knowledge needed to effectively manage their program. **(T-1)**

23.10.4.1. This training will not replace the organization specific training required to be developed specifically to address the procedures required to enter organizational permit-required confined spaces, but will supplement initial training. Students in this training shall be required to experience entry into simulated or actual confined spaces that represent common hazards and procedures found on the installation. Training objectives must focus on providing a clear understanding of how a confined space program shall be developed and implemented. **(T-1)**

23.10.4.2. A formal risk assessment will be conducted as part of lesson planning to ensure student safety. **(T-1) Note:** Simulated means using a trainer that can best simulate the configuration of the represented confined space.

23.10.4.3. The MAJCOM/SEG or FLDCOM/SEG will approve the train-the-trainer course materials and provide MAJCOM/FLDCOM specific requirements. **(T-1)**

23.10.5. Documentation of training will have name of student, name of trainer and dates of training.

23.11. Instructions for Completing the AF Form 1024, *Confined Spaces Entry Permit.* The following guidance shall be used to complete the AF Form 1024, or equivalent DoD or commercial form:

23.11.1. Section 1 – Master Entry Plan. Mark the appropriate block indicating whether or not the entry permit was issued under a Confined Space Program Team-approved Master Entry Plan. **(T-1)** If not, SEG, BE and F&ES Flight will be coordinated with using Section 9 prior to entering a confined space.

23.11.2. Section 2 – General Information. Enter the location (Global Positioning Satellite coordinates, if known) of the confined space and indicate if the space is located on or off the installation. **(T-0)** Include a description of the space to be entered, along with the purpose for entry. **(T-0)** Identify any TO or OI that covers the entry. **(T-1)** Enter the date and duration (time used and time expires) of the permit. **(T-0)**

23.11.3. Section 3 – Hazards. Specify all probable hazards associated with the entry, e.g., oxygen enrichment, engulfment, mechanical. **(T-0)**

23.11.4. Section 4 – Hazard Controls. Specify exact items required, to include manufacturer and part number, and add any equipment not listed in the form. **(T-0)**

23.11.5. Section 5 – Preparation for Entry. Identify required preparations prior to entering the space. **(T-0)** Refer to Master Entry Plan, governing TO or OI, as appropriate.

23.11.6. Section 6 – Atmospheric Testing and Monitoring Record. Enter the make, model and serial number for all testing equipment along with its calibration and bump test date. **(T-0)** Indicate if continuous monitoring is required; if yes, document the frequency. **(T-0)** Consider the potential for stratified atmospheres that would facilitate additional testing/monitoring. Indicate if there is additional testing/monitoring or entrant paperwork; if yes, ensure it is attached. **(T-0)**

23.11.7. Section 7 – Authorized Personnel. List the names of all entry supervisors, atmospheric monitors, attendants and entrants for entry. **(T-0)** Enter the name of each entrant and the time of each individual's entry and exit in the Entry Time Log. **(T-0)** If the entry supervisor(s) will enter the permit-required space, list them as entrants. **(T-0)** Attach an additional separate sheet if needed to list additional entrants. **Note:** Attendants and entrants are not required to sign or initial next to their names.

23.11.8. Section 8 – Fire Emergency Services (FES) Flight or equivalent. Identify and notify emergency response personnel. **(T-0)** Include POC name, contact information (phone number, radio call sign, etc.) and indicate the date/time when availability of emergency response personnel was confirmed. **(T-0)**

23.11.9. Section 9 – Coordination. SEG, BE and F&ES Flight will be coordinated with prior to entry. **(T-1) Note:** Coordination is not required if entry is covered by a Confined Space Program Team-approved Master Entry Plan.

23.11.10. Section 10 – Entry Time Log. Enter the name of each entrant and the time of each individual's entry and exit. **(T-0)**

23.11.11. Section 11 – Close-out/Cancellation. The entry supervisor will sign each entry permit to validate the form. **(T-0)** (For Construction Only—Personnel responsible for the confined space will brief the owner that all occupants for the space have exited and the permit has been closed). **(T-0)**

23.12. Contractor Requirements.

23.12.1. Contractors performing confined space work for the DAF will comply with DoDI 6055.01 and AFI 91-202. **(T-0)** Required communication of confined spaces will be conducted to comply with 29 CFR § 1926.1203(h). **(T-0)** The details of responsibilities for the contractor and the DAF will be specified in contracts. **(T-0)** BE shall not test or monitor a confined space for a contracted confined space operation. **(T-0)** Rescue services for contractors will not be provided by the installation F&ES Flight without specific written approval by the installation fire chief. **(T-1)**

23.12.2. Where the F&ES Flight has a primary and secondary rescue team, the F&ES Flight representative will verify the currency of the rescue team members. **(T-1)**

23.12.3. BE representative will assist entry supervisor in the interpretation of air monitoring results when requested. **(T-1)**

23.12.4. BE representative serves as the OPR for the installation respiratory program in accordance with AFI 48-137, and is the sole authority for selecting appropriate respiratory equipment and enrolling all personnel required to wear any type of respirator, to include rescue teams, who may enter confined spaces into the installation respiratory protection program. **(T-1)**

23.12.5. BE will provide appropriate atmospheric testing and monitoring in isolated cases where trained unit personnel and/or equipment are not available. **(T-1)**

23.12.6. BE will provide appropriate atmospheric testing and monitoring for Immediately Dangerous to Life and Health (IDLH) conditions during permit-required confined space operations. **(T-1)**

23.12.7. BE will evaluate potential worker exposure related to confined spaces in accordance with AFI 48-145. **(T-1)**

Chapter 24

AIRCRAFT FLIGHTLINE – GROUND OPERATIONS AND ACTIVITIES

24.1. Scope. This chapter addresses hazards and safe operating procedures on the flightline, to include activities in maintenance hangars and ground operations conducted on the flightline ramp. Refer to AFI 91-202 for additional guidance on job hazard analysis (JHA). **Note:** A JHA is not required when existing guidance adequately covers all safety requirements of an operation or process.

24.2. Specific Requirements.

24.2.1. Guidance. Supervisors and managers shall follow guidance addressed within as well as guidance in AFI 91-202, aircraft-specific procedural TOs and other TOs and safety standards and local written operating instructions (OIs) applicable to their areas of responsibility. **(T-1)**

24.2.2. Fire Prevention. Aircraft servicing and maintenance facilities shall conform to DAF design criteria or equivalent DAF-approved engineering guidance to minimize fire and explosion hazards. **(T-1)** Contractor aircraft maintenance facilities shall conform to this publication and National Fire Codes. **(T-0)** Refer to **Chapter 6** for additional guidance on fire prevention guidance.

24.2.3. Cardiopulmonary Resuscitation (CPR)/Self-Aid Buddy Care (SABC). Aircraft maintenance and support shop employees exposed to electrical hazards from energized aircraft electrical systems, aircraft components or aircraft equipment shall be provided CPR and SABC training. **(T-1)** This includes personnel who act as safety observers. Installation unit maintenance commanders and supervisors may identify other job tasks that require CPR/SABC training based on hazards associated with tasks performed. Unit CPR instructors shall meet training requirements described in **paragraph 1.9** All personnel requiring CPR/SABC training shall remain current. **(T-0)**

24.2.4. Lifting Devices. Engines and other heavy parts shall be handled with hoists, approved hoisting slings and similar equipment. **(T-1)** Safe load capacities shall be stenciled on all hoists and strictly observed by operating personnel. **(T-0)** Personnel shall not work under suspended loads. **(T-0)** Inspect hoisting equipment in accordance with **Chapter 12**, technical orders (TOs), and/or the manufacturer‘s instructions. Defective hoists shall be locked and/or tagged out of service and shall remain out of service until repairs are complete in accordance with **Chapter 21. (T-0)** Weight testing of all lifting devices shall be in accordance with **Chapter 12** and/or applicable TOs. **(T-1)**

24.2.5. Compressed Air.

24.2.5.1. Compressed air shall not be used for cleaning purposes in accordance with 29 CFR § 1910.242(b), *Hand and Portable Powered Tools and Other Hand-Held Equipment.* **(T-0)** OSHA prohibits the use of compressed air for cleaning when cadmium, lead, chromium dusts or any other regulated air contaminant may be present. **(T-0)** Refer to **paragraph 25.3.1** for additional guidance.

24.2.5.2. Before servicing or checking pressure for any aircraft systems or components, e.g., aircraft tires, air bottles or landing gear struts, mechanics shall:

24.2.5.2.1. Inspect all chucks and valve stems for serviceability to ensure safe servicing. **(T-1)**

24.2.5.2.2. Not over-inflate these components. **(T-1)**

24.2.5.2.3. Install pressure regulators to prevent over-pressurization of components. **(T-1)**

24.2.5.2.4. Wear proper PPE and eye protection in accordance with TO and local installation directives. **(T-0)**

24.2.5.2.5. Ensure appropriate equipment has been calibrated, as required. **(T-1)**

24.2.5.3. Air Lines and Fittings. Employees shall:

24.2.5.3.1. Avoid bending or kinking air hose lines. **(T-1)**

24.2.5.3.2. Place air hose lines where they minimize a tripping hazard and are protected against damage caused by equipment or vehicles rolling over them. **(T-0)**

24.2.5.3.3. Inspect air lines and fittings for defects before each use. **(T-1)**

24.2.5.3.4. Ensure non-interchangeable chucks and connections are used on high- and low- pressure equipment to preclude servicing low-pressure systems with high-pressure equipment. **(T-1)**

24.2.5.4. A drain pipe and valve shall be installed at the lowest point of the air receiver to remove accumulated oil and water. **(T-1)** The air receiver drain valve, if not automatic, shall be opened and receiver completely drained daily to prevent accumulation of excess fluids. **(T-1)** Refer to **paragraph 2.4.8.8** for additional guidance.

24.2.6. Oxygen and Nitrogen (Liquid and Gaseous). Refer to **Chapter 26** for additional guidance.

24.2.6.1. Personnel Training and Safety. Only fully trained and qualified personnel shall operate oxygen and nitrogen equipment or service aircraft systems. **(T-0)** A trainee may service only if directly supervised by a qualified supervisor or operator. **(T-1)** Personnel engaged in oxygen handling and servicing operations shall strictly adhere to pertinent safety standards and TOs. **(T-0)**

24.2.6.2. Mobile Servicing Units or Bottles. Mobile servicing units or bottles used to service aircraft or components shall be carefully positioned and not left unattended after hook-up or during servicing operations. **(T-1)**

24.2.6.3. Aircraft oxygen systems (both gaseous and liquid) shall be emptied/drained prior to entering a major maintenance cycle at either an Air Logistics Center, Contract Repair Facility or Contract/Depot Field team location. **(T-1)** Safeguards shall be taken while performing aircraft servicing or maintenance operations to prevent inherently or accidentally introducing ignition or combustible sources. **(T-1)** Refer to TO 00-25-172 for additional guidance.

24.2.7. Aircraft arresting systems may pose hazards to aircraft and vehicle operations.

24.2.8. Confined Spaces. Supervisors shall ensure employees comply with requirements in **Chapter 23,** when entering confined spaces. Personnel will not enter confined spaces without training. **(T-0)**

24.2.9. Red Ball. Maintenance personnel shall not deviate from authorized maintenance procedures or violate any flightline requirements, e.g., flightline speed limits or safety requirements, during Red Ball events. **(T-1)**

24.2.9.1. TOs, tools, rags, parts, unused supplies and checklists shall be accounted for before the aircraft is allowed to taxi/takeoff. **(T-1)**

24.2.9.2. Emphasis will be placed on foreign object damage (FOD) awareness/prevention during this critical maintenance operation. **(T-1)**

24.2.9.3. If aircraft engines are operating, a safety observer (maintenance or aircrew member) shall maintain interphone communications or remain in full view of the flight crew and be positioned to maintain overall surveillance of the aircraft and personnel performing maintenance. **(T-1)**

24.2.9.4. Weapons loaded aircraft shall be safed in accordance with applicable Mission Design Series (MDS) and/or weapons specific technical data. **(T-1)**

24.3. Flightline Potentially Hazardous Areas and Operations.

24.3.1. Flammable Fuel Vapor Areas. Supervisors shall ensure all personnel are aware of potentially flammable fuel vapor areas and the restriction against ignition sources in these areas. **(T-0)**

24.3.1.1. Fuel vapors are heavier than air, settle to ground level and will enter below-ground areas. These areas include, but are not limited to, fuel pits below ground level, areas within 10 feet of aircraft fuel vent systems and fuel spills, hydrant pump houses and fuels laboratories.

24.3.1.2. Spark arresters are not required on general or special purpose vehicles driving on the flightline and around aircraft. However, these vehicles are not designed, certified or authorized to operate in flammable fuel vapor areas. Employees in flammable fuel vapor areas shall receive specialized training emphasizing hazards associated with these operations. **(T-0)** Refer to DESR 6055.09_AFMAN 91-201 for requirements for spark arresters on general or special purpose vehicles within or near structures containing exposed explosives.

24.3.1.3. Not rated/approved equipment shall be turned off or removed from the area during refueling operations and fuel cell/tank work, unless permitted by TO 1-1-3. **(T-1)** Only explosion-proof, intrinsically safe radios/equipment or equipment incapable of having sufficient energy to be an ignition source (approved by competent authority, e.g., HQ AFSEC, FLDCOM, HQ AFMC, AFCEC, shall be used in and around flammable fuel vapor areas. **(T-0)** Refer to NFPA 70, Article 501, Class I Locations, for additional information.

24.3.2. Electrical Receptacles. Exterior electrical receptacles on the flightline are protected from weather conditions, but are not authorized for use in hazardous areas as defined in NFPA 70. If separation is not possible, receptacles in the immediate area of the fueling or defueling

operations shall be de-energized using administrative devices in accordance with **Chapter 17, (T-1)**

24.3.3. Aircraft Maintenance Operations. MAJCOMs/FLDCOMs/units operating in overseas or remote areas may supplement this publication to meet international or host country safety requirements or unique working conditions.

24.3.3.1. Electrical Devices and Power Equipment. Portable electrical equipment in Class I, Division 1 and Class I, Division 2 locations shall be explosion-proof or intrinsically safe and shall comply with NFPA 70 or shall be approved by competent authority, e.g., HQ AFSEC, HQ AFMC, AFCEC/COS, to show that the equipment is incapable of having sufficient energy to be an ignition source. **(T-0)** Items listed in TO 00-25-172 can be used in Class 1, Division 2 locations. Equipment not meeting this requirement may be temporarily approved by the installation fire chief prior to the use of the equipment. Approval shall be documented in writing, stating the area, nature, duration and the reason for the exception. **(T-1)** If the working environment has been tested and contains flammable fuel vapors, all maintenance activities shall be stopped until the hazardous condition is eliminated and a safe work environment restored. **(T-0)** Equipment in an area with a high potential for flammable fuel vapor release and that can be automatically energized when unattended shall be considered for explosion- proof or intrinsically-safe design. **(T-0)**

24.3.3.2. Tobacco. In accordance with AFI 48-104, *Tobacco Free Living*, tobacco use is prohibited in aircraft maintenance facilities, flightline areas, and weapons storage and maintenance areas, unless designated by the installation F&ES Flight, in coordination with the Maintenance Group commander or equivalent, Airfield Manager and/or the functional manager.

24.3.3.3. Aircraft Fuels Management and Servicing. Fuel system maintenance and servicing operations shall be in accordance with **Chapter 18,** TO 00-25-172 and other applicable TOs. **(T-1).** Aircraft fuel cell and integral tank inspections and repairs shall be in accordance with TO 1-1-3. **(T-1)**

24.3.3.4. Welding on Aircraft. Welding on aircraft shall be done outside of hangars, whenever possible. **(T-1)** An AF Form 592, *Hot Work Permit*, shall be issued prior to aircraft welding operations. **(T-1)** Welding shall only be performed on aircraft system components in accordance with applicable aircraft technical data and **Chapter 20. (T-1)** Welding operations in hangars shall meet the requirements of NFPA 410, *Standard on Aircraft Hangars*, Chapter 6. **(T-1)** Refer to American Conference of Governmental Industrial Hygienists' *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance,* for industrial ventilation requirements during welding on aircraft.

24.3.3.5. Fire Extinguishers. Suitable fire extinguishers shall be placed throughout flightline and maintenance areas, within easy reach of the operator and close to ground power equipment. **(T-1)** Refer to TO 00-25-172, Table 3-1, for flightline operations fire extinguisher requirements and **Chapter 6** for additional information.

24.3.3.6. Nondestructive Inspection (NDI). NDI operations involving ionizing radiation (normally X-ray operations) shall be conducted in accordance with TO 33B-1-1. **(T-1)** The

installation Radiation Safety Officer shall approve flightline X-ray procedures and locations. **(T-1)**

24.3.4. Hazardous Noise. Personnel assigned to the flightline may be exposed to hazardous noise levels. Refer to AFI 48-127 for guidance.

24.4. Additional PPE Requirements. The information below is specific to flightline operations and activities and is in addition to the PPE requirements of **Chapter 14.** Maintenance employees shall wear heat-resistant gloves to prevent burns when working around hot exhaust or tail pipes. **(T-1)**

24.4.1. Head Apparel. Head apparel without chinstraps will not be worn in an engine intake danger zone, as defined by the specific aircraft TO, while engines are operating. For further details see AFI 21- 101.

24.4.1.1. Bump Caps. If bump caps are the chosen PPE for use after conducting a hazard assessment in accordance with paragraphs **14.3.1** and **14.3.2,** follow the guidance in **paragraph 14.3.3**.

24.4.1.2. Metal, plastic or leather hair fasteners and wigs shall not be worn during aircraft maintenance. Hair ties (with no metal parts) that secure the hair at the back of the head may be worn. Refer to **paragraph 14.3.5.1** for additional guidance. Umbrellas are not permitted on the operational flightline except when assisting passengers on or off aircraft during inclement weather. Criteria in **Chapter 14** shall be used when aircraft or equipment TOs do not provide specific PPE guidance. **(T-1).** When in doubt, consult the installation occupational safety office and BE. **Note:** Helmets to protect employees from impact and flying objects must meet requirements in **Chapter 14**. **(T-1)**

24.4.2. Footwear. Protective footwear shall be provided and worn when there is a reasonable possibility of foot injuries. **(T-0).** Removable shoe cleats may be worn on the flightline under the following conditions: In areas where severe snow/ice conditions are common, organizations may permit use of removable shoe cleats to improve traction on ice/snow covered surfaces and prevent employee slips and falls. Organizations will obtain coordinated approval from their installation management, to include the F&ES Flight and Occupational Safety office. **(T-1)** Organizations should consider using non-metallic cleats to reduce the potential for spark- initiated fire. Organizations shall define the type(s) of footwear to be worn, the conditions and locations where such footwear may be worn, and procedures/controls to prevent cleats/spikes/studs becoming a FOD hazard. **(T-1)** Cleats will not be worn while working on or inside aircraft. Metal cleats will not be worn within 50 feet of fueling, defueling or fuel cell repair operations, or operations that involve flammable solvents, paints, etc.

24.4.3. Jet Intakes. Mechanics entering jet intake sections shall wear appropriate PPE. **(T-0)** A pocket-less, zipper-less, button-less bunny-suit labeled, “Intakes Only,” and cloth over-booties or stocking feet (Boots may be worn if not restricted for use by TO/MAJCOM/FLDCOM and are authorized by MXG). Boots, if worn, must be inspected and FOD removed from boots prior to installing cloth over-booties. **(T-2)** To minimize heat stress during high heat/humidity conditions, e.g., air temperatures above 85° F, employees in engine intakes may wear half-bunny suits and garments designed for use over trousers. When worn with a pocket-less T-shirt, these items provide the same level of FOD protection as a full bunny suit. Units using half-bunny suits shall have procedures in place to control use. **(T-1)**

24.4.4. LOX/LN_2 Transfers. When transferring LOX/LN_2, personnel shall wear PPE (all items shall be clean and free of grease, oil and fuel) as identified in the task-specific JHA, OI and/or job safety training outline (JSTO). Protective footwear, which fit closely around the top, with rubber soles and heels. **(T-0) Note:** A leather boot approximately eight (8) inches in height with close fitting top and rubber soles and heel is recommended, since LOX spills normally subject one's foot area to a freeze burn exposure hazard. This type footwear when equipped with a hard protective toe area is a generally classified as a safety shoe or boot.

24.4.5. Face Shield. Face shields are secondary eye protection and must be worn in conjunction with primary eye protection. **(T-0)**

24.5. Aircraft Parking Requirements.

24.5.1. Specific parking locations shall be designated for each aircraft in accordance with DAFMAN 32-1084, *Standard Facility Requirements*. **(T-1)** Generally, distances between parked aircraft, wingtip to wingtip, shall allow immediate access of emergency vehicles and permit free movement of equipment and materials. **(T-1)** Refer to DAFMAN 32-1084 for specific aircraft wingtip distances. Refer to DESR 6055.09_AFMAN 91-201 and TO 11A-1-33, *Handling and Maintenance of Explosives Loaded Aircraft,* for parking explosives loaded aircraft.

24.5.2. Temporary Parking. A qualified ground observer shall be used to warn oncoming traffic when temporarily parked aircraft extend into an active taxiway. **(T-1)** A suitable flag will suffice in daytime; however, when dark, a high-visibility reflective equipment/gear and red warning light shall be used. **(T-1)** A ground observer shall remain with the aircraft until moved to a safe location. **(T-1).**

24.5.3. Wheel Chocking. Aircraft wheel chocks shall be placed fore and aft of the main landing gear or as specified in applicable aircraft TOs. **(T-1)**

24.5.4. Clean Parking Areas. Maintenance equipment, workstands, loose aircraft parts and materials not actually required for work in progress or planned, shall be moved from the aircraft parking area to designated storage locations. **(T-1)** Equipment stored outside buildings shall be tied down and/or chocked or brakes applied to prevent movement by wind or engine blast. **(T-**

1) Mobile work platforms and stands shall be moored/tied down when in designated storage locations to prevent collision with aircraft, vehicles or other equipment. **(T-1)** Designated flightline support equipment storage areas shall be determined by the Aerospace Ground Equipment (AGE) flight commander and airfield manager and approved by the Maintenance Group Commander or equivalent in coordination with the installation occupational safety office. **(T-1)**

24.5.5. Taxi/Tow Lines. Refer to AFMAN 11-218, *Aircraft Operations and Movement on the Ground,* for guidance.

24.5.6. Mooring or Tie-Down of Aircraft. Follow applicable aircraft TOs and use designated fittings on aircraft. **(T-1)** Square or bowline knots shall be used to provide secure rope fastenings. **(T-1)** Allow sufficient slack to prevent excessive stress on wings, fittings and rope from tire or strut expansion or deflation and contraction of tie-down ropes when wet. **(T-1)**

Aircraft mooring points shall be placed directly over ground mooring points, or as close as possible. **(T-1)**

24.5.7. Aircraft Emergency Removal. Emergency procedures shall be developed to remove endangered aircraft in the event of fire, adverse weather or other emergency situations on the flightline or in hangars. **(T-1)** Refer to **paragraph 24.14.10**.

24.5.8. C-130 Aircraft. Personnel will not enter the plane of rotation of the propellers except by walking around the outside (number 1 or number 4) propeller arcs. **Exception**: If bleed air is not supplied to the aircraft, personnel may enter the plane of rotation for preflight inspections and maintenance actions.

24.6. Adverse Weather Conditions.

24.6.1. Specific weather thresholds and notification procedures will be documented in the installation weather support document. **(T-1)** Aircraft shall be moved/evacuated to safe weather areas when tornadoes, hurricanes or winds of 50 knots or greater are forecast. **(T-1)** Local damaging wind and severe weather safety plans shall be developed to include an evacuation plan and hangaring of installation and transient aircraft. **(T-1)** The option to evacuate is the installation commander‘s decision in coordination with the appropriate MAJCOM/FLDCOM. Refer to **Chapter 3** for additional guidance on weather safety.

24.6.2. Safeguarding Aircraft.

24.6.2.1. Taxiing Aircraft. Avoid taxiing aircraft during strong or damaging wind conditions defined by local weather support document. Taxi only at the discretion of the wing/delta commander when the action will lessen the possibility of aircraft damage.

24.6.2.2. Outside Parking. If possible, park aircraft inside hangars during periods of strong or damaging winds. Light aircraft shall be given priority over heavy aircraft for parking inside hangars. **(T-1)** Aircraft parked outside shall be faced into the wind and tied down. **(T-1)** Wing spoilers shall be used when necessary to reduce airfoil lift. **(T-1)** Transient aircraft shall be parked inside hangars, if space permits, or tied down as directed by the Maintenance Group Commander or equivalent. **(T-1)**

24.6.2.3. When to Tow Aircraft. Light aircraft in docks or extending outside hangars shall be towed clear and parked in accordance with applicable aircraft TOs when winds exceed 30 knots (sustained or gusts). **(T-1)** Medium or heavy aircraft in docks or extending outside hangars shall be towed clear and parked in accordance with applicable aircraft TOs when winds meet or exceed 50 knots (sustained or gusts). **(T-1)** Refer to **Table 24.1** for additional information.

24.6.2.4. Working Materials. All maintenance equipment, workstands, loose aircraft parts, flightline fire extinguishers and materials not in use shall be removed from aircraft parking areas and stored in a safe area. **(T-1)** Equipment remaining outside shall be secured against wind movement. **(T-1)**

24.6.2.5. Personnel. Activities other than those required to safeguard aircraft shall be suspended and avoided when winds reach velocities of 40 knots or greater. **(T-1)**

24.6.3. High Profile Vehicles (Example: C-5 Wide-body Staircases, Raised K-Loader, etc.). Caution is required when using high profile vehicles during high wind conditions. Refer to the vehicle technical order and lesson plan for specifics regarding specific vehicle types.

Table 24.1. Adverse Weather High Wind Safeguards.

	Winds 20-30 Knots	**Winds 31-50 Knots**	**Winds Over 50 Knots**
Required Actions Personnel will adhere to locally established high wind safety precautions, plans, and checklists developed by each functional area and observed along with the guidance presented. Criteria for advisories varies from state to state; local procedures shall consider these factors.	Ensure all aircraft precautionary actions are taken in accordance with applicable TOs, Directives and Publications.	In addition to high wind precautions secure all materials and maintenance equipment.	In addition to high wind precautions, have all nonessential personnel move to shelter or remain in their duty section. **WARNING**: Do not open canopy hatch or any access door or remove any covers when winds are in excess of 50 knots.
	Ensure all non-essential AGE and other loose equipment is removed from the flightline and secured (except fire extinguishers)	Hangar all aircraft with less than 15,000 pounds gross weight (e.g., engines removed, no fuel)	ALL AGE must be removed from flightline. Maximum number of aircraft shall be hangared.
	If aircraft is not being worked, ensure all RADOMES, canopies and access panels/doors are closed and secured.	Hangar all aircraft with canopies and/or RADOMES removed.	All non-essential personnel shall seek shelter or remain inside their duty sections.
	Ensure all protective covers are installed on aircraft.	Aircraft should be triple chocked and laced.	For winds in excess of 70 knots, moor aircraft in accordance with applicable TOs; clear ramp.
		Secure all equipment.	Consider evacuation of aircraft.
Note: This table shall be used as a guide in tying down, hangaring or evacuating aircraft. **Note:** Installation commander is the governing authority on the evacuation of installation aircraft.			

24.7. Towing and Taxiing Aircraft.

24.7.1. Towing Operations. Refer to AFI 21-101, AFMAN 11-218 and specific aircraft TO for vehicle operator's aircraft towing and taxiing. When connecting a tow bar to the tow vehicle, employees shall stand clear until the backing tow vehicle is in close proximity to the tow bar. **(T-1)** When connecting a tow vehicle to the aircraft, employees shall watch for any sudden tow vehicle movement. **(T-1)** Avoid backing aircraft when possible. MAJCOMs/FLDCOMs may authorize movement of aircraft into hardened aircraft shelters while the aircraft engines are operating, provided a System Safety Engineering Analysis has been conducted. A System Safety Engineering Analysis shall be conducted for each type or

generation shelter and type of aircraft to be moved into the shelter. **(T-1) Note:** Technical data takes precedence over this publication when differences exist in towing procedures.

24.7.2. Qualified Personnel. Newly assigned aircraft maintenance personnel shall pass a proficiency test on the types of aircraft towed after completing supervised on-the-job training (OJT). **(T-1)** Wing and tail walkers shall be familiar with all published towing procedures for the aircraft being towed but do not require annual proficiency training if their duties are restricted to these positions during towing operations. **(T-1)** Tow team supervisors shall clearly define duties and responsibilities at the time of the pre-tow briefing. **(T-1)**

24.7.3. Workers Riding or Walking. Personnel shall not cross a tow bar when connected to the aircraft and the tow vehicle, nor ride on the outside of a moving aircraft, tow bar or on the outside of tow vehicles unless an authorized seat is provided. **(T-1)** No one will try to board or leave a moving aircraft or tow vehicle. **(T-1)** The tow supervisor shall brief this information prior to towing. **(T-1)**

24.7.4. Night Crew Signals. Refer to AFMAN 11-218 for night crew signaling practices. **Note:** Many units have established local policy on night crew signaling procedures. Local policy shall be written in accordance with the tenets of AFMAN 11-218. **(T-1)**

24.7.5. Control Tower Clearance. The tow team supervisor shall obtain control tower clearance before towing aircraft on or across a taxiway or runway, maintain radio contact with tower and inform the tower when tow is complete. **(T-1)** The primary means of communication shall be the aircraft radio, but, if not feasible, a radio-equipped escort vehicle, in direct radio contact with the control tower, shall accompany the aircraft throughout the towing operation. **(T-1)**

24.7.6. Chocks. Chocks shall be maintained near the tow vehicle or aircraft for emergency use throughout the towing operation and shall be properly placed before the tow vehicle is unhooked. **(T-1)** Chocks or other support equipment shall not be placed on or hung from any part of the aircraft exterior during towing or repositioning operations. **(T-1)** Conduct a risk management assessment of proposed tow operation based on current runway and taxiway condition readings from local Airfield Management.

24.7.7. Tow Bars.

24.7.7.1. Only authorized equipment in good condition shall be used in towing operations. **(T-1)** Before moving any aircraft, the tow vehicle, tow bars and connections, and other associated equipment shall be inspected for defects by the tow team supervisor. **(T-1)**

24.7.7.2. Tow Bar Failure. In the event of a tow bar failure, separation between the towing vehicle and aircraft must be maintained. **(T-1)** Many tow bars incorporate a load limiting device (shear joints, axial load limiters, etc.) by design with the purpose of preventing secondary damage to the aircraft in the event of a mechanical overload that could occur with sudden braking or deceleration, acceleration, excessive steering force, exceeding turn limits, etc. The tow team supervisor shall brief tow bar failure contingencies to the entire tow team prior to commencing towing operations. **(T-1)**

24.7.8. Towing Vehicle Inspections. Tow vehicle operators shall inspect all towing equipment to ensure it is serviceable and functioning properly before starting any tow operation. **(T-1)** Inspection shall be documented on AF Form 1800, *Operator's Inspection Guide and Trouble*

Report. The tow team supervisor is responsible for the entire towing operation and shall ensure the tow vehicle is free of defects or extraneous material that may interfere with safe operation before the tow bar is hooked to the aircraft. **(T-1)** Tow vehicles with safety defects shall be removed from service until repaired. **(T-1)**

24.7.9. Engine Operation. As a general rule, aircraft shall not be towed with engines operating. However, civilian contract air carrier jet engine transport aircraft may be towed or pushed short distances, e.g., pushing away from hangar or terminal gate, with engines operating in accordance with Federal Aviation Administration-approved procedures in operations and maintenance handbooks. Copies of these procedures shall be carried on the aircraft. **(T-1)** Air Force aircraft may only be pushed back with engines running during non-routine or abnormal operational requirements using push-back procedures supported by engineering analysis and the aircraft Dash 1 TO.

24.7.10. Taxiing Operations. Refer to AFMAN 11-218 for additional guidance. A marshaler shall be used. **(T-1)** Personnel shall remain clear of taxiing aircraft until the aircraft has come to a complete stop. **(T-1)** Aircraft shall not be taxied without clearance. Radio contact shall be maintained with the control tower throughout taxi operations. **(T-1)** Taxi speeds in uncongested areas shall be reasonable, with aircraft and personnel safety the determining factors. **(T-1)** Follow guidance in Dash 1 handbooks for taxi operations under varying wind conditions. Personnel, vehicles and towed aircraft shall remain clear of taxiing traffic and will not pass within 200 feet behind aircraft with engines running. **(T-1) Note:** Exercise care not to blind ground crew members when taxiing with landing lights on. **Caution**: The wingtip path on swept-back wing aircraft extends beyond the straight line wingtip path during turns, based on the degree of turn and the degree of sweep on the wings. Equipment, vehicles and other aircraft may appear to be clear of the intended path while actually impeding it.

24.8. Aircraft Jacking Operations.

24.8.1. Jacks shall be:

24.8.1.1. Operated, maintained, inspected and tested in accordance with applicable TOs, handbooks or manufacturer's instructions. **(T-1)**

24.8.1.2. Inspected before use to verify lifting capacity, proper functioning of safety locks, conditions of pins and general serviceability. **(T-1)**

24.8.1.3. Inspected with documentation maintained by work section supervisor. **(T-1)**

24.8.1.4. Removed from service if integrity of the jack is questionable, and the supervisor will be notified. **(T-1)**

24.8.2. Workers shall follow specific aircraft TO jacking procedures. **(T-1)** Non-essential workstands and equipment shall be removed from under the aircraft before jacking. If the aircraft weight-and-balance condition has been affected by removing heavy items, weight shall be added to reestablish the proper center of gravity before jacking. **(T-1)** Workers shall not remain in aircraft being raised or lowered, unless directed by TO (e.g., to observe leveling instruments). TO prescribed jack pads, jack pad fittings and correct jack screw adapters and extensions shall be installed prior to jacking. **(T-1)** Chocks shall be removed and brakes released before the aircraft is raised or lowered. **(T-1)**

24.8.3. Safety/jack stands of suitable capacity or as specified by the manufacturer, shall be installed under aircraft wings and tail after the aircraft is jacked and leveled if equipment failure or an unbalanced condition could occur. **(T-1)**

24.8.4. Personnel shall not pass under, climb or walk on any portion of the aircraft when the entire aircraft is supported by jacks, except to support jacking activities or when operationally necessary to perform maintenance. The area around jacked aircraft shall be secured and warning signs posted. **(T-1)** Personnel not directly involved in jacking operations or performing maintenance on jacked aircraft shall remain outside the posted area. **(T-1)** Depot maintenance facilities may post signs at work area, hangar and flightline entrances in lieu of securing and signing individual aircraft.

24.8.5. Engines and other major components, such as wing panels and stabilizers, that affect aircraft center of gravity or are identified as stress areas, shall not be changed or removed on jacked aircraft with landing gear clear of the ramp or floor except in accordance with aircraft TOs.

24.8.6. Fire Fighting Equipment. Maintenance personnel will ensure suitable portable firefighting equipment is readily available and properly positioned. **(T-1)** After aircraft departure, fire extinguishers used to support that aircraft shall be removed from the ramp. **(T-1)** Refer to **Chapter 6** for additional guidance.

24.9. Aircraft Engine Operations.

24.9.1. Follow local OIs, aircraft TOs and procedures. Refer to AFMAN 11-218 for engine start, run-up and testing.

24.9.1.1. Personnel near an engine start or run-up shall wear, at a minimum, hearing protection as prescribed by BE. **(T-1)** Eye protection shall be required if conditions exist where flying debris is present, e.g., unimproved/austere runways or aircraft backing maneuvers. **(T-1)**

24.9.1.2. The fire hazard is high because fuel vapors may be ignited by exhaust flames. Rotating propellers are dangerous to personnel and can cause extensive equipment damage. Except for turboprop aircraft, personnel will not hand-pull the propeller of a recently operated engine. The ignition switch for reciprocating or electric start engines shall be in the OFF position when engines are not operating and the master battery switch shall be turned off when no longer required. **(T-1)** For C-130 aircraft, personnel will not enter the plane of rotation of the propellers except by walking around the outside (number 1 or number 4) propeller arcs. (**Exception**: If bleed air is not supplied to the aircraft, personnel may enter the plane of rotation for preflight inspections and maintenance actions.)

24.9.1.3. Personnel shall not stand in line with the stripe that designates the plane of propeller operation. Radio contact with the control tower shall be maintained during engine operation or taxiing or with job control during engine runs when the control tower is not operating. **(T-1)** Maintenance Operations Center (MOC) shall be prepared to request F&ES Flight or medical services assistance as needed. **(T-1)**

24.9.2. Aircraft Chocks. When aircraft engines are in operation, chocks shall be removed with the utmost caution after the proper signal has been given. **(T-1)** Employees will approach the

aircraft from the safest direction, considering location of propellers, jet intakes and exhausts. **(T-1)**

24.9.3. Fire Guard. A qualified fire guard (need not be a certified firefighter) shall be positioned by the fire bottle(s)as required by the aircraft TO prior to starting aircraft engines. **(T-1)** This individual shall remain stand by in readiness until all engines are operating and fire danger is past, e.g., crew chief or team leader can release fire guard once engines are started and no fire danger exists. **(T-1)** If no fire guard is required by aircraft TO:

24.9.3.1. Aircraft with internal firefighting capability shall have a ground observer in position on interphone to monitor and report any problems, e.g., fire, fuel leaks, aircraft movement, and shall remain in position until released by the individual operating the engine. **(T-1)**

24.9.3.2. Aircraft without interphone capability shall have a fire guard stationed to observe the engine start process. **(T-1)** After start, the fire guard will remain in clear view of cockpit personnel and observe aircraft and area during engine operation. **(T-1) Warning**: Use extreme caution to ensure all personnel remain clear of propeller arc and/or jet intakes/exhaust during ground operation. **Exception**: Aero Club or similar aircraft used by Civil Air Patrol (CAP-USAF) may be started/operated without a fire guard if fire extinguishers are readily accessible during engine starts, aircraft maintenance and refueling, and if it does not violate manufacturer's operating handbook procedures.

24.9.4. Rotary Wing Aircraft.

24.9.4.1. The collective pitch stick shall be locked in the full low position during engine run-up by ground workers. **(T-1)** Personnel and equipment shall be kept clear of rotary wing aircraft at least a distance equal to its length, to prevent injury and damage if a quick excessive throttle start swings the tail. **(T-1)**

24.9.4.2. Main rotor blades shall be tracked only with an experienced pilot at the controls. **(T-1)** Engine run-up shall not be attempted by fewer employees than specified in specific aircraft TOs. Personnel shall exercise caution when approaching the plane of rotation of main rotor blades because they droop at decreased speeds. **(T-1)**

24.9.4.3. All personnel shall remain in full view of the pilot or helicopter operator and keep a crouched position approaching or leaving a helicopter with rotating blades. **(T-1)** Personnel shall avoid the area from cockpit or cabin rearward unless authorized by helicopter operator to work in this location. **(T-1)** Keep unauthorized personnel at least 50 feet from helicopters with turning rotor blades.

24.9.4.4. Personnel shall use extreme caution to stay clear of main and stabilizing rotors when visibility is reduced by dust or other conditions. **(T-1)** Protective goggles shall be worn by all personnel and other precautions taken as needed to minimize problems from reduced visibility. **(T-0)**

24.9.4.5. Adequate precautions shall be taken to protect personnel from flying objects caused by rotor downwash. **(T-1)** All loose gear within 100 feet of the area susceptible to rotor downwash shall be secured or removed. **(T-1)**

24.10. Jet Aircraft Requirements.

24.10.1. General safety standards for conventional powered aircraft also apply to jet aircraft, and ground handling of jet aircraft involves hazards not common to conventional types. Engine inlet suction and exhaust blast pose hazards to maintenance, support and flight crew personnel.

24.10.2. Suction Effect. Jet engine suction can ingest personnel, causing loss of life. Additionally, ingestion of tools, personal articles or any form of FOD may cause extensive engine damage. Unless required by TO, crewmembers, maintainers and other personnel shall not approach closer than 5 feet from the side or rear or 25 feet from the front of engine intake ducts of running engines. Personnel may approach multi-engine aircraft, e.g., F-15, from the opposite direction of the running engine, but shall use extreme caution to prevent ingestion. **(T-1)** All objects shall be removed from in front of or within intake ducts prior to starting engines. **(T-1)** Visiting personnel or observers shall be briefed on removing hats and carrying objects near jet engines. **(T-1)**

24.10.3. Exhaust Blast. Jet engine exhaust blast is hazardous to personnel and property. Local procedures shall be established to prevent personnel, vehicles and aircraft passing behind engines operating above idle speed or through hazardous jet blast areas in accordance with applicable aircraft TOs. **(T-1)** A ground or flight crewmember shall be stationed alongside the operating engine to warn personnel and traffic to remain clear at least 25 feet in front and 200 feet to the rear of the aircraft, depending on the aircraft involved or as prescribed in accordance with applicable aircraft TOs and handbooks. **(T-1)** A blast fence shall be installed where needed to protect personnel and equipment from exhaust blast. **(T-1)** Tools, spare parts and other objects shall be removed from blast areas before any jet engine is started. **(T-1)**

24.10.4. Ejection Seats and Canopies. Accidental discharge of ejection seats, cockpit canopies and jettisonable hatches (e.g., A-10, B-2, and F-16) is hazardous to employees. Extreme heat or unintentional movement of actuating mechanisms can fire the ejection seat catapult or canopy remover. The following precautions will reduce accidental seat or canopy ejections for aircraft on the ground. **Note:** Anyone entering a cockpit or flight deck equipped with escape system components shall have aircraft cockpit and flight deck familiarization training prior to entry in accordance with AFI 21-101. **(T-1) Exception**: C-17 Aircraft, Flotation Equipment Deployment Systems – Electro-Environmental workers with task qualification training and annual explosive safety training for time change compliance related to Flotation Equipment Deployment Systems meets the intent of this paragraph, and paragraphs **24.10.4.1** and **24.10.4.2**.

24.10.4.1. Personnel will avoid accidental arming and firing when working near ejection seat catapults and ejection seat or canopy remover controls. **(T-1)** Care shall be exercised to avoid snagging arming and firing mechanisms when removing crewmembers from crashed aircraft. **(T-1)** Cook-off, inadvertent actuation or residual pressure stored in lines and tubes of explosive egress components may pose hazards during rescue attempts.

24.10.4.2. Salvage Operations. Explosive Ordnance Disposal personnel will ensure explosive devices are removed before any aircraft salvage operations begin. **(T-1)** Only qualified and certified egress personnel will remove escape and/or egress system explosive components. **(T-1)**

24.10.5. Sharp Edges. Some jet aircraft control surfaces have sharp edges. Personnel shall use caution when working on or near these edges. **(T-1)** During prolonged maintenance periods, sharp edges or corners of aircraft parts or equipment shall have suitable protective covers, where practical, or tape placed over them and red streamers attached to indicate the danger area. **(T-1)**

24.10.6. Entering Tail Pipe. In accordance with **Chapter 23,** based on the determination of the Confined Space Program Team, employees will evaluate the condition of tail pipes prior to entering, e.g., to inspect engine turbine wheel assembly. **(T-1)** This evaluation will include an atmospheric test prior to entry. **(T-1)** If the tail pipe was deemed to be a permit-required confined space, appropriate measures shall be taken before entry in accordance with **Chapter 23,** including use of a BE-approved respirator. **(T-1)** If the space was deemed non-permit required, the space shall be checked to ensure the space is safe to enter prior to any work being started in the tail pipe. **(T-1)**

24.10.7. Handling Hydrazine. Firefighting and transient maintenance personnel may be exposed to hydrazine. Employees shall be trained in accordance with **Chapter 14** of this manual, and AFI 90-821 and TO 00-25-172. **(T-0)** Training shall be documented in accordance with AFI 91-202. **(T-1)**

24.11. Aircraft Cleaning.

24.11.1. General Requirements. Aircraft shall be cleaned in accordance with MDS-specific TOs. **(T-1)** To prevent falls, employees shall not climb or walk on wet aircraft surfaces. **(T-1)** Separate elevated work platforms and long-handle brushes shall be used to the maximum extent possible. **(T-1)** If absolutely necessary to walk on aircraft TO-designated areas during washing, extreme care shall be exercised, and locally designed systems, such as sky-lines (horizontal life lines) and personal fall arrest systems, shall be used. **(T-1)** Refer to **paragraph 24.16** Workers will wear PPE identified by BE to include, but not limited to, chemical-splash goggles, when using brightening agents, caustics, acids, phenolic compounds or other chemicals. Only authorized cleaning agents shall be used. **(T-0)** Appropriate footwear shall be worn to prevent falls from wet surfaces. **(T-0)** Refer to **Chapter 14** for additional PPE guidance. Refer to AFI 90-821 for hazard communication requirements.

24.11.2. Aircraft Cleaning Operations.

24.11.2.1. Cleaning Parts. Parts shall be cleaned with approved high flashpoint or nonflammable solvents or compounds whenever possible. **(T-1)** Do not clean aircraft parts, hangar floors, equipment or clothing with gasoline or unauthorized solvents. Operations requiring low flashpoint solvents shall be considered hazardous and performed in a facility or area compatible with the solvents. **(T-1)**

24.11.2.2. Flammable liquids shall be kept in approved containers, marked to identify contents and stored in buildings/areas specifically approved by the installation F&ES Flight. **(T-1)** Refer to **Chapter 22** for additional guidance.

24.11.2.3. Wiping cloths, oily waste and other combustible materials shall be disposed of in accordance with **paragraph 24.11.2.2**. **(T-1)**

24.11.2.4. Proper ventilation shall be maintained and proper protective clothing used when working with solvents. **(T-1)** Refer to AFI 90-821when handling and using hazardous materials.

24.11.3. Fire Control. Use Class B extinguishers for flammable solvents. In no case shall water be used. Employees using flammable solvents shall be trained and proficient in extinguisher use. **(T-0)** Extinguishers shall be sized for possible fires. **(T-1)** A gallon of spilled solvent can cover 25 to 50 square feet, but a small extinguisher may only extinguish 2 square feet. The F&ES Flight shall be consulted to ensure extinguishers with proper capacity are obtained. **(T-1)** Employees shall remain vigilant after a fire is extinguished because flammable solvent may still be present beneath the extinguishing material. **(T-1)** If an ignition source is present, the vapors can re-ignite. Safety cans and solvent storage cabinets shall have flash arresters to prevent flame from entering the container. **(T-1)**

24.12. Aircraft Tire Mounting and Servicing Operations. Refer to TO 4T-1-3, *Inspection, Maintenance Instructions, Storage, and Disposition of Aircraft Tires and Inner Tubes,* and 29 CFR § 1910.177, *Servicing Multi-piece and Single Piece Rim Wheels*, for additional guidance on tire mounting and servicing operations.

24.12.1. Maintenance workers shall use tire dollies or mechanical devices when mounting, servicing or removing heavy aircraft tires. **(T-0)** Tire cages shall be used when inflating tires in the shop to prevent injury to employees. **(T-0)** Extreme caution shall be used to avoid over-inflating tires. **(T-1)** Only qualified precision measurement equipment laboratory (PMEL) personnel will adjust and/or calibrate tire inflation equipment. **(T-1)**

24.12.2. The supervisor shall ensure each employee demonstrates and maintains the ability to service aircraft wheels safely. **(T-0)** An employee is considered qualified and trained after completing the installation or unit's training program. The supervisor shall evaluate each employee's ability to perform tasks safely and provide additional training as necessary to ensure each employee maintains proficiency. **(T-0)**

24.13. Flightline Vehicle Operations.

24.13.1. General Requirements. Refer to AFMAN 24-306, AFI 13-213, *Airfield Driving*, and AFI 31-218, *Motor Vehicle Traffic Supervision*, for additional guidance and information on vehicles operated on the flightline, including motorcycles, mopeds, bicycles and tricycles.

24.13.2. Vehicle and Equipment Marking. Vehicles, ground servicing and ground powered equipment shall be marked with reflective materials to the maximum extent authorized by appropriate TOs, such as TO 36-1-191 and TO 35-1-3. **(T-1)** Fire extinguishers and all hazardous obstacles on or adjacent to the flightline shall be marked with reflective materials. **(T-1)**

24.13.3. Speed Limits. No vehicle (including motorcycles, mopeds, bicycle or tricycles) shall be operated at a speed in excess of that deemed reasonable and prudent for existing traffic, road and weather condition. **(T-2)**Emergency vehicles will not automatically assume the right of way. **(T-2)** Installation commanders and aircraft maintenance commanders are responsible for ensuring personnel authorized to drive on the flightline are informed of flightline speed limits. **Note:** Vehicles responding to Red Balls (emergency flightline scenarios), exercises and precautionary landings are not authorized to exceed posted flightline speed limits.

24.13.4. Entering or Leaving Flightline Driving Areas. All vehicles, to include wheeled AGE equipment being towed, except emergency and alert vehicles responding to an alert or emergency, shall stop prior to entering the flightline and accomplish an FOD check. **(T-1)** FOD check signs shall be positioned at every entrance to ramp areas and flightline. **(T-3)** Traffic lanes on aircraft parking ramps are normally to the right of the aircraft. Unless prevented by local procedures, traffic flow on aircraft parking ramps shall be parallel to the noses of parked aircraft with the driver‘s side toward the aircraft. **(T-1)** Vehicles shall not be driven diagonally across the parking ramp, but at 90-degree angles to the driving lanes. **(T-1)**

24.13.5. Vehicle Parking. Vehicles shall not be backed or parked within 25 feet of any aircraft, unless authorized for operations such as loading or unloading, servicing or towing. A spotter shall be posted when backing a vehicle towards an aircraft. **(T-1)** Prepositioned wheel chocks shall be used to prevent vehicles backing into aircraft. **(T-1)** Refer to **paragraph 30.3.3.2** for additional backing/spotter guidance.

24.13.5.1. Unattended vehicles shall be parked with the driver‘s side facing the aircraft and so it will not interfere with aircraft being towed or taxied. **(T-1)** Ignition shall be turned off; keys left in the ignition; and the gear lever put in reverse gear for manual transmissions, and in ‘park’ for automatic transmissions. **(T-1)** All vehicles parked and left unattended will have brakes set or chocks placed in front of and behind a rear wheel, or one chock placed between the tandem wheels of dual (tandem) axle vehicles. **(T-1)** Only alert and emergency vehicles responding to an alert or emergency are exempt from these requirements. In accordance with AFI 24-302, the installation/delta commander may authorize operators to leave vehicles idling subject to weather conditions. With approval from the MAJCOM/FLDCOM, the installation/delta commander may permit leaving the vehicle running while unattended. **Note:** AGE towing vehicles may be placed in “park” (neutral for manual transmissions) with parking brake set and engine left running during equipment hitching and unhitching operations, and during FOD checks. To conduct a rolling FOD check, the vehicle operator MUST enter vehicle and “close ALL doors” prior to placing the vehicle in drive to rotate tires the minimum distance necessary to finish the FOD check. **(T-1)** AGE towing vehicles must be turned off when the driver seat is vacated for any other purpose. **(T-1)**

24.13.5.2. Vehicles shall not be parked or driven less than 25 feet in front or 200 feet behind aircraft with running engines, unless prescribed in applicable aircraft handbooks. Vehicles parked next to aircraft shall be clear of wingtips and clearly visible to personnel in cockpit. **(T-1)**

24.13.6. Passengers in Vehicle. Passengers shall be limited to the designed seating capacity of the vehicle during routine operations. **(T-1)** This includes pickup trucks and cargo vans with passenger seats as well as sedans, station-wagons and buses. Passengers shall use available seat belts when the vehicle is in motion. **(T-1)** If deemed operationally necessary by the unit commander to ride in the bed of pickup trucks, occupants will sit only on the floor, not on wheel wells, with their backs against the cab and remain seated while vehicle is moving. **(T-1)** Passengers in vans will remain seated, keep their arms and legs within the vehicle body, and keep side doors closed while the van is moving. **(T-1)** Passengers will not ride in doorways or sit on engine covers in metro vans/step vans. **Note:** Personnel jumping or descending from the bed of pickup and stake bed trucks have caused a large number of injuries and the practice of riding in the bed of these type vehicles is highly discouraged.

24.13.7. Restricted Visibility or Night Operations. Flashing or parking lights shall be used at night when vehicles are temporarily parked on any part of the aircraft ramp. **(T-1)** (**Note:** Due to possible battery and alternator concerns, MAJCOMs/FLDCOMs may substitute this requirement by adding portable flashing lights.) This does not apply to vehicles parked in a designated parking area. Refueling and explosive loaded (laden) vehicles shall not be operated when visibility is less than 300 feet unless directed by wing/delta or installation commander. PMVs and flightline vehicles, except emergency and alert vehicles, shall not be operated on the flightline with visibility less than 100 feet. A walking guide with a flashing or luminescent wand shall be used during emergency movement of alert vehicles when visibility is under 50 feet. **(T-1)** Vehicle operators shall ensure headlights do not point toward taxiing aircraft or towing operations to prevent blinding aircraft or tow vehicle operators. **(T-1)**

24.13.8. Control Tower Signs. Refer to AFI 13-213 for information.

24.13.9. *Follow Me* Vehicles. *Follow Me* vehicles for guiding aircraft shall be equipped with signs, easily visible at night, reading *"Stop"* and *"Follow Me"*. **(T-1)** They shall have two-way radio communication on control tower frequencies. **(T-1)** When approaching the parking spot, the *Follow Me* vehicle operator should illuminate the *"Stop"* signal, move the vehicle from the intended path of aircraft travel, and position it laterally – clear of the aircraft wingtip. The marshaler, who may be the vehicle operator, will guide the aircraft to the parking spot using approved marshaling signals. **(T-1)** *Follow Me* vehicles may exceed the 15 mph flightline speed limit when necessary to accommodate the safe taxiing speed of aircraft. Tugs shall not be used as *Follow Me* vehicles. **(T-1)**

24.13.10. Forklift and Hi-Lift Truck Operations Around Aircraft.

24.13.10.1. A spotter shall assist operators in determining safe clearances when maneuvering close to aircraft. **(T-1)** Bumper blocks or vehicle chocks placed on ramps shall be used to prevent backing into aircraft. **(T-1)** Spotters shall assist operators when necessary to back the vehicle. **(T-1)** The driver and spotter shall be able to communicate at all times. **(T-1)** The spotter shall use luminous wands or flashlights to relay signals to the hi-lift operator during the night unless supplemental lighting (light carts) is used. **(T-1)**

24.13.10.2. Spotters shall be used any time the cargo bed is raised or lowered. **(T-1)** Forklift carriage operation (e.g., raise/lower, tilt, side shift) is prohibited while forklift is in motion. Forklifts shall never be driven under an aircraft except when required by the aircraft involved. **(T-1)**

24.13.10.3. When travelling long distances and/or when carrying bulky loads, the forklift shall be driven in reverse as the operator's field of vision is less obstructed. **(T-1)** Forks of parked forklifts shall be lowered flat on the ground to prevent injury to personnel working or walking in the area. **(T-1)** Parked and unattended forklifts shall have operating levers placed in neutral, ignition switched off and handbrake set. **(T-1)**

24.13.11. Hand Pallet Trucks Inside Aircraft. Hand pallet trucks are hydraulically-operated material handling devices used for moving heavy objects inside aircraft. Since hand pallet trucks do not have brakes, at least two (2) persons will operate this piece of equipment. **(T-1)** 1-inch by 12- inch shoring or equivalent protection shall be used to prevent floor damage when moving extremely heavy loads inside aircraft. **(T-1)** Care shall be taken to avoid damaging aircraft ceilings and sidewalls. **(T-1)**

24.13.12. Tractor Operations. All tractor-trailer combinations shall be equipped with lights when operating at night or during low visibility. **(T-1)** Signs reading "*Slow Moving Vehicle*" or the triangular slow moving vehicle emblem shall be displayed on these vehicles. **(T-1)** Passengers shall not be allowed to ride on tractors unless adequate seats are installed. **(T-1)** No more than four (4) trailers, loaded or empty, shall be pulled by any tractor. **(T-1)** To avoid jackknifing, trailer trains shall be arranged with the most heavily loaded trailer next to the towing vehicle, the next heaviest second in line, etc. **(T-1) Exception: S**ix A/M- 3H-6 palletized cargo trailers may be moved behind one prime mover.

24.13.13. Deicing Operations. Conduct deicing operations in accordance with TO 42C-1-2, *Anti-icing, Deicing and Defrosting of Parked Aircraft*, and aircraft-specific deicing TO guidance. Only licensed drivers shall operate deicing trucks. **(T-1)**

24.14. Aircraft Hangar Operations.

24.14.1. Hangaring Aircraft. The Maintenance Group Commander or equivalent shall ensure detailed local operating procedures for hangaring aircraft, including safety precautions, are prepared and coordinated with the installation Occupational Safety office and F&ES Flight. **(T-1)** Include installation Weapons Safety Office coordination if hangaring weapons-loaded aircraft.

24.14.2. Aircraft Hangar, Shelter and Dock Facility Guidance. The installation Occupational Safety office, F&ES Flight and BE will evaluate facilities, equipment, processes, etc., and provide recommendations to ensure safety, fire and health hazards are properly mitigated and/or controlled, and complied with required standards, codes, etc. **(T-1)**

24.14.2.1. Fixed electrical equipment approved for Class I, Division 1 locations may be used in Class I, Division 2 locations of the same class and compatibility group. Equipment not meeting these guidelines shall be de-energized or disabled and locked out until special operations are complete and hazardous conditions permanently eliminated. **(T-1)** Refer to **paragraph 24.3.3.1** for additional guidance.

24.14.2.2. Keep portable electrical equipment out of hangars during special hazardous procedures unless it meets requirements in **paragraph 24.14.2.1** and is marked accordingly.

24.14.2.3. Install barriers such as chains and fencing to restrict personnel from hazardous areas. Ensure mechanical safeguards for hangar, nose dock and shelter doors are in place such as installing limit switches and doorstops where necessary to limit unnecessary door travel. **(T-1)** Doors not in compliance shall be assigned an risk assessment code by the installation occupational safety office. **(T-1)** A JHA shall be performed and appropriate controls put in place until doors are compliant. **(T-1)** Establish a clear zone, e.g., five (5) feet if space allows, around all hazardous areas. **(T-1)**

24.14.2.4. Safety signs shall be printed in English and the predominant language of non-English reading employees. **(T-1)** Established symbols should also be considered. Employees unable to read posted signs shall be informed of hazardous areas and instructions printed on the signs. **(T-1) Note:** For overseas installations with host-nation employees, the maintenance group or squadron commander should consider a training class on safety signs and symbols for host-nation employees.

24.14.3. Training. Employees who routinely work in hangars or require access through hangar doors shall receive Hangar Door Awareness Training, both an initial training program and

annual refresher course. **(T-1)** Courses shall include, at a minimum, door hazards, emergency procedures (including manual door operation) and safe operation. **(T-1)**

24.14.4. Operating Condition. Hangar doors shall be maintained in safe working condition. **(T-1)** Door paths shall be free of obstructions with door tracks and track-ways in good condition and free of debris. **(T-1)** A visual inspection shall be made prior to operation and discrepancies corrected before operation. **(T-1)** Hangar doors shall be on a preventative maintenance schedule and only qualified employees shall perform hangar door maintenance. **(T-1)**

24.14.5. Alarm/Warning Lights. To prevent confusion, powered hangar doors shall have an alarm device with a sound distinguishable from the facility fire alarm and audible above normal noise levels. **(T-1)** The warning device shall automatically signal at least 5 seconds before any door section movement, continuously while the door is operated and shall reset immediately after movement stops. **(T-1)** Additionally, warning lights are required in high noise areas if the audible alarm is difficult to hear, but use caution to avoid stroboscopic effects. **(T-1)**

24.14.6. Operational Checkout of Doors and Safety Features. Facility managers shall conduct monthly inspections of hangar door operational and safety features. **(T-1)** CE and Airfield Management shall be notified immediately of any discrepancies. **(T-1)**

24.14.7. Roll-up Hangar Doors. See **paragraph 2.7** for roll up door requirements.

24.14.8. Clear Space Requirements Around Hangars. Maintain a clear zone of at least 50 feet around all sides of a hangar, shelter or nose dock. Do not store or park aircraft, position concentrations of combustible materials or erect buildings of any kind within the clear zone. Refer to NFPA 409, *Standard on Aircraft Hangars*, for additional guidance.

24.14.9. Heaters. Combustion heaters installed in aircraft shall not be operated in a hangar. Portable engine and cabin heaters shall be removed and stored immediately after each use or when no longer required. **(T-1)** Engine and shelter heaters shall be placed as far from the aircraft as ducting permits. **(T-1)** No portable heater shall be left operating unattended. **(T-1)** Only heaters approved for operation inside hangars and that do not give off unacceptable levels of carbon monoxide (CO) shall be used. **(T-1)** Heaters and the processes for which they are used shall be evaluated by BE to ensure adequate ventilation is provided and that health threats (e.g., CO) are effectively controlled (e.g., CO alarms are installed) to prevent harmful exposures. **(T-1)**

24.14.10. Aircraft Emergency Removal. The aircraft maintenance officer, designated by the Maintenance Group Commander or equivalent, shall establish emergency procedures to remove aircraft from hangars in case of fire, severe weather or other hazards. **(T-1)** Workers shall be trained on emergency procedures to eliminate confusion and ensure timely evacuation of aircraft. **(T-1)** If normal towing method (nose gear) is not available, snatch blocks and/or harnesses laid out on hangar floors shall be attached to the aircraft when in-progress work permits. **(T-1)**

24.14.11. Aircraft shall only be fueled or defuled in facilities approved through a System Safety Engineering Analysis to the current weapons system and facility configuration in accordance with instructions in TO 00-25-172. **(T-1)** Documentation of System Safety Engineering Analysis, other than Tactical Air Base Hardened Aircraft shelters, modified Tactical Air Base Hardened Aircraft, 2nd and 3rd generation aircraft shelters, flow-through

revetments and facilities listed in TO 00-25-172 shall be maintained by the installation. **(T-1)** Aircraft fueling and fueling operations in aircraft fuel system maintenance (fuel cell repair) facilities is not allowed unless the facility is fully compliance with requirements of TO 1-1-3 and/or UFC 4-211-01, *Aircraft Maintenance Hangars.* **(T-1)**

24.15. Aircraft Shop and Flightline Maintenance Operations.

24.15.1. General Requirements.

24.15.1.1. Machine Safeguarding and Shop Layout. Refer to **Chapter 11** and **Chapter 7** for additional guidance.

24.15.1.2. Tool Safety. Use of personally owned hand and power tools shall be prohibited. **(T-1)** Refer to TO 32-1-101 and TO 32-1-2, *Use of Hand Tools (International Business Machines),* and **paragraph 24.15.8** for battery-powered tool use.

24.15.1.3. Compressed Gases. Refer to TO 42B-5-1-2, *Gas Cylinders (Storage Type) – Use, Handling, and Maintenance,* for additional guidance on compressed gases.

24.15.1.4. Occupational Health. Aircraft maintenance operations on the flightline, in shops, aircraft shelters, hangars and maintenance facilities pose chemical and physical hazards. These hazards shall be evaluated, the level of risk established and controls incorporated where necessary. **(T-1)** AFI 48-145 provides guidance for these evaluations.

24.15.2. Aircraft Electrical System Maintenance. Electrical systems shall be de-energized whenever possible. **(T-1)** If the approved procedure requires work on an energized circuit, approved technical data or manufacturer's instructions and 29 CFR § 1910.333, *Selection and Use of Work Practices,* shall be followed and other maintenance personnel informed of the actions. **(T-0)** If work is done on energized circuits of 50 volts or more, arc flash protection must be worn. **(T-1)** Refer to **paragraph 8.17.2.2** for additional guidance. If de-energized, approved procedures shall be strictly followed. **(T-0)**

24.15.2.1. For on-equipment aircraft maintenance, the AFTO Form 492, *MX Warning Tag*, shall be used to flag a condition that could cause damage or injury if ignored. **(T-1)** Warning tags shall be used during maintenance actions as required by applicable technical data and/or local procedures. **(T-1)** Refer to AFI 21-101 for additional guidance. Do not use the AF Form 979, *Danger Tag*, for on-equipment aircraft maintenance. The AF Form 979 shall only be used when an immediate hazard exists and specific precautions are required to protect personnel or property or as required by TOs, instructions or other directed requirements. **(T-1)** Tags shall be placed on damaged equipment to be taken out of service and sent to the repair shop. To reduce the probability of internal electrical shorts, aircraft wiring, including wire bundles, shall be secured to prevent scraping and chafing. **(T-1)** Electrical components shall be bench-tested in a properly designed shop. **(T-1)** Testing of electrical systems or equipment while installed on the aircraft shall be held to a minimum. **(T-1)**

24.15.2.2. If a circuit breaker opens (pops) during maintenance on the aircraft, the popped circuit breaker shall not be reset without following specific guidance in the applicable aircraft system TO and the cause is determined. **(T-1)** An unexpected popped circuit breaker may result from an overload or ground fault. A popped fuel system circuit breaker shall not be reset without following specific guidance in aircraft system TOs. **(T-1)**

Electrical components and systems shall be de-energized and isolated from other energized circuits or power sources during cleaning operations. **(T-1)**

24.15.3. Aircraft Painting and Paint Removal Operations. There are many safety and health hazards associated with painting and paint removal operations. Spray painting an entire aircraft is permitted only in hangars designed for the purpose. Refer to **Chapter 27,** NFPA 410 and NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*, for additional information.

24.15.4. Aerospace Ground Equipment (AGE). Operators shall be familiar with OIs for equipment they use, including emergency shutdown, other precautionary measures and use of fire extinguishers. **(T-1)** Operators shall review maintenance records and inspect equipment for leaks, damage or malfunction before operation. **(T-1)** AGE equipment shall not be left unattended while running, unless specifically designed for unattended operation. **(T-1)** Contact the installation AGE Maintenance Shop for further guidance. **Warning**: Danger Area. Personnel shall not climb inside combustion powered AGE (e.g., light carts) as the enclosure may contain fatal levels of carbon monoxide. **(T-1)**

24.15.5. Communication and Navigation Equipment Repair. Repair communication and electronic equipment on an approved shop bench in accordance with TO or manufacturer‘s instructions. Do not operate, test or check radar or high frequency radio transmitting equipment with power-on during aircraft fueling/defueling, fuel cell/integral tank repair activities or when hazardous vapors may be present. No radar emissions are allowed in hangars due to personnel hazards or inadvertent activation of facility warning and fire protection systems. See AFI 48-109 *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health Program*, for additional information.

24.15.6. Flight Control Systems. Unexpected movement of flight controls may cause severe injuries. Maintenance personnel shall be trained and aware of dangers with flight control system operation. **(T-1)** Flight control operation shall be directed orally by interphone or after visual assurance from a person outside the aircraft that flight control surfaces and movement areas are clear. **(T-1)** All maintenance activities shall be coordinated and a warning tag applied to the flight controls to prevent movement when employees are exposed to potential injury. **(T-1)** Local procedures shall be developed to address work shift changes when tags must remain in place or be reapplied. **(T-1)**

24.15.7. Aircraft Hydraulic Systems. Employees shall ensure pressures are relieved prior to disassembling any hydraulic lines or system components. **(T-1)** Control(s) that could injure personnel or damage equipment shall be tagged out in accordance with TO procedures and/or local procedures while maintenance activities are in progress. **(T-1)** Proper PPE, such as goggles, shall be worn. **(T-0)** Hydraulic spills shall be cleaned up immediately to prevent slips and falls. **(T-1)**

24.15.8. Explosives. Storing, handling and using explosives shall be in accordance with specific TOs and DESR 6055.09_AFMAN 91-201. **(T-1)**

24.16. Fall Protection Requirements. Maintenance group commanders or designated representative must ensure safe DAF maintenance operations. **(T-0)** Flightline and hangar operations must include an appropriate level of fall protection commensurate with DAF mission requirements. **(T-0)** To ensure consistency across DAF operations, AFMC and the lead

MAJCOM/FLDCOM for the MDS will work together to ensure development of standardized fall protection requirements and procedures are published in the applicable weapon system TOs. When deployed operations preclude proper use of fall protection, a JHA may be used to address the limitations and list the actions required to mitigate the risks of falling. The use of chemical gear during chemical, biological, radiological, nuclear and explosive (CBRNE) operations is a good example of a military-unique operation. **Note:** Refer to AFMAN 10-2503, *Operations in a Chemical, Biological, Radiological, and Nuclear Environment,* for additional guidance. These terms are defined as follows:

24.16.1. Military-Unique. Refer to **paragraph 1.7.1**.

24.16.2. Nonmilitary-Unique. Refer to **paragraph 1.7.2**.

24.16.3. Given the diversity and complexity of DAF operations, it is impossible to address every situation in this guidance. However, the intent is reasonably clear and commanders have the authority to make final determinations regarding military uniqueness. Decisions that are based upon sound risk management principles, and the DoD guidance provided, are very likely to be defendable and correct. Supervisors working with the local safety staff are in the best position to recommend decisions that optimally balance safety and mission accomplishment.

24.16.4. While the DAF must comply with OSHA requirements to the maximum extent practical, there may be operations where, due to facility or equipment design, or operational requirements, active or passive means of fall protection are not feasible. **(T-1)** In such cases, the best level of fall protection available, within existing operational limitations, shall be provided. **(T-0)** Where adequate lead time is available or for repetitive operations, a fall hazard survey shall be conducted and documented in accordance with **paragraph 13.4** **(T-1)** Organizations should discuss fall hazard surveys with the applicable TO writer or Aircraft Item Manager for their airframe, then involve organizational/appropriate safety office. **Note:** For Air Logistics Center (ALC) Depots, a standardized Process Order integrated into the task may be used in lieu of a fall hazard survey.

24.16.5. Types of Fall Protection. Fall hazards from aircraft walking and working surfaces are controlled through application of Risk Management, at command and local levels, to determine which fall protection method offers optimal employee safety for the tasks performed. The maximum use of maintenance stands and work platforms, whenever possible, will reduce the exposure and risk. Whenever it becomes necessary to perform required tasks where a worker can fall four (4) feet or more, fall protection will be used. **(T-0)**

24.16.5.1. Passive. Passive fall protection is the most preferred means of protecting workers from falls. Passive systems need not be directly connected to the employee to prevent an employee from falling. These systems include guardrails, work stands and platforms (including aircraft maintenance stands, e.g., B-1, B-4, B-5), nets and other devices. If passive fall protection is not feasible, active fall protection will be the next option considered. **(T-0)**

24.16.5.2. Active. Active fall protection, such as positioning devices, fall restraint systems, ladder climbing devices and personal fall arrest systems, require the employee to wear a full body harness and components and attach himself/herself to an anchorage or lifeline. Positioning devices and fall restraint systems prevent an employee from falling off unprotected sides and edges by restricting the employee's range of movement while a

personal fall arrest system allows an employee to fall off unprotected sides and edges, but the personal fall arrest system and components absorb the energy forces during a fall, reducing the potential for injury.

24.16.5.2.1. Personal fall arrest systems (PFAS) allow an employee to fall, but limits arresting loads to generally safe levels and prevents the employee from hitting the next level. Refer to paragraph **13.8** and **29** CFR § 1910.140, *Personal Fall Arrest Systems*, for additional guidance on PFAS. **Caution**: Shock absorbing lanyards will not be used in conjunction with self-retracting lifelines, fall limiters, retractable web lanyards or decelerator packs (inertial reel type lifelines) devices. Multi-use or combinations of use can result in two falls and could hinder and/or prevent self-rescue or external rescue. **Warning**: Hanging in a harness for an extended period of time can be fatal. Supervisors shall ensure employees using a personal fall arrest system can be properly rescued or can rescue themselves should a fall occur. **(T-0)** Availability of rescue personnel, ladders or other rescue equipment shall be determined prior to using a fall arrest system. **(T-0)**

24.16.5.2.2. Positioning and restraint systems. Fall restraint systems restrict an employee's range of movement so the individual cannot get into a position that would allow a fall. Positioning systems allow an employee to be supported on an elevated vertical/inclined surface and body support is hands free. Anchorage connecting point(s), work positioning and restraint lanyards for each employee will have minimal support strength of 5,000 pounds (22.2 kN). **(T-0)** Secure the employee to an anchor using a lanyard short enough to prevent the employee's center of mass from reaching the fall hazard. When exposed to a fall hazard, a personal fall arrest system must also be used. **(T-0)** Refer to **paragraph 24.16.5.2.1** for additional guidance.

24.16.6. Mobile Work Platforms. Refer to **Chapter 16** for additional guidance.

24.17. Safety in Flightline Contractor Operations.

24.17.1. Contractor operations may create hazardous working conditions for DAF personnel. To ensure DAF personnel or resources are not subjected to hazards, the installation Occupational Safety office, F&ES Flight, Airfield Management and BE shall review requirement documents prior to submission to Contracting office to ensure contracts and activities of contractors performing a task or service for the DAF. **(T-1)** Appropriate safety, fire and health requirements shall be included in contract specifications. **(T-1)** This is normally accomplished by including appropriate Federal Acquisition Regulation (FAR) provisions or clauses in the contract. Installation Occupational Safety office, F&ES Flight, Airfield Management and BE shall assist the contracting officer and using organization establish appropriate requirements. **(T-1)** If a contractor procedure or condition requires correction, action shall be initiated through the Contracting Officer. **(T-1) Note:** Contractors are responsible for compliance with all OSHA requirements, as applicable, while performing work on military installations.

24.17.2. Construction Contracts. The contracting officer shall call a pre-construction conference before the contractor begins construction on an DAF installation. **(T-1)** Installation Occupational Safety office, Flight Safety Office, F&ES Flight, Airfield Management, BE, the using organization, CE, contractor representatives and other affected agencies, as appropriate, shall be present. **(T-1)** The Contracting Officer shall ensure the contractor knows all necessary

DAF safety requirements associated with the contract. **(T-1) Note:** This guidance does not apply to US Army Corps of Engineers contracts.

24.17.3. Non-Construction Contracts. Most non-construction contracts on DAF installations involve persons or companies providing goods and services to installation personnel and activities. During requirement development, requiring activity coordination with the installation Occupational Safety office, F&ES Flight, Airfield Management, BE, contract representatives, using organization and other affected organizations, as appropriate, is necessary to assure appropriate safety, fire prevention and health requirements are included in the contract. Prior to contract renewal, Occupational Safety office, F&ES Flight, Airfield Management, BE, contract representatives and the using organization will review the contract to ensure its continued adequacy. **(T-1)**

Chapter 25

CIVIL ENGINEERING

25.1. Scope. Civil Engineering (CE) units are typically involved in numerous planning, maintenance and fire prevention activities that have a high risk for mishaps. Safe management of the work force, inclusion of safety features (most economical during the identification, planning or design phases) and the correction of facility and grounds hazards are instrumental in preventing mishaps. Training, safe work practices, correct PPE, proper tools, human factors and risk management should all be addressed and accomplished prior to starting tasks.

25.1.1. Interruption of services, injury to employees and equipment damages can occur when electrical, gas and steam lines are broken during digging operations. Ensure AF Form 103, *Base Civil Engineering Work Clearance Request,* is obtained prior to digging. **(T-1)**

25.1.2. The use of propane gasoline, or diesel-powered equipment, e.g., forklifts and materials handling carts, produces carbon monoxide. Employee exposure to carbon monoxide may be excessive if such operations are conducted in low ceiling, enclosed or poorly ventilated areas. Ensure proper ventilation is available at all times. **(T-0)**

25.1.3. Asbestos fibers can cause lung diseases such as asbestosis and cancer of the lung. If asbestos is used or already in place, safe handling procedures shall be in accordance with 29 CFR § 1910.1001, *Asbestos.* **(T-0)** Employees shall not be exposed to unsafe levels of airborne asbestos. **(T-0)** Consult BE prior to all planned asbestos projects. Immediately notify installation BE and BCE if asbestos is suspected or confirmed during a project. Employees shall not resume work until receiving proper guidance from BE. **(T-1)** Refer to AFMAN 48-146, AFI 32-1001, *Civil Engineer Operations,* 15 U.S.C. Chapter 53, *Toxic Substances Control Act,* 42 U.S.C. Chapter 85, *Air Pollution Prevention and Control,* and 29 U.S.C. Change 15, *Occupational Safety and Health Act,* for additional guidance.

Table 25.1. Relevant CE-related References.

Subject	Reference
Fire Protection and Prevention	**Chapter 6** AFI 32-2001, *Fire and Emergency Services Program* UFC 3-600-01, *Fire Protection Engineering for Facilities* UFC 3-601-02, *Operations and Maintenance: Inspections, Testing, and Maintenance of Fire Protection Systems* National Fire Protection Association (NFPA) standards, as applicable
Electrical	**Chapter 8** UFC 3-560-01, *Operation and Maintenance: Electrical Safety* 29 CFR § 1910, Subpart S – *Electrical* NFPA 70E, *Standard for Electrical Safety in the Workplace*
Fall Protection	**Chapter 13** **Chapter 24** 29 CFR § 1910, Subpart D – *Walking-Working Surfaces* 29 CFR § 1910.140, *Personal Fall Protection Systems*
Machinery and Tools	**Chapter 11** TO 32-1-101, *Use and Care of Hand Tools and Measuring Tools*

Subject	Reference
	29 CFR § 1910, Subpart O – *Machinery and Machine Guarding* 29 CFR § 1910, Subpart P – *Hand and Portable Powered Tools and Other Hand-Held Equipment*
Materials Handling Equipment	**Chapter 12** 29 CFR § 1910, Subpart N – *Materials Handling and Storage* 29 CFR § 1926, Subpart CC – *Cranes and Derricks in Construction*
Personal Protective Equipment	**Chapter 14** AFI 90-821, *Hazard Communication (HAZCOM) Program* ***** 29 CFR § 1910, Subpart I – *Personal Protective Equipment* ******
Hot Work	**Chapter 20** AFI 32-2001, *Fire and Emergency Services Program* AFI 90-821, *Hazard Communication (HAZCOM) Program* 29 CFR § 1910, Subpart Q – *Welding, Cutting and Brazing*
Hazardous Energy Control	**Chapter 21** AFMAN 32-1065, *Grounding and Electrical Systems* NFPA 70E, *Standard For Electrical Safety in the Workplace*
Flammables and Combustibles	**Chapter 22** 29 CFR § 1910, Subpart H – *Hazardous Materials* 29 CFR § 1910.106, *Flammable Liquids* 29 CFR § 1910.119, *Process Safety Management of Highly Hazardous Chemicals* 29 CFR § 1910.120, *Hazardous Waste Operations and Emergency Response* 29 CFR § 1910.134, *Respiratory Protection* 29 CFR § 1926.152, *Flammable Liquids* NFPA 30, *Flammable and Combustible Liquid Code*
Confined Spaces	**Chapter 23** AFI 23-201, *Fuels Management* AFI 90-821, *Hazard Communications Programs* TO 1-1-3, *Inspection and Repair of Aircraft Integral Tanks and Fuel Cells* 29 CFR § 1910.146, *Permit-Required Confined Spaces* 29 CFR § 1926, Subpart AA – *Confined Spaces in Construction*
Training Systems	**Chapter 15** AFI 16-1007, *Management of Air Force Operational Training Systems* UFC 3-600-01, *Fire Protection Engineering for Facilities* UFC 3-601-02, *Operations and Maintenance: Inspection, Testing, and Maintenance of Fire Protection Systems*
*** Note:** Specific AFIs, AFMANs or TOs may include PPE for specific operations. **** Note:** Specific OSHA standards may include PPE for specified operations conducive to that standard.	

25.2. Supervisory Responsibilities. Supervisors will comply with the requirements of AFI 91-202, AFMAN 32-1065, UFC 3-560-01 and applicable NFPA standards to ensure a safe work environment. **(T-1)**

25.2.1. Supervisors must recognize workplace hazards and apply risk management when existing guidance, e.g., manufacturer's instructions, does not sufficiently address operational concerns or requirements. **(T-0)**

25.2.2. Supervisors shall not require personnel to work in environments or conditions that are hazardous to their safety or health without first employing adequate hierarchy of controls. **(T-1)** These controls include, but are not limited to, (hazard elimination, substitution, isolating employee from the hazard, administrative controls, to include changes in work procedures, e.g., written policy, rules, training – identified through a Job Hazard Analysis (JHA). **Note:** Use of PPE is the least preferred method.

25.2.3. The supervisor shall frequently inspect job sites, work methods, materials and equipment used. **(T-0)** Any unsafe equipment or material shall be tagged and rendered inoperative or physically removed from the workplace. **(T-0)**

25.2.4. The supervisor shall permit only qualified personnel to operate equipment and machinery according to safe work practices. **(T-0)** Refer to AFI 90-802, *Risk Management*, for additional risk management information.

25.2.5. Ensure industrial shops and sites have a basic first aid kit, or suitable substitute that is approved by the installation medical services, available to care for employees injuries until professional help arrives or they can obtain full medical care. **(T-1)** Refer to **Chapter 8** for additional guidance.

25.3. Compressed Air.

25.3.1. All employees shall be aware of the inherent dangers of using compressed air. **(T-0)** Alternate methods of cleaning surfaces should be sought. Compressed air may be used if no alternative method of cleaning surfaces is acceptable. Compressed air shall never be used to blow debris from a person. **(T-0)** The downstream pressure of compressed air will remain below 30 psi whenever the nozzle is dead-ended and then only when effective chip guarding and PPE are used. Face shield, safety goggles and hearing protection are required when cleaning with compressed air. **(T-0)**

25.3.2. All personnel assigned to shops with air compressors shall be familiar with compressor operating and maintenance instructions. **(T-0)**

25.3.3. The following are requirements for air compressors:

25.3.3.1. Air compressors shall be maintained strictly in accordance with manufacturer's instructions or applicable TO. **(T-1)**

25.3.3.2. The compressed air tank shall be drained in accordance with manufacturer's instructions to prevent moisture build up. **(T-1)**

25.3.3.3. Air tanks shall be protected by adequate safety relief valves. **(T-0)** These valves shall be tested at regular intervals (as required by manufacturer's specifications) to ensure they are in good operating condition. **(T-0)**

25.3.3.4. The pressure controller and gauge shall be maintained in good operating condition. **(T-0)**

25.3.3.5. The maximum working pressure of compressed air lines shall be identified in psi. **(T-1)** Pipeline outlets shall be tagged or marked showing maximum working pressure immediately adjacent to the outlet. **(T-0)**

25.3.4. Air supply lines shall be protected from damage by vehicles, tools and equipment. **(T-0)** They shall be inspected regularly and maintained in good condition. **(T-1)** Air supply lines shall be marked or tagged to identify the maximum psi on the lines. **(T-0)**

25.3.5. Compressed Air Systems. Plumbing employees shall be trained and authorized to inspect, maintain or install compressed air systems. **(T-1)**

25.4. Shoring and Trenching. The walls and faces of excavations and trenches over five (5) feet in depth, where employees may be exposed to danger of a cave-in, shall be guarded by a shoring system, slope excavation, bench excavation or some other equivalent means consistent with 29 CFR § 1926, Subpart P – *Excavations*. **(T-0)** Trenches less than five (5) feet deep with hazardous soil conditions shall also be effectively protected. **(T-0)** Refer to 29 CFR § 1926.650, *Scope, Application and Definitions Applicable to Subpart P*, 29 CFR § 1926.651, *Specific Excavation Requirements*, and 29 CFR § 1926.652, *Requirements for Protective Systems*, for additional guidance. **Note:** A competent person will examine the excavation soil to determine the need for a shoring system, sloping or benching system or some other equivalent means. **(T-0)**

25.5. Barricades and Traffic Signs. Whenever a common area is disturbed by CE maintenance, repair or construction operations and presents a hazard to personnel in the area (residents, other employees or passers-by), care shall be taken to warn these personnel and other engineering employees of the potential hazard. **(T-0)**

25.5.1. Appropriate barriers shall be erected around excavations, open manholes, open electrical panels, etc., whenever they will be left unattended. **(T-0)**

25.5.2. Appropriate warning signs and steady or flashing warning lights for periods of reduced visibility (e.g., nighttime operations, inclement weather, fog) shall be posted a sufficient distance from the hazard to give ample advance warning to approaching pedestrian or vehicular traffic. **(T-0)** For vehicular traffic, comply with DOT's *Manual on Uniform Traffic Control Devices.* **(T-0)**

25.5.3. Traffic control signs or devices will conform to the DOT's *Manual on Uniform Traffic Control Devices.* **(T-0)**

25.5.4. Employees exposed to vehicle traffic shall be provided with and required to wear warning vests marked with or made of reflector-type or high visibility material. **(T-0)** **Chapter 14** provides additional guidance for these requirements. In some situations, the use of flagmen to control the flow of traffic may be necessary. Employees in equipment operations, pavement maintenance, plumbing, heating maintenance and exterior electrical career fields shall be trained in traffic control procedures. **(T-1)**

25.6. Sanitation.

25.6.1. Shop supervisors shall ensure shop personnel use the protective clothing and equipment that will protect them from hazards of the work they perform. **(T-0)** The employee

is responsible for keeping their PPE clean, serviceable, sanitary and in a state of good repair at all times, and use the proper equipment, when required.

25.6.2. Employees shall keep their hands and face clean, change clothes when they are contaminated with solvents, lubricants or fuels and keep their hands and soiled objects from contacting their skin, eyes or mouth. **(T-0)** No food or drink shall be brought into or consumed in areas exposed to toxic materials, chemicals or industrial shop contaminants. **(T-0)** After exposure to any contaminant, shop personnel shall wash their hands before eating or smoking. **(T-0)** Safe drinking water shall be provided in or reasonably near all shops. **(T-0)** Waste food from the lunch area shall be kept in a receptacle that is tightly covered and kept clean. **(T-1)** Restrooms must be provided with hot and cold running water and shall be kept clean and in a sanitary condition. **(T-0)**

25.6.3. Shop personnel required to wear protective clothing shall be provided with change rooms equipped with clothing lockers having separate storage facilities for clean and soiled clothing. **(T-0)** Shower facilities shall be provided when necessary to remove contamination from skin. **(T-0)**

25.6.4. Clothing used daily and issued by the shop shall be cleaned and stored in shop lockers or fenced areas within the building. **(T-0)** Employees shall inspect clothing and protective equipment daily for serviceability. **(T-0)** In addition, supervisors or a designated employee will spot check equipment and clothing. **(T-0)** Refer to 29 CFR § 1910.141, *Sanitation*, for additional guidance.

25.7. Restrictions. Clothing worn shall be suitable to weather conditions and work being done. **(T-1)** Highly combustible garments or coveralls made of a synthetic material such as nylon shall not be worn in or around high-temperature equipment or operations such as boiler operations, hot-tar roofing, welding or any other work with open-flame devices. **(T-0)** Refer to AFMAN 32-1065 for additional guidance.

25.8. Equipment Operations and Pavements. Training outlines for operator qualifications shall be tailored to the particular equipment and shall be updated as new equipment is received, or new processes are implemented. **(T-0)** All equipment operators must be trained in specific safe operating procedures by a competent person following the manufacturers or sellers recommendation. **(T-0)** AFMAN 24-306 contain general requirements applicable to construction equipment. All required PPE shall be used. **(T-0)**

25.8.1. Joint Seal Kettle-Melter.

25.8.1.1. Kettles shall not be operated without installation F&ES Flight approval. **(T-1)** A permit shall be obtained at least two (2) working days prior to the placement of the tar kettle. **(T-1)**

25.8.1.2. Serious burns can result from improper operation. Clothing that is loose fitting shall be worn. **(T-1)** Pants will completely cover the legs to below the tops of shoes. **(T-1)** Shirts shall be long sleeved. **(T-1)** Loose-fitting gloves shall be worn. **(T-1)**

25.8.1.3. Safety-toe shoes and a face shield shall be worn. **(T-0)** The operator and personnel handling the heated kettle product will wear face shields and gloves. **(T-0)** All tripping hazards shall be removed from the vicinity of the worksite. **(T-1)**

25.8.1.4. Containers shall not be overfilled and shall be allowed sufficient room for the bitumen (tar) to slosh without spilling when the container is moved. **(T-1)**

25.8.1.5. Appropriate number and type of fire extinguishers shall be kept near the kettle. **(T-1)**

25.8.1.6. When adding bituminous or joint sealant materials to the kettle, the product shall be eased into the kettle to prevent splashing of heated materials on the operator. **(T-1)** The kettle shall be watched closely and the products not heated above the safe heating temperature specified by the product manufacturer. **(T-1)**

25.8.1.7. Employees will never use direct heating of the materials. **(T-1)** No open flame or source of ignition shall be permitted near asphalt material that is heated to a temperature near its flash point. **(T-1)** Wherever heating kettles are used, the temperature of the product shall be controlled by thermostatic devices or checked at frequent intervals with an accurate thermometer to prevent overheating. **(T-1)** **Warning**: Gasoline or other highly volatile solvents shall never be used for cleaning. **(T-1)**

25.8.2. Pavement Grinders (Line Eradicator or Paint Scraper). Employees will keep their hands and feet clear of the cutting wheels. **(T-1)** The operator and personnel within the immediate work area will wear safety-toe shoes, goggles and hearing protection. **(T-0)**

25.8.3. Tampers. Employees will keep their hands and feet clear of the tamping tool. **(T-1)** A firm footing shall be maintained while using this equipment. **(T-1)** Safety-toe shoes and hearing protection are required when operating tampers. **(T-0)**

25.8.4. Pneumatic Drill. Safety-toe shoes, goggles and hearing protection shall be worn during operation. **(T-0)** A firm grasp will be maintained on the tool. **(T-1)** It shall be kept aligned with the hole to prevent binding. **(T-1)** The tool shall not be forced. **(T-1)**

25.9. Carpentry and Structural Maintenance.

25.9.1. Potential physical and health hazards can be effectively controlled by following proper work procedures and controls, and by using required PPE. Prior to commencement of work, ensure personnel are not exposed to asbestos or lead-based paint. **(T-1)** Contact installation Environmental Management office and BE for asbestos and lead verification. **(T-1)** If lead or asbestos is identified or suspected, contact BE for an Occupational and Environmental Health Risk Assessment. **(T-1)**

25.9.2. General Carpentry.

25.9.2.1. Employees shall not leave power tools or machines running unattended nor attempt to clear, clean, or repair the machine while it is operating. **(T-0)** When maintenance or adjustments are necessary, the machine shall be completely shut down and all energy sources locked or tagged in the de-energized position according to instructions in **Chapter 21.** **(T-0)** Supervisors shall ensure periodic inspections are accomplished on all shop equipment in accordance with appropriate technical data or manufacturer's recommendations. **(T-1)** Chips or dust shall never be removed from machinery by hand. **(T-1)** Machine guards and safeties shall not be removed nor made inoperative except for authorized maintenance. **(T-0)**

25.9.2.2. PPE will be worn while operating tools and machinery. **(T-0)** Refer to **Chapter 14** for additional guidance on required PPE.

25.9.2.3. General Power Tool Safety. Supervisors will ensure compliance with equipment manufacturer's instructions as well as guidance provided in Chapter **11** and **29** CFR §§ 1910, Subpart O – *Machinery and Machine Guarding*, and Subpart P – *Hand and Portable Powered Tools and Other Hand-Held Equipment*, and 29 CFR § 1926 Subpart I – *Tools – Hand and Power*, for both carpentry and structural maintenance work methods or tools. **(T-0)**

25.9.3. Ventilation Systems.

25.9.3.1. Only essential safety, fire prevention and occupational health requirements are addressed in this publication. Contact BE for specific guidance, including information on flow rate requirements. Ventilation and exhaust systems shall be installed and maintained in accordance with the manufacturer's instructions. **(T-1)**

25.9.3.2. Refuse. Refuse shall be removed daily in all operations not required to have an exhaust system or where the refuse cannot be handled by an exhaust system. **(T-1)**

25.9.4. Storage and Handling of Lumber. Refer to 29 CFR § 1910.265(c)(27), *Lumber Piling and Storage*, for additional guidance.

25.9.5. Roofing Operations. Refer to AFI 32-1001 for additional guidance.

25.9.6. Masonry. Refer to 29 CFR §§ 1926, Subpart H, *Materials Handling, Storage, Use, and Disposal*, and Subpart Q, *Concrete and Masonry Construction*, OSHA 3221-12N 2004, *OSHA Pocket Guide for Concrete Manufacturing*, and ANSI/ASSP A10.9, *Safety Requirements for Concrete and Masonry Work*, for additional guidance.

25.10. Protective Coating Maintenance. Interior spray, airless and electrostatic painting facilities and requirements are addressed in **Chapter 27.** Refer to **Chapter 14** for additional PPE information. Ventilated lockers for clothing and shower facilities shall be provided and located separately from the office areas and breakroom. **(T-0)**

25.11. Plumbing Maintenance. Plumbing maintenance normally includes the installation, preventive maintenance and repair of water supply systems, sewage and water disposal systems, natural, liquefied petroleum gas or other gas supply systems (to include gas appliances) and oxygen supply systems. Hazards encountered during plumbing maintenance include, but are not limited to, entry into an oxygen-deficient atmosphere (enclosed area or confined space), fire or explosion by introducing an ignition or flame source into a hazardous environment, falls, cave-in of excavated area, burns from heat-producing equipment, strains and sprains of the back or other muscle group, cuts and bruises. Refer to **Chapter 23** for confined space entry procedures and requirements.

25.11.1. Personal Protective Equipment. Ventilated lockers for clothing and shower facilities shall be provided and located separately from the office areas and breakroom. **(T-0)** Refer to **Chapter 14** for additional PPE guidance.

25.11.2. Hot Operations.

25.11.2.1. Torches and Furnaces. Work and storage areas for this equipment shall be well ventilated. **(T-0)** Where flammable or explosive vapors or dust may be present, torches and furnaces shall not be used until the atmosphere has been tested and the sources of such vapors or dust removed. **(T-1)** Refer to **Chapter 20, Chapter 18, Chapter 22,** and NFPA

51, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes*, for additional information.

25.11.2.2. Soldering and Brazing. Soldering and brazing is the joining of metal parts by melting a fusible alloy. When solders used have a melting point above 800° F, the procedure is called brazing.

25.11.2.2.1. The concentration of toxic fumes and irritants at the breathing level of the operation shall be checked. **(T-1)** Where required because of toxic fumes, a respirator or adequate ventilation shall be provided. **(T-1)** Lead-tin, zinc, silver, cadmium and antimony- tin solders can pose moderate to serious health hazards. If welding, soldering and brazing operations have not been evaluated, contact BE for an occupational and environmental health risk assessment.

25.11.2.2.2. Electric soldering irons shall be grounded unless of double-insulation construction. **(T-1)** All soldering irons shall be placed in suitable non-combustible receptacles when not in use. **(T-1)**

25.11.2.2.3. When required, an AF Form 592, *Hot Work Permit*, shall be obtained for these operations. **(T-1)** Refer to **Chapter 27** for additional information.

25.11.3. Gas Systems. Maintenance of gas systems includes natural gas, liquefied petroleum gas, oxygen, nitrogen or nitrous oxide. Shop personnel shall be familiar with the properties of gases in the systems they maintain. **(T-1)** Personnel entering the area shall be suited with PPE and respiratory protective devices. **(T-1)** Consult with installation occupational safety office and BE with questions pertaining to PPE. Refer to **Chapter 14** for additional guidance.

25.11.4. Tunnels, Pits and Sumps. Where shop personnel are required to work in utility tunnels, pits and sumps, the atmospheric conditions shall be checked for explosive atmosphere or oxygen deficiency before allowing employees to enter. **(T-0)** Personnel shall be suited with proper protective equipment and respiratory protective devices, when required, while performing maintenance to underground utilities. **(T-0)** Consult with the installation occupational safety office and BE on questions pertaining to PPE and proper air quality testing. Refer to **Chapter 14** for additional guidance on PPE. All tunnels, pits or sumps known to be contaminated shall be tagged or otherwise identified for work crews. **(T-1)** Spaces determined to be permit required confined spaces shall be entered under all provisions addressed in accordance with **Chapter 23**. **(T-0)** When manhole covers are removed, barriers shall be installed to prevent injury to personnel not associated with the work in progress. **(T-0)**

25.12. Refrigeration and Air Conditioning Maintenance. Refer to AFMAN 32-7002 for additional guidance.

25.13. Heating Systems and Central Heating Plant Maintenance. Refer to AFMAN 32-1068, *Heating Systems and Unfired Pressure Vessels*, for additional guidance.

25.14. Water and Wastewater Treatment. Refer to AFMAN 32-1067, *Water and Fuel Systems*, and AFMAN 32-7002 for additional guidance.

25.15. Aircraft Arresting Systems. Personnel engaged in aircraft arresting systems operations and maintenance are exposed to several potential hazards, including exposure to flammable and combustible liquids and gases and absorption of toxic and hazardous chemicals through the skin and respiratory system. Aircraft arresting systems personnel are exposed to physical injuries

associated with aircraft arresting systems maintenance, and are also subject to noise, lifting hazards, and in underground facilities, confined space hazards (e.g., oxygen deficiency). Particular attention shall be given to prevent exposure to hazardous noise levels since the effects of over-exposure are not always apparent immediately or in the near future. **(T-1)** Potential physical and health hazards can be effectively controlled by following guidance in this chapter, by proper work procedures and controls, and by using protective equipment and clothing. Refer to **Chapter 14,** TO 35E8-2-5-1, *Operation and Maintenance Aircraft Arresting System Mod BAK-12/E32A*, AFMAN 32-1040, *Civil Engineer Airfield Infrastructure Systems*, AFI 48-127, and FC 3-260-18F, *Air Force Aircraft Arresting Systems (AAS), Installation, Operation, and Maintenance*, for additional guidance.

25.16. Miscellaneous.

25.16.1. Mobile Cranes. A minimum of one person assigned to each 4FPET and 4FPAS Unit Type Code (UTC) will be qualified and certified within the respective Career Field Education and Training Plan. **(T-1)** Contact AFCEC for more information on operator certification, qualification and currency training requirements. Refer to 29 CFR § 1926.1427, *Operator Training, Certification, and Evaluation*, and 29 CFR § 1926, Subpart CC – Appendix C, *Operator Certification—Written Examination—Technical Knowledge Criteria*, for minimum training requirements.

25.16.2. Dump Trucks. Dump truck operators shall be trained in accordance with Air Force Qualification Training Package (QTP) 3E2X1-8 Earth Moving and Excavation Equipment. **(T-1)** This course covers operational checks/maintenance, operations and tailgate removal and installation. Members are required to complete the AFQTP and associated web-based training: Dump Truck Operator QTP and Dump Truck Tailgate Removal and Installation QTP. Additionally, there is a Dump Truck Training package for non-3E2s located at the Air Force e-Publications website.

Chapter 26

CRYOGENIC LIQUIDS

26.1. Specific Hazards. Follow manufacturer's instructions and applicable safety data sheets (SDSs) for proper handling, storage, dispensing and transporting of cryogenic liquids. Information contained within this chapter provides general guidance applicable to most cryogenic liquids.

26.1.1. Physical Hazards.

26.1.1.1. Liquid nitrogen (LN_2) and liquid oxygen (LOX) hazards are primarily associated with phase change and low temperature effects of cryogens. A tremendous volume increase occurs when either liquids undergoes a phase change from liquid to gas. When LN_2 vaporizes, each cubic foot of liquid expands to 695 cubic feet of nitrogen gas. For LOX, the expansion ratio is 860 to 1. Containment of cryogens may create a tremendous pressure increase if liquid to gas conversion occurs, so a sealed container can become a bomb. Expansion on ratio of LN_2 can displace oxygen in a confined space, causing an asphyxiation hazard. Expansion of LOX can cause oxygen enrichment, producing fire and explosion hazards. See **paragraph 26.1.3** for additional information.

26.1.1.2. The cold temperature of LN_2 (-320° F) and LOX (-297° F) can alter the strength, ductility, thermal expansion, thermal conductivity and heat capacity of materials. Mild carbon steels become brittle and failure-prone when exposed to cryogens. However, properly treated metals such as austenitic steels, nickel, aluminum, copper and a number of alloys are safe for low temperature work.

26.1.1.3. LN_2 can liquefy oxygen from the air it contacts. Therefore, an open container of LN_2 will slowly condense air causing a LOX concentration buildup within the LN_2. The presence of LOX within LN_2 can cause unexpected chemical reactions with other materials. See paragraphs **26.1.3** and **26.1.4** for additional information on LOX reactivity with chemicals.

26.1.1.4. Nitrogen and Freon displace oxygen in air and shall be handled carefully in poorly ventilated or confined spaces to minimize the potential for asphyxiation. **(T-1)** Freon is a fluorocarbon and requires stringent environmental controls in accordance with local procedures. Refer to TO 42B-5-1-2 for general safety guidance and requirements for compressed gases.

26.1.1.5. Liquid Hydrogen (LH_2). Hydrogen's flammability range is very wide (between 4 percent and 75 percent in air), compared to other fuels. Under optimal combustion condition (29 percent hydrogen-to-air volume ratio), the energy required to initiate hydrogen combustion is much lower than that required for other common fuels, e.g., a small spark will ignite it). However, low concentrations of hydrogen in air, the energy required to initiate combustion is similar to that of other fuels. Liquid hydrogen has different characteristics and different potential hazards than gaseous hydrogen, so different control measures are used to ensure safety. As a liquid, hydrogen is stored -423° F, a temperature that can cause cryogenic burns or lung damage. Detection sensors and PPE are critical when dealing with a potential LH_2 leak or spill. Refer to 29 CFR § 1910.103, *Hydrogen*, for additional guidance.

26.1.1.6. Liquefied Natural Gas (LNG). LNG is natural gas (predominantly methane [CH4], with some mixture of ethane [C2H6]) that has been cooled down to liquid form for ease and safety of non-pressurized storage or transport. It takes up about 1/600th the volume of natural gas in the gaseous state (at standard conditions for temperature and pressure). It is odorless, colorless, non-toxic and non-corrosive. Hazards include flammability after vaporization into a gaseous state, freezing and asphyxia. The liquefaction process involves removal of certain components, such as dust, acid gases, helium, water and heavy hydrocarbons, which could cause difficulty downstream. The natural gas is then condensed into a liquid at close to atmospheric pressure by cooling it to approximately -162° C (-260° F) and maximum transport pressure is set at around 25 kPa (4 psi).

26.1.2. Physiological Hazards.

26.1.2.1. Evaporation of LN_2 in a poorly ventilated or unventilated enclosure may reduce the oxygen content of the air and produce asphyxiation and death. Because the brain requires the most oxygen, a reduction in available oxygen will first affect the mental processes. A slight impairment of the ability to concentrate and think clearly is an early symptom, which then progresses to a loss of consciousness. Unconsciousness can occur in seconds in atmospheres with very high concentrations of nitrogen. Recovery in fresh air is rapid and complete if exposure to high concentrations of nitrogen is short. Prolonged exposure can cause death.

26.1.2.2. The extremely cold temperature of LN_2 and LOX can freeze or seriously damage human tissue upon contact. The effect is similar to frostbite or thermal burn and is instantaneous. Uninsulated parts of equipment are cooled to extremely low temperatures by LN_2 and LOX and will freeze to the skin on contact. Flesh can be badly burned and severely torn in an attempt to free it, which must be done immediately since the results of prolonged skin contact are worse.

26.1.2.3. LH_2 is a flammable liquefied gas that is extremely cold and forms explosive mixtures with air, and will condense moisture in the atmosphere, producing a vapor cloud. Avoid contact with cold liquid, vapor or frosty condensation. LH_2 can freeze air, oxygen and other gases. Contact with liquid or solid gases can cause severe frostbite, a burn-like injury. Flammable gas may spread from leaks. Approach suspected leak area with caution. Before entering area, especially confined areas, check atmosphere with an appropriate device. Self-contained breathing apparatus and PPE may be required by rescue workers. Remove all sources of ignition if without risk. Reduce gas with fog or fine water spray. Shut off flow if without risk. Ventilate area or move container to a well-ventilated area.

26.1.2.4. LNG is normally stored and transported in liquid form at a temperature of approximately -162°C (-260° F). If this cooled liquid is released from a storage facility, pipeline or LNG transport ship, then it begins to warm. As LNG warms above its storage temperature, the liquid begins to vaporize. The resulting gas produced by this warming is typically methane, which is the major component (with some ethane) of natural gas and one of the most potent and hazardous greenhouse gases.

26.1.3. LOX Chemical Hazards.

26.1.3.1. Normal air contains about 21 percent oxygen and 79 percent nitrogen. LOX contains about 4,100 times more oxygen than the same volume of air. Under these

conditions, combustible materials and organic compounds react at explosive rates, and materials not normally thought of as combustible can burn or explode. Because of this, control of combustible and potentially reactive materials in LOX work is as important as the control of ignition sources when flammable gases or liquids are handled. Because of the severe reaction of LOX with various materials, unauthorized substitutions of various LOX-service parts, fittings, hoses, seals, lubricants and so forth can be disastrous. Such reactions can arise out of hydrocarbon contamination or substitution of unsuitable materials.

26.1.3.2. Hydrocarbon contamination can cause explosions and fires. Oil, dirt and other foreign debris are a special concern during aircraft servicing where serious aircraft fires have resulted from combustible foreign matter in aircraft LOX systems. LOX must be handled only in areas where it will not come in contact with hydrocarbon materials when leaked or spilled, including all areas where LOX might flow after a spill. If spilled onto asphalt, LOX will seep into cracks and form shock-sensitive compounds which can explode violently upon impact. **(T-0)** LOX spills also cause localized atmospheric oxygen enrichment, which increases the fire danger until dissipated.

26.1.4. Solvents and Chemical Hazards. Some solvents and chemicals used for LN_2 and LOX production and storage cause skin irritation or burns, and can be absorbed through the skin. It may also cause liver damage and poisonous if taken internally.

26.1.5. Spill Hazards. LN_2 and LOX spills may cause asphyxiation, fire, explosion, severe cryogenic burns or equipment damage. Whenever the cryogenic liquid is exposed to the atmosphere, moisture condenses from the air and forms a fog over the immediate area. Refer to the installation and work area spill plans and the National Institute for Occupational Safety and Health *Pocket Guide to Chemical Hazards* (**www.cdc.gov/NIOSH/npg/**) for additional information on handling cryogenic spills.

26.2. General Requirements.

26.2.1. Characteristics and Production of LN_2 and LOX.

26.2.1.1. Liquid Nitrogen. LN_2 is a colorless, odorless, nonflammable, nontoxic and chemically inactive water-like fluid with a boiling point of -320° Fahrenheit (F). LN_2, less dense than water, weighs approximately 6.7 pounds per gallon. The expansion ratio for LN_2 (from LN_2 to gaseous nitrogen) is 695 to 1 at normal temperature and pressure. The critical temperature of LN_2 is -233° F at 493 pounds per square inch absolute. At temperatures higher than this, LN_2 cannot be liquefied regardless of pressure.

26.2.1.2. Liquid Oxygen. LOX is a pale blue, nontoxic, water-like fluid with a boiling point of-297° F. It is heavier than water, weighing approximately 9.5 pounds per gallon. The expansion ratio for LOX is 860 to 1 at normal temperature and pressure. The critical temperature of oxygen is -181° F at 737 per square inch absolute. At temperatures higher than this, LOX cannot be liquefied regardless of pressure. Liquid oxygen is attracted to an electromagnet much like iron and will combine readily with other substances to actively support combustion.

26.2.2. Production of LN_2 and LOX. LN_2 and LOX storage tanks are constructed with an inner cylinder supported in an outer vacuum insulated jacket to reduce radiation and convection heat transfer. The evacuated space between the inner and outer vessels contains a highly efficient

insulating material, which reduces boil off of the LN_2 or LOX. Pressure buildup in the inner tank, necessary to transfer liquid from the tank, is accomplished by vaporizing liquid in coils located beneath the tank. All operating controls are located in a cabinet at the front end of the tank. Storage tanks are manufactured in various sizes and shall be designed and constructed in accordance with the ASME Boiler and Pressure Vessel Code. **(T-0)** Safety relief valves shall be installed so moisture cannot collect, freeze and interfere with proper operation of the valves. **(T-0)** Frangible disks shall also be included in the design of pressurized tanks. **(T-0) Note:** Tanks operating at atmospheric pressure do not require pressure relief devices if adequately vented. Refer to 29 CFR § 1910.104, *Oxygen*, for additional guidance.

26.2.3. Production of LH_2 and LNG.

26.2.3.1. Liquid Hydrogen. LH_2 is in a fully liquid state at an atmospheric pressure of 20.28K (-252.87^o C or -423.17^o F). It requires cryogenic storage technology, such as special thermally insulated containers and requires special handling common to all cryogenic fuels. This is similar to, but more severe than LOX. Even with thermally insulated containers, it is difficult to keep LH_2 low temperatures, and the hydrogen may gradually leak away (typically at a rate of 1% per day). It also shares many of the same safety issues as other forms of hydrogen, as well as being cold enough to liquefy, or even solidify atmospheric oxygen, which can be an explosion hazard.

26.2.3.2. Liquefied Natural Gas. LNG is condensed into a liquid at close to atmospheric pressure by cooling it to approximately -162° C (-260° F) for shipping and storage. LNG is normally warmed to make natural gas to be used in heating and cooking as well as electrically generation and other industrial uses. LNG can also be kept as a liquid to be used as an alternative transportation fuel. LNG is often regarded as extremely dangerous and toxic. LNG vapors are flammable and present safety hazards that must be managed, but those hazards are substantially less than for gasoline, diesel and other liquid fuels.

26.2.4. Generating Plants. DAF LN_2 and LOX plants can typically produce one and one-half to five tons of liquid oxygen per day (24 hours). These plants produce four products: liquid and gaseous nitrogen, and liquid and gaseous oxygen. LN_2 and LOX are generated from atmospheric air through five basic steps: compression, purification, refrigeration, expansion and distillation.

26.2.5. High Pressure. Pressures approaching 4,000 pounds per square inch (psi) may be found in production facilities. To prevent personnel injury and property damage from whipping of failed lines, all high-pressure lines shall be secured with brackets, braces or other suitable tie-down devices. **(T-0)**

26.2.6. Contamination. Atmospheric contamination during production runs may introduce impurities into the cryogens. To avoid this hazard, the following operations are not permitted during production:

26.2.6.1. Painting.

26.2.6.2. Welding, cutting and other hot work.

26.2.6.3. Solvent use.

26.2.6.4. Any operation generating toxic and noxious gases or vapors.

26.3. Cryogenic Facility Siting.

26.3.1. Safe Distance Criteria. The special hazards associated with LN_2 and LOX require care be exercised in siting these facilities. Production or storage facilities of 100 gallons or more shall conform to the following minimum separation distances. **(T-0)** Refer to UFC 3-600-01 and TO 00-25-172. In accordance with DESR 6055.09_AFMAN 91-201, if the cryogen is used as a propellant and/or fuel, the most stringent distance shall apply.

26.3.1.1. Stationary Cryogenic Containers, Cylinders and Tanks. Stationary containers located outdoors shall be separated from exposure hazards in accordance with the minimum separation distances. **(T-0)** Refer to NFPA 55 for additional guidance.

26.3.1.2. Bulk oxygen systems (100 gallons or more) located outdoors shall be separated from exposure hazards. **(T-0)**

26.3.2. Facility Requirements.

26.3.2.1. Security fencing and lighting shall be in accordance with AFI 23-201. **(T-0)**

26.3.2.2. LOX production and storage facilities shall be permanently placarded to indicate "OXYGEN—NO SMOKING—NO OPEN FLAMES" or an equivalent warning. **(T-0)**

26.3.2.3. Notify the installation BCE prior to installation, modification or repair of utility services (water, electricity, sewage, telephone).

26.3.2.4. Joint sealer shall be LOX-compatible in LOX handling and storage areas (where spills are most likely to occur). **(T-0)** This area will cover a 25-foot radius (minimum) from the LOX cart fill point during servicing. The area around the LN_2 and LOX plant itself (where spills are most likely to occur) shall be concrete. **(T-1)** Refer to AFI 23-201 for additional guidance.

26.3.2.5. A paved road shall be provided to and from the facility for delivery, maintenance and emergency vehicles. **(T-1)** Refer to AFI 23-201 for additional guidance.

26.3.2.6. Generator plants shall be permanently grounded. **(T-1)** Storage and servicing tanks shall have adequate grounding points. **(T-1)** Refer to AFI 23-201 for additional guidance.

26.3.2.7. Generating plants shall be sited to minimize airborne contamination of the local area. **(T-1)**

26.4. Occupational Health.

26.4.1. Solvents and Chemicals. Refer to paragraphs **26.1.3** and **26.1.4** for hazards of chemicals used in LN_2 and LOX production and storage. BE's occupational and environmental health risk assessment recommends appropriate controls.

26.4.2. Noise. Noise levels in generating plants can reach high levels, particularly during defrost, start-up and shutdown operations. AFI 48-127 addresses program responsibilities, designation of hazardous noise-producing equipment and hazardous noise areas, required PPE and required medical examinations for workers exposed to hazardous noise. If process not already evaluated, contact BE for an occupational and environmental health risk assessment.

26.4.3. First Aid Medical Treatment for Cryogenic Burns. Remove the victim from exposure immediately and transport to the nearest emergency room as soon as possible. Identify

exposure to LN_2 or LOX. Keep the victim warm and dry by wrapping exposed areas in a blanket. No attempt to re-warm frozen body parts shall be made until the victim is under proper medical care. **(T-1)** Affected parts will not be rubbed because the tissues may be damaged. **(T-1)** Clothing that may restrict circulation to the frozen area shall be loosened or removed. **(T-1)** Do not allow the victim to drink alcoholic beverages or smoke, because these actions decrease blood flow to the frozen tissue. Control of shock and pain and re-warming of frozen parts shall be done only by medical services personnel. **(T-1)**

26.5. Safety Precautions When Working With LN_2, LOX, LH_2 and LNG.

26.5.1. PPE for LN_2 or LOX. PPE is of two distinct types — cryogenic and chemical protection; and may not be interchangeable. Local procedures shall be developed to prevent hydrocarbon or chemical contaminated PPE from being used during cryogen transfers.

26.5.1.1. Personnel handling or transferring LN_2 or LOX shall follow PPE requirements in **Chapter 14**. **(T-0)** Non-absorbent long sleeves shall extend to the gloves. **(T-0)** Cuff-less trousers shall be worn outside leather boots or over high-top leather shoes to shed spilled liquid. **(T-0)** BE-approved foot protection shall have no mesh sides or air holes and will be tightly laced to prevent spilled cryogen seeping inside. **(T-0)** Only tightly woven materials shall be worn during LN_2 or LOX operations. **(T-0)** A face shield, eye protection (safety goggles or safety glasses with side shields) and apron (leather or other BE-approved) shall be worn. **(T-0)**

26.5.1.2. When transferring LN2/LOX, personnel shall wear protective footwear, which fit closely around the top, with rubber soles and heels. **(T-0)** Boots, shoes or other BE-approved foot protection shall have no mesh sides or air holes and will be tightly laced to prevent spilled cryogen seeping inside. **(T-0) Note:** A leather boot approximately eight (8) inches in height with close fitting top and rubber soles and heel is recommended, since LOX spills normally subject one's foot area to a freeze burn exposure hazard. This type footwear when equipped with a hard protective toe area is generally classified as a safety shoe or boot.

26.5.1.3. LN_2 and LOX both saturate clothing. Such contact holds the LN_2/LOX against the skin and may be more hazardous than a direct splash. Contaminated clothing will be removed, hung up and air dried for one hour. **(T-1)**

26.5.1.4. Due to its cold temperatures, LH_2 is a hazard for cold burns. Also, because of its flammability, LH_2 should be kept away from heat or flames, unless ignition is intended.

26.5.1.5. LNG is not explosive and cannot ignite. For LNG to burn, it must first vaporize, then mix with air in the proper proportions (the flammable range is 5 percent to 15 percent), and then be ignited. In the case of a leak, LNG vaporizes rapidly, turning into a gas (methane plus trace gases), and mixing with air. If this mixture is within the flammable range, there is a risk of ignition, which would create fir and thermal radiation hazards.

26.5.2. Low Temperature Precautions.

26.5.2.1. Avoid splashing on exposed skin. Cryogenics burn on contact.

26.5.2.2. Do not touch an uninsulated cryogenic surface unless wearing the proper PPE. Bare skin will freeze to any uninsulated cryogenic surface and portions of the skin will continue to adhere to the surface after removal of the affected part. Remove the affected

part immediately, as leaving the skin in contact with the surface will freeze the underlying tissue and cause additional damage.

26.5.2.3. Assume all surfaces are cold until proven otherwise. External frost may not always be present.

26.5.3. Equipment and Materials Precautions.

26.5.3.1. Most metal becomes very brittle at cryogenic temperatures and will shatter or crack under stress.

26.5.3.2. Valves may freeze if any moisture is present in the system. Droplets of moisture can freeze into balls and pit valve seats causing them to leak.

26.5.3.3. Most glass and some plastics will shatter on contact with LN_2 or LOX due to thermal stress.

26.5.4. Asphyxiation Prevention.

26.5.4.1. Small amounts of liquid generate large amounts of gas. Avoid using cryogenics in small unventilated rooms.

26.5.4.2. LN_2, when vaporized, is initially heavier than air, sinks to the floor or lowest point, and displaces oxygen. There may not be sufficient oxygen remaining to support life.

26.5.4.3. Elemental hydrogen as a liquid is biologically inert and its only human health hazard as a vapor is displacement of oxygen, resulting in asphyxiation.

26.5.5. LOX/LN_2 Transfers.

26.5.5.1. When transferring LOX, personnel shall wear the following PPE (all items shall be clean and free of grease, oil and fuel):

26.5.5.1.1. Head covering. **(T-0)**

26.5.5.1.2. Eye protection (goggles). **(T-0)**

26.5.5.1.3. Face shield or locally purchased hard hat face shield combination. **(T-0)** **Note:** Face shield is secondary eye protection and must be worn in conjunction with primary eye protection (goggles). **(T-0)**

26.5.5.1.4. Gloves (loose fitting), leather, welder's gauntlet cuff, medium with gloves, cloth, work, cotton knit, medium as an insert; or

26.5.5.1.5. Gloves (loose fitting), leather with glove inserts, wool or other BE-approved hand protection. **(T-0)**

26.5.5.1.6. Apron. **(T-0)**

26.5.5.1.7. Coveralls, cotton white (mandatory). **(T-0)**

26.5.5.1.8. Cuff-less trousers. **(T-0)**

26.5.5.1.9. Long sleeve shirt. **(T-0)**

26.5.5.1.10. Jacket (optional).

26.5.5.1.11. Foot protection in accordance with **paragraph 26.5.1.2** or other BE-approved foot protection. **(T-0)**

26.5.5.2. When transferring LN_2, personnel shall wear the following protective clothing and equipment (all items shall be clean and free of grease, oil and fuel):

26.5.5.2.1. Head covering. **(T-0)**

26.5.5.2.2. Eye protection (goggles). **(T-0)**

26.5.5.2.3. Face shield. **(T-0)**

26.5.5.2.4. Gloves (loose fitting), leather, welder's gauntlet cuff, medium with gloves, cloth, work, cotton knit, medium as an insert; or Gloves (loose fitting), leather with glove inserts, wool. **(T-0)**

26.5.5.2.5. Apron. **(T-0)**

26.5.5.2.6. One of the following: jacket, long sleeve shirt or coveralls (Refer to TO 00-25-172 for guidance on coveralls). **(T-0)**

26.5.5.2.7. Cuff-less trousers. **(T-0)**

26.5.5.2.8. Foot protection in accordance with **paragraph 26.5.1.2** or other BE-approved foot protection. **(T-0)**

26.5.6. Oxygen Carts. Oxygen carts shall be kept clean and free of moisture, oil and grease. **(T-1)** Oxygen carts shall not be parked in grassy, sodded or asphalt-covered areas nor exposed to extreme weather conditions, or allowed to accumulate ice or snow. Gaseous oxygen (GOX) carts shall not be parked in direct sunlight. Liquid oxygen (LOX) carts containing LOX shall not be parked in hangars, nose docks or shelters unless designed or modified for this purpose. LOX carts shall be transported with vent valve closed and parked with vent valve open. **(T-1)** In accordance with TO 00-25-172, cylinders should be isolated from any incompatible or combustible material storage by a barrier of noncombustible material at least 5 five high that has a minimum fire resistance rating of 30 minutes; 50 feet from any combustible structure or sources of ignition, such as heavy traffic areas, areas where equipment is in operation and smoking areas; and 25 feet from parked aircraft and 25 feet from fuel servicing safety zones. Refer to TO 00-25-172, TO 42B5-1-2 and applicable aircraft TOs for more information on gaseous oxygen and LOX handling, servicing and storage.

26.6. Fire Prevention and Protection.

26.6.1. Always avoid contact between LOX and petroleum-based products. Such a mixture is shock sensitive and will explode when struck. **Note:** Most cosmetics and hair care products are petroleum-based.

26.6.2. Ensure no oil or grease is present on clothing or equipment when working with or around LOX. Remove and replace soiled clothes with clean ones. Remove oil or grease on equipment with approved non-petroleum solvents.

26.6.3. Static electricity may ignite combustible materials in an oxygen-rich atmosphere. Workers shall wear only approved clothing and shall ground themselves before beginning LOX operations. **(T-0)**

26.6.4. Never use LOX for cooling people, parts, equipment or food.

26.6.5. Avoid open containers of LN_2. Although inert, LN_2 is colder than LOX. It liquefies oxygen from the surrounding air and, therefore, an open container of LN_2 will slowly condense

oxygen from the air causing a LOX concentration buildup within the LN_2. When the LN_2 is pale blue in color, there is LOX present in the mixture. The LOX contamination can cause unexpected chemical reactions with other materials.

26.6.6. Consult the installation F&ES Flight on fire protection and compatible firefighting agents for LN_2 and LOX production and storage facilities. Nitrogen is a fire suppressant but oxygen supports combustion. In an oxygen supported fire, stop the oxygen flow if possible. Use large quantities of water, preferably in the form of a spray, to cool the burning material. If electrical equipment is involved in the fire, ensure electrical power is turned off before applying water. **(T-1)** LOX is a vigorous oxidizing agent and supports combustion of many materials not flammable in air. A LOX fire cannot be extinguished with carbon dioxide (CO_2), dry chemical or foam. Unless the LOX flow can be stopped or the combustible materials isolated from the LOX, such fires are difficult if not impossible to extinguish.

26.6.7. Always maintain a clear and unobstructed access to and from LN_2 and LOX facilities for firefighting equipment. **(T-1)**

26.6.8. Do not permit LOX to come in contact with organic material or flammable substances. Some materials react violently with oxygen under certain conditions of pressure and temperature. These include oil, grease, asphalt, kerosene, cloth, paint, tar and dirt, and anything which may contain oil or grease. If LOX is spilled on asphalt or surfaces contaminated with combustibles (for example, oil-soaked concrete or gravel), do not walk on or roll equipment over the area of the spill. Keep sources of ignition away for at least 15 minutes after all frost has disappeared.

26.6.9. LH_2 leaking from a fuel tank, evaporates quickly because of its low boiling point, rising in the atmosphere due to its low density in comparison to normal air. Products of burning LH_2 are non-toxic.

26.6.10. LNG vapors are extremely flammable and can be ignited by heat, sparks, flames, static electricity and other sources of ignition, such as pilot lights, mechanical/electrical equipment, and electronic devices that are not intrinsically safe. Vapors may travel considerable distances to a source of ignition where they can ignite, flash back or explode. Vapors may accumulate in confined spaces. High concentrations of LNG vapors may displace oxygen, especially in a confined space. LNG and its vapors do not exhibit the characteristic odor of natural gas. Containers of LNG are typically under pressure and temperature-controlled conditions, containers may explode if heated or if temperature control is not maintained.

26.7. Electrical Safety. LN_2 and LOX production plants and tank support equipment may require electrical service up to 480 volts alternating current. Use extreme care when working around any electrical connections, panels, motors or other energized components. Moving fluids, drive belts, removal of clothing and almost any form of friction can generate a static charge. Ground LN_2 and LOX plant components and storage tanks at all times. Personnel must be arc flash and CPR trained prior to performing duties on electrical systems. **(T-0)**

26.8. Housekeeping.

26.8.1. LOX reacts violently when it contacts many commonly used materials. Therefore, it is important that floors and drip pans in LOX plants and storage areas are kept in spotless condition. Tanks shall be kept clean and free of all hydrocarbons. **(T-1)**

26.8.2. Dirty tools and equipment are sources of hydrocarbon contamination. All tools and equipment used with oxygen components and systems shall be kept meticulously clean and properly stored. **(T-1)**

26.8.3. Store LH_2 in accordance with manufacturer's instructions and/or Air Force safety guidance. Store in a segregated and approved area. Ensure the area is dry, cool and well-ventilated, and away from incompatible materials. Eliminate all ignition sources. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52° C (125° F). Keep containers tightly closed and sealed until ready for use.

26.8.4. When handling LNG, wear all PPE as suggested in the safety data sheet (SDS) to avoid contact of material with eyes, skin or clothing. Handle only with adequate ventilation and do not breathe LNG vapors. Eliminate all sources of ignition, such as flames, sparks (including from internal combustion engines) or high temperatures when working in areas where vapors may be present. Ground and bond all lines to avoid static discharge buildup when transferring product, e.g., truck loading/unloading. Use non-sparking tools when working around LNG transfer lines and equipment. Be sure that all electrical equipment used in the area is UL-listed Class I, Division I, Group D hazardous locations. Do not use cell phones in an area where LNG is stored or transferred. Polyester clothing may cause static discharge and must not be worn at LNG locations. Avoid cold burns from transfer lines or process equipment.

26.9. Receipt, Storage and Issue of LN_2 or LOX.

26.9.1. Due to the catastrophic consequences of mixing LN_2 and LOX in storage tanks and carts, workers shall exercise care in verifying the correct product is transferred to the correct storage tank or cart. **(T-1)** Refer to TO 42B6-1-1, *Quality Control Aviators Breathing Oxygen and Aviators Gaseous Breathing Oxygen*, and TO 42B7-3-1-1, *Quality Control of Nitrogen*, for detailed procedures. Only fittings designed specifically for LOX or LN_2 equipment will be used; workers will never fabricate or use ones that are compatible with both LOX or LN_2 equipment. **(T-1)**

26.9.2. At least two workers, fully knowledgeable in DAF safety criteria and operational procedures shall be within normal voice or eye contact when generating or transferring cryogenic fluids. **(T-1)** This also applies to maintenance actions on cryotainers or plants when cryogenic fluids are present in the system. Personnel requirements for aircraft servicing operations shall be in accordance with TO 00-25-172. **(T-1)**

26.9.3. All transfers of LN_2 and LOX shall be closely monitored to minimize the extent of spills or leaks. **(T-1)** The use of drip pans is required. **(T-1)** Asphyxiation or oxygen enrichment hazards will exist if a spill occurs within a building or confined space. Appropriate local emergency procedures shall be developed for this contingency. **(T-1)**

26.10. Common Cryogenic Liquids, Their Properties and Precautions.

26.10.1. While LOX and LN_2 are widely used cryogens, other cryogens are also used within the DAF, such as LH_2 and LNG. As with LOX and LN_2, these cryogenic liquids have boiling points below minus 130° F (minus 90° C) and their use must be properly controlled to prevent any contact with the liquid, container or piping, or exposure to the gases. **(T-1)** Common cryogenic liquids include nitrogen, helium, hydrogen, argon, methane, oxygen and carbon monoxide.

26.10.2. Although liquefied carbon dioxide (CO_2) does not meet the definition for a cryogen, at -57° C it is very cold, can burn exposed skin and shall be treated as a cryogen. **(T-1)**

26.10.3. Workers shall read the SDS and safety precautions for all cryogens used. **(T-0)**

26.10.4. Use of Cryogenic Liquids.

26.10.4.1. Cryogenic liquids are extremely cold, have high liquid-to-vapor expansion ratios and may be flammable, properties that make them dangerous to handle and use.

26.10.4.2. Skin or eye contact with cryogenic liquids, cold equipment and materials used in conjunction with cryogens, or splashing liquid can cause severe burns, frostbite, tearing of flesh and eye damage. Vapors from boiling liquids can cause eye damage, freeze skin and produce oxygen deficient environments.

26.10.4.3. BE's occupational and environmental health risk assessment of the cryogenic liquid work processes identify hazards and recommend controls. Typical PPE for work with cryogenic liquids includes safety goggles, insulated gloves, apron, face shield and leather boots. Gloves should be loose enough to easily toss off in the event spilled cryogens enter the gloves. Supervisors shall review chemical SDSs as well as contact BE for proper PPE. **(T-0)**

26.10.4.3.1. Wear a long sleeve shirt and cuffless pants. **(T-0)** Pants should be worn over the tops of boots. **(T-0)**

26.10.4.3.2. Wear foot protection in accordance with **paragraph 26.5.1.2** or other BE-approved foot protection.

26.10.4.3.3. Do not wear jewelry or other materials that could trap spilled liquid against the skin.

26.10.4.3.4. Stay out of cryogen vapor pathway. **(T-1)**

26.10.4.3.5. Always use tongs when handling objects in liquid. **(T-1)**

26.10.4.3.6. Only use materials approved for use with cryogens. **(T-0)** Unapproved materials such as plastic, rubber, wrought iron and carbon steel will become brittle and shatter. (Chemical ensemble vinyl overboots shall not be worn while handling cryogens, except when threat of chemical/biological threat exists, as determined by the organization commander.)

26.10.4.3.7. Periodically inspect equipment and remove ice and frost blockages from openings to prevent over pressurization. **(T-1)**

26.10.4.3.8. Do not tamper with pressure relief valves. Report any leaky or improperly set relief valves to maintenance personnel or the manufacturer. **(T-1)**

26.10.4.3.9. Keep equipment clean without using corrosive cleaning materials that could damage the metal jacket. **(T-1)**

26.10.5. Dispensing and Transport of Cryogenic Liquids. **Note:** Follow manufacturer's instructions and SDSs for proper handling, storage, dispensing and transporting of cryogenic liquids. Information contained within this chapter provides general guidelines applicable to most cryogenic liquids.

26.10.5.1. Special precautions shall be taken to prevent spills while dispensing or transporting cryogens and minimize exposure to liquids and vapors. **(T-1)** The high liquid to vapor expansion ratio can rapidly displace all oxygen in a room and result in asphyxiation. Personnel using cryogens shall:

26.10.5.1.1. Wear proper PPE when dispensing or transferring cryogenic liquids. **(T-0)**

26.10.5.1.2. Cool the secondary container by adding a little cryogenic liquid first, when obtaining liquid from a large dispensing dewar or cylinder. **(T-1)** Dispense slowly to mitigate thermal stress and prevent excess splashing. **(T-1)** Do not leave the filling operation unattended to avoid overfilling the container. Do not allow the cryogenic liquid to fall too far before reaching the receiving container.

26.10.5.1.3. Ensure the secondary container is secured when manually pouring liquid into a smaller dewar. **(T-1)** Do not overfill, fill to less than 80 percent full to allow room for expansion and use a phase separator, if available, to control the vapor path while pouring.

26.10.5.2. Additional Precautions.

26.10.5.2.1. When using cryogens, personnel shall use at least two (2) personnel to transport cryogenic liquids indoors. **(T-1)** Use handcarts equipped with brakes to move large dewars and cylinders. **(T-1) Note:** Avoid traveling in an elevator with a dewar. For buildings with multiple floors, take necessary steps to prevent people from traveling in the elevator with the unattended cylinder/dewar. **(T-1)** Spills or elevator failures may be dangerous in this restricted space as oxygen could be displaced if the cylinder failed or leaked. Prior to transport, signage will be placed on each floor stating a dewar is not to be accompanied during transport on the elevator. **(T-1) Note:** One person transporting LOX and LN_2 carts to the flightline is acceptable as long as carts are equipped with a pintle hook and towed behind a vehicle.

26.10.5.2.2. Personnel shall always use care when handling equipment. **(T-1)** Damage to dewars could cause loss of vacuum, increased evaporation or leaks.

26.10.5.2.3. Personnel shall wear PPE and hold the dewar as far away from the face as possible when carrying a dewar. **(T-0)** Containers that cannot be easily and safely carried shall be placed on a stable wheeled base designed for the dewar. **(T-0)**

26.10.6. Storage of Cryogenic Liquids. Gas from a cryogenic liquid storage unit left open to the atmosphere or a catastrophic failure of a storage unit could create an oxygen deficient atmosphere. To reduce the likelihood of this occurring, users shall ensure:

26.10.6.1. Glass dewars have an exterior coating/cover/plastic mesh to minimize projectiles if an explosion occurs. **(T-1)**

26.10.6.2. Dewars are stored in well-ventilated rooms with a minimum of six (6) air changes per hour. **(T-1)** If the ventilation rate is unknown, contact BE to evaluate the storage area as the installation of oxygen detection systems and alarms for cryogenic liquid storage areas may be required based on location, ventilation and quantity of material stored.

26.10.6.3. Cryogenic liquids are not stored with corrosive or flammable chemicals. **(T-1)**

26.10.6.4. Dewars are placed so vents and openings are positioned away from personnel and lab equipment. **(T-1)**

26.10.6.5. Bulk cryogenic storage and dispensing facilities follow the siting process in **paragraph 26.3**. **(T-1)**

26.10.6.6. Bulk cryogenic liquid dispensing areas within buildings are well ventilated. **(T-0)** Consult BE for recommended continuous oxygen monitoring equipment. All new installations shall be designed with an oxygen monitoring system and alarm. **(T-0)**

26.10.6.7. Cryogenic dewars are not be stored in hallways, unventilated closets, environmental rooms or stairwells. **(T-0)**

26.10.7. Special Precautions for Liquid Oxygen and Flammable Cryogenic Liquids. Flammable cryogenic liquids like methane, hydrogen and carbon monoxide are hazardous. While oxygen does not burn, it supports and accelerates combustion rates of other materials and may form explosive mixtures with other combustibles. Prior to using flammable cryogenics and oxygen:

26.10.7.1. The supervisor shall contact BE to assess cryogen engineering and work practice controls. **(T-1)**

26.10.7.2. Keep all combustible materials away from flammable liquids and oxygen. **(T-1)**

26.10.7.3. The supervisor will ensure "No Smoking" signs are posted, and no sources of ignition are present. **(T-1)**

26.10.7.4. Ensure oxygen dewars and equipment are kept very clean as surface contamination can ignite if oxygen leaks from the dewar. **(T-1)**

26.10.7.5. Ensure stationary equipment is properly grounded and mobile equipment is properly bonded when dispensing. **(T-1)**

26.10.7.6. Ensure a valve operation is performed very slowly to prevent ignition of contaminants in the system.

26.10.7.7. Ensure flammable gas venting is independent from other ventilation systems and a nitrogen purge is used when needed.

26.10.8. Emergency Procedures.

26.10.8.1. Periodic equipment inspections, removal of ice blockages and replacement of damaged or old storage units will reduce the probability of catastrophic failure of storage units. Ice blockages that prevent the container from venting properly can cause an explosion hazard. **Note:** Contact the installation F&ES Flight and BE immediately if ice blockages occur.

26.10.8.2. If a spill occurs, immediately exit the area and contact the installation F&ES Flight to monitor oxygen levels in the area and determine when it is safe to re-enter.

26.10.8.3. If experiencing symptoms such as lightheadedness, dizziness or confusion, immediately seek fresh air and medical attention.

26.10.8.4. An unconscious employee in a cryogenic liquid storage area shall only be retrieved by personnel using a self-contained breathing apparatus. **(T-1)** Once the person is removed to fresh air, provide rescue breathing or CPR until paramedics arrive.

26.10.8.5. If eyes or skin comes in contact with cryogenic liquid or gases, follow first aid procedures, then immediately seek medical attention. Refer to **paragraph 26.4.3** for additional guidance.

26.10.8.5.1. Immediately remove any contaminated clothing. If clothes are contaminated with oxygen, hydrogen or carbon monoxide, remove clothing, evacuate personnel from the facility and keep contaminated clothing away from ignition sources.

26.10.8.5.2. Do not apply dry heat or rub damaged flesh or eyes.

26.10.8.5.3. Seek treatment at the nearest medical treatment facility.

26.10.8.5.4. Workers shall notify their supervisor of injuries.

Chapter 27

INTERIOR SPRAY FINISHING

27.1. Scope. Painting, doping and paint removal hazards include exposure to toxic materials and flammable or explosive mists, particulates and vapors. Inhalation of mists and vapors from paints, solvents, thinners, cleaning chemicals, strippers and epoxies can be injurious depending upon the agent's toxic characteristics and the amount and method of exposure. Three of the more toxic pigment ingredients are lead, antimony and chromates. Their use shall be avoided. **(T-0)** In addition, paints containing epoxy or polyurethanes can cause respiratory sensitization. Respiratory sensitization results from an allergic reaction to a given substance. This sensitivity develops during the induction period, which may be a few days to a few months. After sensitivity is established, exposure to even a small amount of the sensitizing material can produce a severe reaction. Refer to **Chapter 2** of this instruction, 29 CFR § 1910.107, *Spray Finishing Using Flammable and Combustible Materials*, AFI 90-821, and BE workplace evaluations for additional guidance and information.

27.2. Safety.

27.2.1. Equipment used in painting operations is hazardous. Therefore, functional managers shall ensure spray painting operations are closely supervised and equipment is in serviceable condition. **(T-0)**

27.2.2. Other Equipment. Painter's ladders, scaffolds, lifelines and other equipment shall be inspected prior to use to ensure all equipment is in a safe condition. **(T-0)** Refer to **Chapter 7, Chapter 14,** and **Chapter 22** for additional guidance and information. Powered industrial trucks, man lifts and other aerospace ground equipment shall meet the requirements of 29 CFR § 1910.178, *Powered Industrial Trucks*, for Class I, Division I locations. **(T-0)**

27.2.3. Paint Mixing. Paint or dope mixing shall be performed in designated areas, which will be adequately ventilated rooms constructed of fire-resistant materials. **(T-0)** The mixing of paint may be accomplished out of doors with approval of the installation Environmental Management office. Otherwise, paint shall only be mixed in a covered, dust-controlled area and shall not exceed local air emission standards. **(T-0)** All sources of ignition shall be prohibited in mixing areas. **(T-0)** All electrical fixtures or equipment within 20 feet of designated paint preparation areas shall meet the requirements of NFPA 70 for Class 1, Division 1 locations. **(T-0)** Mixing rooms shall have spill control and cleanup measures in place for cleaning up large and small spills. **(T-0)**

27.2.4. Housekeeping. Good housekeeping is essential in paint and dope shops to control leakage and prevent the accidental escape of flammable, combustible or toxic liquids. Spills shall be cleaned up promptly. **(T-0)** Work clothing shall be stored in metal lockers that are vented at top and bottom. **(T-0)** Street clothing and protective clothing shall be kept in separate lockers. **(T-0)** Paint rooms, booths, etc., shall be kept clean with equipment stored in a proper and orderly manner. Rags or waste soiled with sprayed materials shall be deposited in approved self-closing metal waste containers immediately after use. **(T-0)** In accordance with 29 CFR § 1910.107(g)(3), *Residue Disposal*, the contents of waste containers shall be disposed of at the end of each shift or at least once daily. **(T-0)** Contact the installation Environmental

Management office for waste disposal guidance. Paint stored in workshops shall be kept in tightly covered metal containers and meet the requirements of **Chapter 22. (T-0)**

27.2.5. Personal Protective Equipment. Personnel engaged in painting and paint removal shall wear protective clothing, respiratory devices (if required) and appropriate face, eye and hand protection. **(T-0)** Clothing shall be changed, as needed, to minimize body contamination and reduce the fire hazard. **(T-0)** Personnel engaged in the application of dopes and paints will wear an apron or equivalent protection impervious to paints, solvents and dopes. **(T-0)** These aprons and clothing shall be kept clean and, when not in use, shall be hung in ventilated metal lockers. **(T-0)** Refer to **Chapter 14** for additional guidance.

27.2.6. Eye Protection. Personnel using abrasive techniques to prepare surfaces for painting shall wear suitable eye protection to protect their eyes from chips and flying particles. **(T-0)** Eye protection and rubber gloves shall be worn when using acids, lye or noxious cleaning materials. **(T-0)** Refer to **Chapter 14** for additional guidance.

27.2.7. Respiratory Protection. BE's occupational and environmental health risk assessment determines respiratory protection. Refer to **Chapter 14** for additional guidance.

27.3. Health/Environmental Protection.

27.3.1. Radioactive Luminous Paint. This paint presents a potential health hazard and shall not be used without approval of the installation Radiation Safety Officer (usually the BE or assigned to BE). **(T-0)** Refer to AFMAN 40-201 for additional guidance.

27.3.2. Protective Creams. Hand protective creams are available and may be used by employees engaged in cleaning and painting. These creams, when applied to the skin prior to painting operations, help protect the skin and facilitate the removal of contaminants by washing in water. Refer to BE's occupational and environmental health risk assessment for additional guidance.

27.3.3. Personal Hygiene. In accordance with 29 CFR § 1910.134(g)(1)(i)(A), personnel required to wear tight fitting respiratory protection shall be clean shaven so facial hair will not interfere with the face- piece seal of the respirator. **(T-0)** Employees shall keep hands and faces clean, clothes shall be changed when contaminated, and hands and soiled objects shall be kept out of the mouth. **(T-0)** No food or drink shall be brought into or consumed in paint and dope shops. **(T-0)** Employees shall wash their hands prior to smoking or consuming food outside the work area. **(T-0)**

27.3.4. Air and Water Pollution. Painting and paint removal operations can cause air and water pollution problems impacting both the installation and local community. Liquid, solid and gaseous waste products from painting and paint removal operations shall be disposed of in accordance with AFMAN 32-7002, and as specified and approved by the installation BCE. **(T-0)**

27.4. Fire Prevention.

27.4.1. Fire Prevention. Some painting operations may pose fire hazards, e.g., paint removal, solvent wipe and paint application by means of spray apparatus. Refer to **Chapter 6,** NFPA 10, *Standard for Portable Fire Extinguishers*, NFPA 13, and NFPA 33, *Spray Applications Using Flammable and Combustible Materials*, for additional guidance.

27.4.2. Paints. Certain paints, lacquers, dopes, varnishes, shellacs, solvents, thinners and dilatants are very flammable. Other paints, under certain conditions, will burn violently. These

paints, for control purposes, are classified as flammable, unless specifically stated by the manufacture as being combustible.

27.4.3. Paint Remover. Paint removers are corrosive and are considered flammable or combustible based on their flash point. They may contain volatile ingredients and the residue after evaporation may also be flammable or combustible.

27.4.4. Solvents. Solvent materials used for residual cleanup, after the initial removal, will have a flashpoint of 140° F or above. Cleaning operations using flammable or combustible solvents shall be conducted inside spray areas with ventilating equipment operating. **(T-0)**

27.4.5. Methyl Ethyl Ketone. Methyl ethyl ketone used as a solvent wipe-down on aircraft just prior to painting. Methyl ethyl ketone is extremely flammable with a flashpoint of 21° F. At normal working temperatures, methyl ethyl ketone presents a constant fire hazard. Use extreme caution to ensure there are no ignition sources in the area and ventilation is adequate to remove flammable vapors. Employees shall use approved respiratory protection in accordance with AFI 48-137 and minimize skin contact. **(T-1)**

27.4.6. Storage. Paints and solvents shall be stored in accordance with **Chapter 22. (T-0)**

27.4.7. Spray Painting. Spray painting presents varying degrees of fire hazards, depending on the materials used. Some are particularly dangerous, and the same precautions pertaining to solvent wipe-down apply. Any material having a flashpoint below 140° F shall be handled carefully, and precautions are in order even for those having higher flashpoints. **(T-0)**

27.4.8. Housekeeping. Solvent or paint-soiled rags, paper towels and kraft paper can produce spontaneous ignition. Contaminated materials shall be removed and placed in approved self-closing metal containers plainly marked to indicate the contents. **(T-0)** At the end of each shift or at least once daily, these containers shall be emptied or removed to an approved location outside the shop for pickup and disposal. **(T-0)** Contact the installation Environmental Management office for waste disposal guidance. Refer to 29 CFR § 1910.107(g)(3) for additional guidance.

27.4.9. Sprinklers. Fire suppression sprinklers installed in spray finishing areas shall conform to NFPA 13. **(T-0)** Dry chemical or carbon dioxide extinguisher systems may be installed where automatic sprinkler protection is not available. Refer to NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, and NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, for additional guidance.

27.4.10. Extinguishers. Portable fire extinguishers shall be installed near all paint spraying areas. Refer to **Chapter 6** for additional guidance. **(T-0)**

27.5. Ventilation Systems.

27.5.1. Ventilation. Each spray area shall be provided with mechanical ventilation capable of confining, controlling and/or removing vapors, mists and combustible residues, dusts and deposits. **(T-0)** Mechanical ventilation shall be kept in operation whenever spray operations are conducted and for a sufficient time thereafter to allow ventilation of vapors from drying coated objects or material and residues. **(T-0)** An adequate supply of makeup air, e.g., fresh outside air flowing through a building via ventilating (heating or cooling) equipment, shall be provided. **(T-0)** BE shall be consulted for questions concerning makeup air requirements. **(T-0)** Ventilation and exhaust systems shall be installed and conform to the provisions of this chapter

and NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists and Particulate Solids*. **(T-0)** Refer to American Conference of Governmental Industrial Hygienists' (ACGIH) *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance,* for additional guidance.

27.5.2. Exhaust and Ventilation Units. The rotating elements of the exhaust fan shall be of nonferrous materials or the fan shall be constructed so that a shift of the impeller or shaft shall not permit two ferrous parts to rub or strike together. **(T-0)** There shall be ample clearance between the rotating element and fan casing to avoid a fire caused by friction. **(T-0)** Necessary allowances shall be made for ordinary expansion and loading, and to prevent contact between moving parts and the duct or fan housing. **(T-0)** Fan blades shall be mounted on a shaft rigid enough to maintain alignment when the fan is operating under full load. **(T-0)** All bearings shall be of the self-lubricating type or shall be lubricated from a point outside the duct and, preferably, shall be located outside the duct and the booth. **(T-0)** Refer to NFPA 30 and NFPA 91 for additional guidance**.**

27.5.3. Exhaust Ducts. Exhaust ducts shall be protected against mechanical damage, properly supported and shall normally have a separation of at least 18 inches from combustible materials. **(T-0)** Ducts shall be periodically inspected for accumulation of paint deposits and shall be cleaned as needed. **(T-0)**

27.5.4. Exhaust. Exhaust air from spray operations shall be directed so it shall not contaminate makeup air introduced into the spraying area or other ventilation intakes. **(T-0)** Unless the spray booth exhaust is from a water wash spray booth, the terminal discharge point shall be at least 6 feet from any combustible exterior wall or roof and will not discharge within 25 feet of any combustible construction or unprotected opening in any noncombustible exterior wall. **(T-0)**

27.5.5. Drying. Freshly sprayed articles shall only be dried in spaces with adequate ventilation to prevent the accumulation of explosive vapors. **(T-0)** If adequate and reliable ventilation is not provided, such drying spaces shall be considered as spraying areas. **(T-0)**

27.5.6. Motors. Unless approved for use in a flammable vapor/dust environment, electric motors driving exhaust fans shall be placed outside of booths or ducts. **(T-0)** Drive belts shall not enter the duct or booth unless the belt and pulley within the duct or booth are enclosed and guarded. **(T-0)**

27.5.7. Minimum safety, fire prevention and occupational health requirements pertaining to ventilation are addressed in this chapter. Ventilation and exhaust systems details, including information on flow-rate requirements, and the design of ventilation and exhaust systems are in the most current edition of the ACGIH's *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance.* BE will determine what, if any, periodic testing of ventilation systems is required. **(T-0)**

27.6. Storage and Handling.

27.6.1. Storage. Limit the quantity of paints, lacquers, thinners, solvents and other flammable and combustible liquids kept near spraying operations to the minimum required for operations, but not to exceed one day's supply. Storage in process areas shall be no more than three (3) approved flammable liquids storage cabinets in any single process area without the approval of the authority having jurisdiction. **(T-0)** Storage shall be listed or designed and constructed to meet the requirements of NFPA 30. **(T-0)** Any single cabinet shall contain no more than120

gallons (454 liters) of Class I, Class II or Class IIIA liquids, of which no more than 60 gallons (227 liters) shall be Class I and Class II liquids. **(T-0)** Bulk storage of these liquids shall be in a separate detached building or in rooms specifically designed and constructed to meet flammable storage requirements, e.g., inside smaller paint booth installations. **(T-0)** Operations involving water-base latex paints are exempt from the above requirements. Refer to **Chapter 22** for additional guidance and information.

27.6.2. Containers. Flammable or combustible liquids brought into spray finishing rooms shall be in original closed containers, approved portable tanks, approved safety cans or by a properly arranged system of piping. **(T-0)** Containers shall be marked in accordance with AFI 90-821. Open or glass containers shall not be used. **(T-0)**

27.6.3. Liquid Transfer. The withdrawal of liquids from containers and the filling of containers, including portable mixing tanks, shall be done only in a mixing room or in a spraying area. **(T-0)** The ventilating system shall be in operation. **(T-0)** Precautions shall be taken to prevent liquid spillage. **(T-0)**

27.6.4. Grounding. Whenever flammable or combustible liquids are transferred from one container to another, both containers shall be effectively bonded and grounded. **(T-0)** Piping systems used to transfer fluids shall also be properly bonded and grounded. **(T-0)**

27.7. Electrical.

27.7.1. Electrical Wiring. Electrical wiring and equipment shall conform to the provisions of NFPA 33. **(T-0)** Electrical wiring located in spray areas must be in rigid metal conduit, Type MI cable, or in metal boxes or fitting containing no taps, splices or terminal connections. **(T-0)** There are alternative electrical wiring options when the location is adjacent to, rather than inside, a spray area. Refer to NFPA 33 for additional guidance.

27.7.2. Electrical Equipment. Electrical equipment outside, but within 20 feet horizontally and 10 feet vertically, of any spraying area and not separated from it by partitions extending at least to the boundary of the Division 2 location shall be of a non-spark-producing design. **(T-0)** This equipment shall also conform to the provisions of the NFPA 70 for Class 1 or Class 1, Division 2 locations, as applicable. **(T-0)** Refer to the illustrations in NFPA 33 for examples of how these space limitations apply. If spraying operations are confined to an enclosed spray booth or room, the space adjacent to the booth or room shall be considered non-hazardous except for the space within three (3) feet (in all directions) of any opening in the booth or room. **(T-0)**

27.7.3. Electric Lamps. Electric lamps outside of, but within 20 feet, of any spraying area and not separated by a partition, shall be totally enclosed to prevent hot particles from falling should breakage occur, and shall be protected from mechanical damage by guards or by location. **(T-0)** Portable electric lamps shall not be used in any spraying area during spraying operations. **(T-0)**

27.7.4. Grounding. All metal parts of spray booths, exhaust ducts and piping systems conveying flammable or combustible liquids or aerated combustible solids shall be electrically grounded in an effective and permanent manner. **(T-0)**

27.7.5. Heaters. If a heater is used to heat the liquid being sprayed, it shall be low-pressure steam, low-pressure hot water or electricity. **(T-0)** If electric, it shall be approved and listed for the specific location in which it is used. **(T-0)** Heaters shall not be located in spray booths or other locations subject to the accumulation of combustible residue. **(T-0)** Agitators, if used,

shall be driven by compressed air, water, low-pressure steam or electricity. **(T-0)** If powered by an electric motor, the motor shall meet the requirements of NFPA 33. **(T-0)**

27.8. Location of Paint Shops, Dope Shops and Spray-Finishing Operations.

27.8.1. Paint Shops. Paint and dope shops shall be located in separate one-story buildings with fire-resistant floors, walls and ceilings. **(T-1)** They may be located in specially constructed rooms if separated from other operations by fire-resistant walls. Paint and dope shops shall be provided with automatic sprinkler protection. **(T-0)** Supervisors will avoid locating these shops near ignition sources. **(T-1)** Refer to NFPA 33 for additional guidance.

27.8.2. Spray Booths. When possible, paint spray booths shall be located in the paint and dope shop. In industrial facilities, spray-finishing operations shall be located and protected to minimize possible damage to other property by fire or by extinguishing agents. **(T-1)** All spray booths shall be installed and conform to the requirements in NFPA 33, the BE occupational and environmental health risk assessment and ACGIH's *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance*. **(T-1)**

27.8.3. Prohibited Locations. Spray-finishing operations shall not be conducted in an administrative, educational or public assembly facility, unless in a room specifically designed for the purpose, protected with an automatic sprinkler system and separated vertically and horizontally from such occupancies by not less than 2-hour fire-resistance construction. **(T-0)**

27.9. Paint Spray Booths.

27.9.1. Construction. ACGIH's *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance*, and 29 CFR § 1910.107(b), *Spray Booths*, provides direction on the construction of paint booths.

27.9.2. Exhaust Filters.

27.9.2.1. Filter pads and filter rolls shall be inspected after each painting operation and replaced when necessary or from a tracking log based on the number of hours in use. **(T-0)** Consult the manufacturer's instructions or the installation Environmental Management office for the proper replacement interval.

27.9.2.2. Automatic-advance roll filters shall be equipped with interlocks to stop the spraying operation should the roll advance mechanism fail. **(T-0)**

27.9.2.3. Filter pads and rolls shall be made of noncombustible materials. **(T-0)**

27.9.2.4. Both filter pads and rolls shall be changed when changing coating materials if the two materials are susceptible to spontaneous combustion when in contact with each other. **(T-0)**

27.9.2.5. Discarded filter pads and rolls shall be removed from the area daily unless water-filled metal containers are provided to hold them immersed until disposal. **(T-0)**

27.9.3. Baffle Plates. Baffle plates, if used, shall be made of noncombustible material and readily removable or accessible on both sides for cleaning. **(T-0)** Such plates shall be grounded. **(T-0)**

27.9.4. Extinguishers. The appropriate type and size portable fire extinguishers shall be located within the work area in accordance with NFPA 10 and the installation F&ES Flight. **(T-0)** Refer to **Chapter 6** for additional guidance.

27.9.5. Floor Covering. The floor of paint spray booths shall be covered with a noncombustible mat, removable for cleaning or disposal. **(T-0)** If an overspray covering is not feasible, consult the installation occupational safety office for additional guidance.

27.9.6. Flame-Producing Devices. Using or carrying of matches, lighters or other spark or flame-producing devices in or adjacent to paint spray booths is prohibited.

27.9.7. Containers. Containers supplying spray nozzles shall be a closed type or provided with metal covers, which shall be kept closed. **(T-0)** Original shipping containers shall not be subjected to air pressure above atmospheric for supplying spray nozzles. **(T-0)** Containers under pressure exceeding atmospheric pressure shall be designed and approved for such use, shall be provided with a visible pressure gauge and shall be provided with both a relief valve and a shutoff valve. **(T-0)**

27.9.8. Hoses and Couplings. Pressure hoses and couplings shall be regularly inspected for condition and shall be replaced, as needed. **(T-0)** When positive displacement pumps are used, a relief valve shall be installed in the discharge line to prevent overpressure. **(T-0)**

27.10. Compressed Air Paint Spraying.

27.10.1. On compressed air spraying equipment, a pressure regulator valve shall be installed in the air line between the compressor and painting equipment. **(T-0)** Refer to the compressor manufacturer's operating instructions for proper configuration, operation and pressure adjustments for the type of paint being used. **Warning**: Compressed air shall not be directed toward a fellow employee. **(T-0)**

27.10.2. Air Hoses. All hoses shall be checked prior to each shift to ensure they are properly connected to both their pipe outlets and the equipment to be used. **(T-0)** Air hoses shall not be connected to a pipe outlet unless the loose end is secured, since a loose hose connected to a compressed air outlet will whip. **(T-0)** Hose couplings shall be incompatible with airline respiratory protection hoses and/or respirators. **(T-0) Note:** Quick release fittings or similar devices that prevent flow or air when hose is not attached to a tool or other equipment, may be used in place of securing the loose end of an air hose.

27.10.3. Any hose showing signs of extreme wear, deterioration, leakage or weakness shall be removed from service and repaired or replaced. **(T-0)**

27.10.4. Portable Paint Spray Equipment**.**

27.10.4.1. Description. Equipment usually consists of an air compressor, paint spray gun and hose. The paint reservoir on most portable spray guns holds one quart of fluid or less. When a considerable amount of paint is to be applied, a 2-1/2 or 5-gallon pressure tank is usually employed.

27.10.4.2. Compressor. The air compressor shall be equipped with an ASME-rated air tank, a visible pressure gauge on the tank, a pressure reducer with its own gauge, a guard fully enclosing the drive belt and pulleys and a pressure-limiting switch to shut down the compressor when the system's working pressure has been reached. **(T-0)** The equipment shall be securely mounted on a wheeled carriage for portability. **(T-1)** For interior painting,

where the compressor shall be located inside the facility, only electric motor-driven equipment shall be used. **(T-0)**

27.10.4.3. Overpressure Protection. When separate paint pressure tanks are used, they shall be equipped with a gauge and a relief valve to prevent overpressure. **(T-0)** Hoses shall be rated for the maximum working pressure of the system. **(T-0)**

27.10.5. Maintenance.

27.10.5.1. A preventive maintenance program covering periodic inspection and testing of all components shall be implemented by all organizations using this equipment. **(T-1)**

27.10.5.2. Compressors, hoses, paint pressure tanks and spray guns shall be stored in areas designated and approved by the installation F&ES Flight. **(T-1)**

27.10.5.3. All paint pressure tanks and spray guns shall be cleaned after use and before the equipment is stored. **(T-1)** If solvents are used in the cleaning process, provisions of **Chapter 22** shall be followed. **(T-1)**

27.10.5.4. Respiratory Protection. If process not already evaluated, contact BE for an occupational and environmental health risk assessment. Respiratory protective devices shall meet the requirements of AFI 48-137. **(T-1)**

27.11. Drying Ovens.

27.11.1. Overview. Most drying ovens use gas or electricity to heat air which is blown across the components being dried, although infrared and microwave drying ovens are also used. Refer to the SDS for the specific equipment to use.

27.11.2. Fire Prevention. When used to dry flammable finishes, the ovens must meet or exceed NFPA 86, *Standard for Ovens and Furnaces*. **(T-0)** Avoid using spray booths or rooms for drying purposes. Raising the temperature of a spray booth increases the chance of spontaneous combustion of paint residues. Do not install drying ovens in a spraying area if the oven contains an open flame or a spark-producing element. Never conduct spraying operations in proximity to an operating drying oven.

27.11.3. Ventilation. Adequately vent the exhaust air from the oven. The oven shall have its own ventilation system. **(T-1)** If spray booth ventilation systems are utilized, the oven vent shall enter the system downstream from filters and baffles. **(T-1)** In addition, an interlock shall be installed which will automatically start the blower when the oven is turned on and automatically shut down the oven if the blower stops operating, either by accident or intentionally. **(T-1)**

27.11.4. Electrical Wiring. Make sure electrical wiring for drying ovens and associated equipment conforms to NFPA 70. **(T-0)**

27.11.5. Grounding. Ensure metal parts of drying ovens are bonded and grounded. **(T-0)**

27.11.6. Warning Signs. Post signs in the vicinity of operating drying ovens to warn of heat and to caution against conducting spraying operations. **(T-0)**

27.12. Spray Painting of Aircraft.

27.12.1. Aircraft Painting. Spray painting of an entire aircraft is permitted only in hangars specifically designed for this purpose. **(T-1)**

27.12.2. Fire Prevention. When painting aircraft, the aircraft shall be isolated and adequate fire prevention measures taken. **(T-1)** Solvents used for cleaning operations shall have flashpoints at or above 100° F. **(T-1)** The aircraft shall be properly grounded and all sources of ignition removed from the area. **(T-0)** All electrical devices and equipment shall be of an approved explosion-proof type. **(T-0)** Except when essential to perform concurrent operations, all aircraft electrical systems shall be de-energized during cleaning, painting and paint removal. **(T-0)** Smoking shall be prohibited. **(T-0)** To prevent the accumulation of static charges, all materials or objects shall be effectively grounded. **(T-0)** Refer to **Chapter 6** for additional guidance.

27.12.3. Ventilation. Ventilation shall be provided and BE shall periodically check the adequacy of ventilation in accordance with **paragraph 27.5.7**. **(T-1)**

27.12.4. Housekeeping. All spraying areas shall be kept free from the accumulation of deposits of combustible residues. **(T-0)** Cleaning shall be conducted daily. **(T-1)** Scraping tools shall be non- sparking. **(T-0)** Roof trusses, light fixtures and other overhead equipment shall be checked for accumulation of over-spray at least annually. **(T-1)** Rags or waste soiled with sprayed materials shall be deposited in approved self-closing metal waste containers immediately after use. **(T-0)** in accordance with AFMAN 32-7002 and 29 CFR § 1910.107(g)(3), the contents of waste containers shall be disposed of at the end of each shift or at least once daily. **(T-0)**

27.12.5. Limited Painting. Refer to TO 1-1-8, *Application and Removal of Organic Coatings, Aerospace and Non-Aerospace Equipment,* for additional guidance and information.

27.12.6. Grounding. Aircraft surfaces shall be grounded to preclude the build-up of static electricity whenever operations involving sanding, rubbing, painting or wiping surfaces are performed. **(T-0)**

27.13. Painting Radio and Radar Equipment.

27.13.1. Fire Prevention. The paints used to spray coat radio and radar equipment are very flammable and shall not be used near any open flames. **(T-0)** In accordance with Chapters **6** and **22**, smoking shall be prohibited within 50 feet of painting operations. **(T-1)**

27.13.2. These paints are toxic and shall only be used in ventilated spray booths in accordance with ACGIH's *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance*. **(T-1)**

27.13.3. Personal Protective Equipment. Paint shop personnel shall wear PPE as identified in BE's occupational and environmental health risk assessment. **(T-0)** While painting, personnel shall wear gloves to guard against skin irritation, and shall wear any other necessary PPE needed to complete the task. **(T-1)** Refer to **Chapter 14** for additional guidance.

27.13.4. Drying. Radio and radar equipment that has been spray painted, shall be placed in the open air for several hours or, if possible, for a full day. **(T-1)** This will prevent vapors from off gassing during the drying process and from being ignited by sparks generated when the equipment is put into operation. Emery paper or steel wool shall not be used on radio or radar equipment until the vapors have totally dissipated.

27.14. Electrostatic Paint Spraying.

27.14.1. Overview. In electrostatic paint spraying, low velocity particles of paint are passed through a negatively charged electrostatic field. The particles of paint assume the negative polarity of the electrodes and are then attracted to the work, which is positively charged, usually by being attached to a grounded conveyor.

27.14.2. Fire Prevention. Fire hazards involved in electrostatic paint spraying include solvents used with the paint, possible sparking of the unit and the use of oil-filled transformers. Fire-protective equipment shall be checked regularly with particular attention given to automatic sprinkler heads. **(T-0)** Sprinklers protecting spraying areas shall be kept free from deposits by frequent or, if necessary, daily cleaning. **(T-0)** Portable fire extinguishers shall be available for use. Refer to **Chapter 6** for additional guidance. **(T-0)**

27.14.3. Daily Inspection. Spraying equipment, including spray gun tips, shall be checked daily. **(T-0)** The entire electrostatic unit shall also be checked daily, including the electrical terminals, electrodes and insulators. **(T-0)** On humid days, condensation shall be carefully removed from insulators. **(T-0)** The conveyor system shall be checked for jerky operation, loose hooks or other defects that could permit swinging of the units being painted. **(T-0)** Moisture shall be removed from the compressed air storage tanks. Refer to the manufacturer's operating instructions or **Chapter 25** for drainage requirements. **(T-0)**

27.14.4. Insulators. The insulators on electrodes and conductors shall be kept dry and cleaned frequently to prevent flashover. **(T-0)**

27.14.5. Maintenance. Before cleaning a nozzle or attempting any work on a spray gun, the power unit shall be turned off and the nozzle shall be grounded to discharge any static charge remaining in the system. **(T-0)** Maintenance shall not be completed until enough time has elapsed to permit the solvent vapors to be drawn out of the area. **(T-0)** In the absence of automatic grounding equipment, sufficient time shall be allowed to permit any remaining electrical charge to drain off. **(T-0)** Only approved spark-resistant tools shall be used during cleaning operations, unless other type tools are permitted by the equipment manufacturer or TO. **(T-0)**

27.14.6. Grounding. All metal parts, including guard rails, shields, barriers and enclosures in the vicinity of a unit, shall be grounded to prevent static build-up. **(T-0)** Manual grounding wires shall be available and employees shall be familiar with their use. **(T-0)** Grounding shall be in accordance with AFMAN 32-1065. Items being painted in an interior spray booth shall be bonded or grounded to lessen possibility of static discharge and explosion. **(T-0)**

27.14.7. Manual Spraying. To prevent build-up of a static charge on the operator's body, the spray gun handle shall be electrically connected to ground so the operator, in normal operating position, is in contact with the handle by a resistance of not more than 1 megohm to ground. **(T-0)**

27.14.8. Personnel. Only properly trained, qualified and physically-fit persons shall be permitted to work around electrostatic apparatus. **(T-0)** Medical examinations shall be scheduled with base medical services, as needed. **(T-0)**

27.14.9. Warning Signs. Signs shall be conspicuously posted, designating the process zone as dangerous and indicating the necessity for grounding personnel entering the spray area. A red *ON* light shall be installed to the interlocked power transformer circuit. **(T-0)**

27.15. Airless Paint Spraying.

27.15.1. Principle. The principle of the airless spray method is to force paint through a small orifice at pressures from 1,800 to 4,000 pounds per square inch (psi). An electric or air-powered pump increases the hydraulic pressure of the paint in the hose and pressure vessel, if so equipped, and forces the paint, which may be heated to decrease its viscosity, from the spray gun. When the paint is forced through the orifice under high pressure, it expands and breaks into small particles. The atomized particles have enough velocity to carry them to the surface to be painted, but not enough to rebound. A spray pattern of wide coverage is created rapidly and with very little mist. Since the pattern has unusually sharp edges, masking and shielding are not necessary on most jobs. **Warning**: Never point an airless spray gun at any part of the body.

27.15.2. Operation.

27.15.2.1. Paint can be hypodermically injected into the body by high operating pressures. Injected paint may be life threatening and requires immediate medical treatment.

27.15.2.2. Do not disconnect the gun from the fluid hose or the hose from the pump until the pressure has been released from the hose and other components. This is accomplished by first closing off the electric power or air pressure to the pump and then bleeding off pressure in the fluid hose, by triggering the gun, before disconnecting it.

27.15.2.3. When handling the gun, but not actually spraying (e.g., when changing parts or work position), hold the gun by the grip and remove the fingers from the trigger. This shall prevent the gun from being activated if the operator's hold shall inadvertently tighten due to slipping or stumbling. **Note:** Guns shall be equipped with trigger guards and a safety lock. **(T-0)** The lock shall be positioned to prevent operation, except when the gun is actually in use. **(T-0)**

27.15.2.4. Ensure all hoses connections and fittings are tight and not leaking. **Note:** The fluid hose shall be designed to withstand the high pressure of the system. **(T-0)** The hose, gun and pressure vessel, if so equipped, shall be equipped with special fittings that are not interchangeable with low pressure fittings or any other fittings. **(T-0)**

27.15.2.5. Employees will inspect hoses prior to use to ensure they have no weak or worn spots. **(T-0)** Make certain the hoses do not contact moving parts of machinery, lie over or around sharp edges and corners, or come into contact with objects that would damage them. **(T-0)** Check for deterioration caused by exposure to chemicals and ordinary wear and tear. **Warning**: High-pressure leaks from hoses or connections may also cause hypodermic injection of paint. Injected paint may be life threatening and requires immediate medical treatment.

27.15.2.6. Cleaning. Consult the manufacturer's operating instructions for cleaning procedures. **(T-0)** Never pass a finger over the gun orifice to clean it, as this can result in hypodermic injection of paint into the finger. Injected paint may be life threatening and requires immediate medical treatment.

27.15.2.7. Ground the object being sprayed, as well as the spray gun, to prevent accumulating of static electricity. A static electricity discharge may ignite vapors in the confined atmosphere. Fluid hoses with a ground wire will prevent the accumulation of a static charge if the airless unit is grounded and the object being sprayed is also grounded. Periodic continuity checks shall be performed to ensure hose grounding is intact. **(T-0)**

27.15.2.8. Operators shall wear eye protection and gloves to guard against accidental contact with the spray. **(T-0)** Also, BE-approved respiratory protective equipment shall be worn if exhaust ventilation is inadequate or not available. **(T-0)**

27.16. Aerosol Cans of Spray Paint.

27.16.1. Availability. Pressurized cans of general purpose spray lacquers or enamels are available through the General Services Administration and commercial supply systems.

27.16.2. Precautions. The same general safety and health precautions apply to spray painting from pressurized cans as to spray painting by other means.

27.16.3. Storage. Cans of spray paint shall be considered flammable materials and stored in accordance with criteria in **Chapter 22**. **(T-0)** Office desks shall not be used to store cans of spray paint. **(T-0)** Office storerooms shall not be used to store cans of spray paint, unless the storage area has been approved by the installation F&ES Flight. **(T-0)**

27.16.4. Disposal.

27.16.4.1. Dispose of empty and malfunctioning cans in accordance with AFMAN 32-7002, 29 CFR § 1910.107(g)(3), other approved hazardous waste disposal procedures and applicable environmental regulations. **(T-0)** Contact the installation Environmental Management office for local guidance.

27.16.4.2. Wiping rags and other hazardous waste materials shall be disposed of in self-closing metal containers labeled to indicate the contents and in accordance with the procedures established by the installation Environmental Management office, AFMAN 32-7002, 29 CFR § 1910.107(g)(3), other approved hazardous waste disposal procedures and applicable environmental regulations. **(T-0)** Do not dispose of cans of spray paint, wiping rags and other hazardous waste materials in office waste receptacles. **(T-0)**

27.16.4.3. PPE. The same general rules governing the use of PPE apply to painting with pressurized cans. Refer to other sections of this chapter and **Chapter 14** for additional guidance.

27.17. Powder Coating.

27.17.1. Overview. These operations deposit air suspended powders on components in specially constructed containers called fluidized beds. Some beds are designed to place an electrostatic charge on the powder and the opposite charge on the component being coated. These aerated solid powders must be trapped and not allowed to escape to the atmosphere. **(T-0)** Refer to manufacturer's specifications and NFPA 33 for fluidized bed use.

27.17.2. Fire Prevention. Electrostatic fluidized beds and associated equipment shall be approved types. **(T-0)** The maximum surface temperature of equipment in the coating area shall not exceed 150° F. **(T-0)** The high voltage circuits shall be designed to not produce a spark of sufficient intensity to ignite any powder-air mixtures or result in an appreciable shock

hazard upon contact with a grounded object, under normal operating conditions. **(T-0)** Transformers, power packs, control apparatus and all other electrical portions of the equipment, with the exception of the charging electrodes and their connections to the power supply, shall be located outside the powder coating area. **(T-0)**

27.17.3. Ventilation. Forced exhaust ventilation is mandatory to maintain a safe atmosphere. **(T-0)** Dust collectors shall be incorporated within the ventilation system to trap all excess powder. **(T-0)** Where applicable, exhaust ventilation shall be sufficient to maintain the atmosphere below the lowest explosive limits for the materials being applied. **(T-0)** The electrical equipment shall be interlocked with the ventilation system so the equipment cannot be operated unless the ventilation fans are in operation. **(T-0)**

27.17.4. Housekeeping. All areas shall be kept free of the accumulation of powder coating dusts, including horizontal surfaces such as ledges, beams, pipes, hoods, booths and floors. **(T-0)** Surfaces shall be cleaned in a manner that does not scatter powder or create dust clouds. **(T-0)** Vacuum sweeping equipment, where used, shall be of a type approved for use in hazardous locations. **(T-0)** Water-saturated cleaning cloths shall be used to remove powder dust and to preclude scattering dust deposits. **(T-0)**

27.17.5. Grounding. Objects being coated shall be maintained in contact with the conveyor or other support to insure proper grounding. **(T-0)** Hangers shall be regularly cleaned to ensure effective electrical contact and areas of contact shall be sharp points or knife edges where possible. **(T-0)** The powder coating equipment shall carry a prominent, permanently installed warning regarding the necessity for bonding and grounding all metal parts of the fluidized bed and the objects being coated. **(T-0)**

27.18. Organic Peroxide Coating.

27.18.1. Principle. This type coating is applied using a special purpose spray gun. The peroxide acts as a catalyst and is introduced through one nozzle of the gun. A second material, a polyester, is introduced through a second nozzle. When the two mix at the application point, a chemical reaction occurs producing a plastic polymer coating. Refer to the manufacturer's label for the specific material in use and NFPA 33 for additional guidance.

27.18.2. Training. Only designated personnel, trained to use and handle organic peroxide formulations, shall be permitted to use these materials. **(T-0)**

27.18.3. Fire Prevention. Do not interchange equipment used for organic peroxide coating with that used for any other application. **(T-0)** Peroxides are oxidizers and shall not be mixed with other materials. **(T-0)** Promptly clean up any overspray or spills. **(T-0)** Use noncombustible absorbent material for cleanup purposes. **(T-0)** Do not store or place organic peroxide materials near any source of heat. Avoid rough handling, since these materials are sensitive to shock. **(T-0)** Smoking is prohibited and *NO SMOKING* signs shall be posted in any area where organic peroxides are stored, mixed or applied. **(T-0)** Use non-sparking tools in areas where these materials are stored, mixed or applied. **(T-0)** Dispose of this material in accordance with AFMAN 32-7002, 29 CFR § 1910.107(g)(3), other approved hazardous waste disposal procedures and applicable environmental regulations. **(T-0)** Contact the installation Environmental Management office for local guidance. **Note:** Copper beryllium tools must not be purchased, kept or dressed. **(T-0)** If a copper beryllium tool is found that has lain undisturbed for more than three (3) years, notify BE for assistance in removal. **(T-0)** If there

is no copper beryllium non-sparking tool substitute, consult with BE to determine how to apply for an exception to this requirement.

27.18.4. Protective Equipment. Ensure respirators, gloves and protective clothing are used, as recommended or required in BE's occupational and environmental health risk assessment. **(T-0)**

27.18.5. Ventilation. Ensure all spraying operations involving the use of organic peroxides are conducted in spray booths meeting the requirements of the BE occupational and environmental health risk assessment, ACGIH's *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance* and NFPA 13. **(T-0)**

27.18.6. Storage of Organic Peroxides. Ensure personnel keep only the minimum quantity of peroxides needed for daily operations in the processing area. **(T-0)** Organic peroxide formulations shall be stored in accordance with NFPA 400 and the manufacturers' recommendations. **(T-0)**

27.18.7. Mixing of Organic Peroxides with Promoters. Organic peroxide formulations shall not be mixed directly with any cobalt compounds or other promoters or accelerations, as violent decomposition or explosion can result. **(T-0)** To minimize the possibility of such accidental mixing, these materials shall not be stored adjacent to each other. **(T-0)**

Chapter 28

COMMUNICATION CABLE, ANTENNA AND COMMUNICATION SYSTEMS

28.1. Scope. This chapter addresses safety requirements for communications systems professionals when installing and maintaining radars, cable and wireless systems, antennas, and airfield and weather systems. Communications systems personnel are inherently susceptible to electrical, hazardous energy, climbing towers and utility poles, radiation, chemicals, falling from heights, soldering and confined hazards. Personnel shall be thoroughly familiar with safety-related work practices that prevent injuries resulting from falling from heights, direct or indirect contact with electrical contacts, or work performed near or on equipment or circuits, which are or may be energized. **(T-0)**

28.2. General Safety Practices.

28.2.1. Electrical Hazards. Specific safety-related work practices shall be consistent with the nature and extent of the associated electrical hazards or any other potential release of hazardous energy. Refer to **Chapter 8** or **Chapter 21** for specific and additional requirements.

28.2.2. Climbing Hazards. The primary hazards associated with climbing are falls and contact with electrical systems. A record of climbing certification shall be maintained on AF Form 1098, *Special Task Certification and Recurring Training,* or an electronic-approved product, for military and government civilian personnel. **(T-1)** Personnel who have not climbed within the last 12 months as a part of their normal job will require refresher training under the supervision of a qualified instructor. **(T-1)** The amount of training required shall be determined by the climbing instructor. **(T-1)** Records shall be updated whenever recertification is accomplished. **(T-1)** Refer to **paragraph 28.7** for additional guidance. (**Warning**: Pole Top rescue shall only be attempted by personnel who are certified or in a training status under the supervision of an instructor.) **(T-0)** Examples of climbing hazards include:

28.2.2.1. Pole conditions such as knots, knotholes, cracks, excessive gaff marks, crooked or raked poles, splinters, ice on poles and heavily creosoted or arsenic-treated poles.

28.2.2.2. Pole attachments such as conduits, molding, cable and ground wire, strain plates, signboards, nails and metal pole numbers.

28.2.2.3. Tower conditions such as cracks, rust, corrosion, loose/missing hardware, ice on climbing surfaces, bent/broken steps, improper grounding, dirt and excessive grease and oil.

28.2.2.4. Improper clothing such as badly worn shoes (e.g., loose heels, thin soles), low-cut shoes, trousers not worn correctly or securely inside of climbing irons.

28.2.2.5. Equipment items that do not fit properly, such as loose, short or dull gaffs; climber straps too tight, too loose, too long or broken; or the wrong sized climbers.

28.2.2.6. Failure to follow approved methods for climbing and working on poles and tower structures.

28.2.2.7. Wearing climbers while working on wooden poles and tower structures.

28.2.2.8. Failure to maintain good physical condition.

28.2.3. Radiation Hazards.

28.2.3.1. Non-ionizing Radiation. Refer to AFI 48-109 *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health Program*, and 29 CFR § 1910.97, *Nonionizing Radiation*, for additional guidance on management of hazards associated with non-ionizing radiation. (**Caution**: Employees with pacemakers and other electrically-active implanted medical devices must not be allowed to work in areas where the function of their device may be adversely affected by exposure to known non-ionizing radiation or electromagnetic fields. **(T-0) Note:** All communications equipment employees should be made aware of this requirement. If there are questions, refer employee(s) for a medical assessment, in coordination with the installation BE.)

28.2.3.2. Ionizing Radiation. Refer to 29 CFR § 1910.1096, *Ionizing Radiation*, and AFMAN 48-148 for guidance on hazards associated with ionizing radiation.

28.2.4. Chemical Hazards. Chemicals used in conjunction with communications equipment maintenance may present health hazards due to skin contact and/or inhalation of toxic vapors. All employees who may be potentially exposed to chemical hazards during the course of work shall require HAZCOM training in accordance with AFI 90-821, upon initial assignment and thereafter when a new hazard or chemical is introduced into the work area, a new employee is assigned or existent tasks are reevaluated with possible new hazards. **(T-0)** Disposal of hazardous waste will be coordinated with the host installation environmental management office. **(T-1) Note:** Supervisors shall ensure all personnel have access to Safety Data Sheets for chemicals used in work processes. **(T-0)** Refer to CFR § 1910.1200, *Hazard Communication*, for additional guidance.

28.2.5. Compressed Gases. Refer to **Chapter 19** for specific and additional guidance on compressed gases.

28.2.6. Falling from Heights. The potential of falling is the most obvious hazard encountered while climbing. Safety gear shall be used and worn properly. **(T-0)** Refer to **Chapter 13** and **paragraph 28.7.16** for additional guidance on personal fall arrest systems.

28.2.7. Soldering Precautions. Ensure fire extinguishers are accessible in the soldering area. **(T-1)** Remove combustible materials from the work area to prevent fires. **(T-1)** Never sling excess solder from a soldering iron. Wipe it off with a damp cloth or sponge. Always place the soldering iron in the proper holder when not in use, and never leave the iron plugged in and unattended. **(T-1)**

28.2.7.1. Wear a face shield or safety goggles when soldering. Normal prescription glasses or plain safety glasses may be used in place of safety goggles for light electronic equipment soldering, such as electronic circuit boards.

28.2.7.2. Ensure the work area where soldering is performed is well ventilated in accordance with the requirements in the BE Occupational and Environmental Health risk assessment and the ACGIH's *Industrial Ventilation: A Manual or Recommended Practice for Operations and Maintenance.* **(T-0)** Ensure all power unit exhausts are vented to the building exterior. **(T-0)** Use approved respiratory devices when working in permit-required confined spaces that are not adequately ventilated. **(T-0)** Refer to AFI 48-137 and **Chapter 23** for additional guidance and information on confined spaces.

28.2.8. Confined Spaces. Employees required to enter confined spaces, such as manholes or underground vaults, shall be trained in self-rescue. **(T-0)** Safety observers or attendants shall be trained in rescue procedures for each type of confined space to be entered. **(T-0)** Refer to **Chapter 23,** applicable TOs and 29 CFR § 1910.146, *Permit-Required Confined Spaces,* for additional requirements.

28.2.9. Grounding and Bonding. Most electricians and electronics employees consider the ground to be a stake or other direct connection into the ground (earth) to which the electrical system of the facility is connected. In a two-wire electrical cord, there is a neutral or ground wire and a hot wire. The neutral or ground wire for the system shall be white. **(T-1)** The other wire is the hot wire and it may be any color other than white or green. In a three-wire system, the third wire is the ground wire and it is always green or green with one or more yellow stripes. Bonding, on the other hand, consists of interconnecting two (2) or more pieces of conductive equipment with a suitable wire or strap to equalize the resistance and, in effect, make them as one piece of equipment as far as electrical potential is concerned. For specific guidance, refer to AFMAN 32-1065.

28.2.10. Respiratory Precautions. Respiratory protection is required if prolonged breathing of chemical vapors, mists or fumes is expected or if working in confined spaces when the atmosphere oxygen deficient or hazardous. A supplied breathing air system with quick access emergency egress air supply may be needed. BE's occupational and environmental health risk assessment identifies recommended controls. Refer to ACGIH's *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance,* and AFMAN 48-146 for additional guidance.

28.2.11. Miscellaneous.

28.2.11.1. Fluid/Chemical Leakage. Employees shall be especially watchful for any sign of oil or fluid leakage from transformers or similar devices. **(T-1)** There is a possibility the liquid may contain high concentrations of polychlorinated biphenyl, which is extremely toxic. Any sign of leakage from any component shall be reported to the nearest BE and Environmental Management office. **(T-1)** Employees shall not touch or disturb the leaking fluid without the approval of the appropriate medical activity. **(T-1)**

28.2.11.2. Heaters and Torches Used in Ground and Aerial Tents. Flame-type heaters shall not be used within ground tents or on platforms within aerial tents unless the tent covers are constructed of fire-resistant materials and adequate ventilation is maintained. **(T-0)**Torches may be used on aerial splicing platforms or in buckets enclosed by tents, provided the material is constructed of fire-resistant material and the torch is turned off when not in actual use. The tent shall be adequately ventilated while torch is in use. **(T-0)**

28.2.11.3. Notifications. Provide the installation F&ES Flight and the emergency response units with maps indicating routes to locations of remote sites. **(T-1)** Where practical, establish a memorandum of understanding with the installation F&ES Flight and emergency rescue units to conduct actual tests to evaluate the route suitability and response times. Ensure all areas containing flammable materials have appropriate fire prevention signs posted and fire extinguishers available. **(T-0) Note:** Off-base facilities/sites shall coordinate and plan with the nearest local area medical facility for emergency medical services, if the host installation medical facility is too far to provide immediate emergency medical attention. **(T-1)**

28.2.11.4. Safety Observers. When installing or repairing commercial and industrial systems, communication cables and antenna systems that may expose employees to energized equipment, high voltage circuits, 600 volts or above, or low voltage power if it has a high current flow, work shall not begin until a qualified safety observer is present. **(T-0)** An individual shall not be assigned other duties while serving as safety observer. **(T-1)** Normally, the supervisor is also the safety observer.

28.2.11.4.1. When repairing or troubleshooting energized high voltage communications equipment, the safety observer does not have to be proficient in the task being observed.

28.2.11.4.2. Safety observers shall be trained in accordance with **paragraph 1.9** and be familiar with local installation procedures to obtain medical assistance. **(T-1)**

28.2.11.4.3. While the task is being performed, the safety observer shall stand where they can plainly see all personnel who are working on the equipment, have access to the main power switch and give a positive warning of potential danger to anyone approaching the equipment. **(T-0)** If unable to maintain visual contact with the main power switch, the hazardous energy control procedure shall be used. **(T-0)** Additionally, the safety observer will have ready access to safety equipment when high voltage is involved. **(T-0)**

28.3. Training. All training shall be documented on the AF Form 55, *Employee Safety and Health Record,* or AF Form 623, *Individual Training Record Folder,* or an approved computer automated system in accordance with AFI 91-202. **(T-1)** A record of climbing certification shall be maintained on AF Form 1098 or approved computer automated system. **(T-0)**

28.4. Safety Equipment and Devices.

28.4.1. Manholes, Aerial Cables and Pole Lines. Motor vehicle traffic is a hazard to personnel working in and around manholes on streets and highways. Warning devices, barriers and guarding shall be used to protect personnel working at these locations. **(T-0)** Employees working on aerial cable installation and pole line construction along streets and highways will use the same barriers, and warning and guarding devices as required for manholes. **(T-0)** Ventilating equipment shall be positioned so the air intake is located away from vehicular exhaust. **(T-0)** Refer to TO 31W3-10-12, *Outside Plant Cable Placement*, for additional guidance on guarding requirements and warning devices.

28.4.2. Safety Straps, Harnesses, and Lanyards. Nylon straps, not leather safety straps, shall be used on steel structures. **(T-0)** Safety harnesses, straps and lanyards shall be provided and supervisors shall ensure their use when work is performed at positions more than four (4) feet above the ground, on poles and on towers. **(T-0)** Safety harnesses, straps and lanyards are not required for portable ladders. Refer to Chapter **13** and **29** CFR § 1910.268(g), *Telecommunications, Personal Climbing Equipment*, for additional guidance. **Note:** If personnel can sustain a fall of more than two (2) feet while wearing climbing equipment, fall arrest procedures and equipment guidance in **Chapter 13,** UFC 3-560-01, 29 CFR § 1910.140 and 29 CFR § 1926, Subpart M, Appendix C, *Personnel Fall Arrest Systems – Non-Mandatory Guidelines for Complying with 1926.502(d)*, shall be followed. **(T-0)** Safety straps and harnesses shall also be worn when working at elevated positions on poles, towers or similar structures, which do not have adequately guarded work areas in accordance with 29 CFR §

1910.268. **(T-0)** Supervisors shall ensure all safety climbing equipment is inspected daily by a qualified individual to determine if it is in safe working condition. **(T-0)** Each person using safety harnesses, straps and lanyards shall inspect the equipment prior to each use. **(T-0)**

28.4.3. Climbing Safety Devices. Climbing safety devices shall be installed on all ladders that are an integral part of the antenna support. **(T-0)** Where climbing safety devices are not installed, installation or maintenance shall be performed only by a certified climber using prescribed fall protection. **(T-0)** Personnel climbing metal antenna support poles equipped with metal steps will use climbing safety devices. **(T-0) Note:** All Cyber Support field technicians required to climb un-stepped communication poles will use the squeeze pole fall protector (pole choker) arrest system. **(T-0)** Users of the pole chokers will comply with TO 00-25-245, *Operations Instructions - Testing and Inspection Procedures for Personnel Safety and Rescue Equipment*, and manufacturer's instructions regarding inspection, maintenance, cleaning and storage of personal fall arrest systems equipment. **(T-0)**

28.4.4. Markings. All antenna support, power, telephone and transmission line poles shall be marked 12 feet from the butt of the pole to determine the depth of the pole. **(T-0)** The 12-foot mark shall be indicated with aluminum pole tags or marker nails. **(T-0)** If these are not available, 1-inch galvanized steel roofing nails shall be driven into the pole to form the numerals "12." **(T-0)**

28.4.5. Proximity Warning Devices. These devices may be used on cranes or aerial lifts. Refer to **Chapter 16,** Chapter **12, 29** CFR § 1910.67, *Vehicle-Mounted Elevating and Rotating Work Platforms,* and 29 CFR § 1910.180, *Crawler Locomotive and Truck Cranes*, for additional guidance.

28.4.6. Electrical Safety Boards. Refer to **paragraph 8.12** for required items in an emergency equipment kit or board.

28.4.7. Hard Hats. Refer to **paragraph 14.4.5** for additional guidance.

28.4.8. Rubber Insulating Floor Matting. Refer to **paragraph 8.11.5** for insulating matting specific guidance.

28.5. Tools and Equipment. Refer to **Chapter 11** for additional information.

28.5.1. Nonconductive tools shall be used while performing work on energized communications systems equipment. **(T-0)** Taping or plastic coating is not an acceptable means of insulation. Wooden handle tools shall not be used on energized communications systems equipment. **(T-0)**

28.5.2. All tools shall be kept clean and free of grease, oil, paint or other foreign material in accordance with TO 32-1-101. **(T-0) Exception**: This does not prevent the use of a light film of oil on tools for rust protection.

28.5.3. Ladders. Refer to **Chapter 7** for additional guidance.

28.5.4. Equipment and/or Component Cleaning. Vacuuming is the preferred method of cleaning electronic equipment. If compressed air is used, employees will limit the air pressure to less than 30 psi, use effective chip guarding and wear required PPE. **(T-0)**

28.5.5. Test equipment shall be designed, constructed and installed to provide safe work procedures and to minimize personnel exposure to hazardous work situations. **(T-0)** When tests

involve live circuits, the area shall be closed. **(T-0)** Only authorized personnel who have been briefed about the potential hazards involved shall be in this area when tests are performed. **(T-0)** At least one safety observer shall be present when high voltage is involved. **(T-0)**

28.5.5.1. Set Up. Test operators and technicians shall follow the exact methods of adjustment, operation and repair of test equipment given in TOs, manufacturer's instructions and manuals or applicable diagrams. **(T-0)** Employees shall be knowledgeable of the characteristics and safe operation of the various instruments before being authorized to use them. **(T-0)** This shall be accomplished by briefings and warning signs at affected locations. **(T-0)** Before voltage is applied, cable conductors shall be isolated to the maximum extent practicable. **(T-0)**

28.5.5.2. Approved and effective warning signs and/or signals shall be used to indicate when power is on. **(T-0)** A means of emergency power shutdown shall be provided outside the test area in addition to the main power switch within the test area. **(T-0)**

28.5.5.3. Connections to test tables, bus bars, plug racks, terminal cabinets and distribution boards shall be secure. **(T-0)**

28.5.6. Other Tools and PPE. All employees involved in test operations shall be provided with approved PPE. **(T-0)** Refer to Chapter **14, 29** CFR § 1910.268(e) and 29 CFR § 1910.268(i) for additional mandatory requirements for head and eye protection, portable lights, protective devices on tools and appliances, soldering devices and lead work.

28.6. High Voltage.

28.6.1. High voltage is defined as greater than 600 volts (root-mean-square) nominal or greater. However, much lower voltage can be lethal. The design and development of all military electronic equipment shall provide fail-safe features for safety of employees during the installation, operation, maintenance or interchanging of a complete equipment assembly or component part. **(T-1)** Operators and technicians shall not attempt to adjust any electronic equipment when there is a possibility of injury from unprotected high voltage. **(T-0)** Adjustments on operating high voltage equipment, other than those specified by TO or manufacturer‘s instructions, shall only be authorized by the unit commander. **(T-1)** The unit commander shall consider all operational requirements, TOs, manufacturer‘s instructions, safety precautions and emergency procedures before authorizing work to proceed. **(T-1)** Employees using high voltage to troubleshoot and/or test cables shall be instructed in the precautions necessary for their safety and the safety of others. **(T-0)** Employees shall be warned to stay clear while voltage is applied. **(T-0)**

28.6.2. Only qualified personnel shall perform work near energized overhead power lines. **(T-0)** Approach distances for qualified workers shall be in accordance with UFC 3-560-01, Table 3-1. **(T-0)** Before starting any communications work near overhead power lines, coordinate the work with CE's electrical shop. Safety precautions in accordance with 29 CFR §§ 1910.268 and 1910.333, *Selection and Use of Work Practices*, shall be considered when working near overhead power lines. **(T-0)**

28.6.3. If an aerial lift or equipment contacts an electrical conductor, the vehicle, equipment and attachments shall be considered energized. **(T-0)** Personnel standing on the ground shall not contact any part unless using protective equipment rated for the voltage. **(T-0)**

28.6.4. Tree branches hanging on an energized conductor shall be removed only with appropriate electrically insulating equipment, and only by authorized personnel. **(T-0)**

28.6.5. Line workers' electrical safety boots shall be worn to provide additional protection against electrical hazards. **(T-0)** Rubber footwear or line workers' overshoes shall not be worn. **(T-0)**

28.6.6. Warning signs or Air Force Visual Aids shall be prominently posted in all areas housing high voltage equipment; the highest expected voltage shall also be posted. **(T-0)**

28.7. Aerial Work.

28.7.1. Only properly trained and certified personnel, or individuals in training status and under the direct observation of a qualified instructor, are authorized to climb poles and towers. Appropriate safety equipment shall be worn while performing aerial work. **(T-0)**

28.7.2. Unit commanders shall designate, in writing, all personnel required to maintain climbing proficiency. **(T-2)** Restrict climbing authorizations to structures that must be climbed to accomplish mission requirements. **(T-1)** Coordinate with installation BCE to ensure real property structures have current inspection and maintenance, and allow only structures with current inspections that identify the structure, as safe to climb, to be climbed. **(T-1)** Ensure employees who must climb structures are provided access to inspections/maintenance records. **(T-1)**

28.7.3. Installation BCE will ensure inspection and maintenance records are provided upon request by using agencies. **(T-1)** Maintain records on the inspection and maintenance of poles and towers considered real property in accordance with DAFI 32-9005, *Real Property Accountability and Reporting*, and the *Real Property Handbook*. **(T-1)** **Note:** The *Real Property Handbook* is maintained at each installation's CE facility.

28.7.4. Installation Safety office will review these records during annual inspections to ensure they are current. **(T-1)**

28.7.5. Initial Certification Procedures. Upon assignment to a unit, each individual whose future duties will require climbing poles and towers where they may be subject to a fall of four (4) feet or more in height shall be trained and certified, as applicable. **(T-1)** For Air Force Specialty Codes other than 3D1X7, commanders shall restrict climbing authorizations to those structures that must be climbed to accomplish mission requirements. **(T-1)**

28.7.6. Climbing Certifier Requirements. Climbing certifier must:

28.7.6.1. Complete a climbing certification training course or commercial equivalent. **(T-1)**

28.7.6.2. Be designated, in writing, by the commander to conduct climbing certification. **(T-1)**

28.7.6.3. Be current in cardiopulmonary resuscitation (CPR), and first aid training. **(T-1)**

28.7.6.4. Demonstrate ability to perform and teach complex tasks aloft. **(T-1)**

28.7.6.5. Be certified to train individuals on rescue on the following structures when present on the installation. **(T-1)**

28.7.6.5.1. Pole Top.

28.7.6.5.2. Tower.

28.7.6.6. Use a training plan to conduct rescue training and climbing certification on the following structures when present on the installation. **(T-1)**

28.7.6.6.1. Pole Top.

28.7.6.6.2. Tower.

28.7.6.7. Maintain climbing proficiency and knowledge of current OSHA requirements. **(T-1)**

28.7.6.8. Determine and arrange for the specific safety equipment to use during performance evaluations. **(T-1)**

28.7.6.9. Evaluate a written and/or oral knowledge test. **(T-1)**

28.7.7. Tower and Pole Climbing Precautions. Refer to TO 31-10-19, *Antenna Systems—Anchors and Supports,* and TO 31R-10-5, *Air Force Comm Commands (E-I Standards) – Antenna Systems, Maintenance, Repair and Testing,* for precautionary requirements on tower and pole climbing.

28.7.8. Steps and Ladders. All antenna towers and structures will have steps and ladders installed when the design permits. **(T-0)** These steps and ladders shall be equipped with cages or safety devices where possible. **(T-0) Exception**: Structures designed to provide equivalent protection of a safety cage, e.g., triangular antenna towers that are climbed internally where structural members provide approximately the same protection normally afforded by a safety cage. Refer to Chapter **7, 29** CFR § 1910.25, *Stairways,* and 29 CFR § 1910.23, *Ladders,* for additional guidance on steps and ladders.

28.7.9. Radome Installation, Maintenance and/or Removal. Employees engaged in radome work shall be experienced riggers and work under the direction of a qualified supervisor. **(T-0)** Those who work on or in the immediate vicinity of the radome shall wear hard hats and safety-toed shoes. **(T-0)** Employees shall make frequent checks with the nearest weather forecasting agency to allow time to lash down equipment for impending inclement weather. **(T-1)** Also, employees shall never try to replace panels when the wind is blowing more than 30 miles per hour and shall never remove more than one panel at a time under normal conditions. **(T-0)** When mixing resin, employees shall follow the manufacturer's instructions. **(T-0)** Employees shall use the maintenance rope to lift the maintenance ladder to the top of the radome. **(T-0)** Prior to each use, the rope shall be inspected for frayed or worn spots and replaced, if required. **(T-0)**

28.8. Ground-Controlled Approach Radars. Before ascending to the roof of the ground-controlled approach trailer or other rotating antenna location, the supervisor shall inform all nearby personnel that work is being performed on the roof and shall ensure the following is accomplished: **(T-1)**

28.8.1. The surveillance antenna control switch is turned off, locked out and a warning sign or AFVA 91-303, *DANGER – DO NOT ENERGIZE – PERSON WORKING ON ANTENNA,* is placed on the high voltage power supply switch. The roof-mounted antenna safety switch shall be turned off. **(T-1)** Refer to **Chapter 21** for additional guidance on hazardous energy control requirements.

28.8.2. TO 35-1-3 requires rooftops of mobile ground-controlled approach vans be painted to warn personnel of rotating antenna hazards. **Note:** In combat areas, the sweep area covered by antenna rotation may be indicated by a broken line of ¾ inch-wide red dashes.

28.9. Single Phase Portable and Vehicle-Mounted Generators.

28.9.1. Portable Generators. Under the following conditions, the frame of a portable generator is not required to be grounded and may serve as the grounding electrode for a system supplied by the generator when:

28.9.1.1. The generator supplies only equipment mounted on the generator and/or cord and plug-connected equipment through receptacles mounted on the generator.

28.9.1.2. The non-current-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are bonded to the generator frame.

28.9.2. Vehicle-Mounted Generators. Under the following conditions, the frame of a vehicle may be permitted to serve as the grounding electrode for a system supplied by a generator located on the vehicle:

28.9.2.1. The frame of the generator is bonded to the vehicle frame.

28.9.2.2. The generator supplies only equipment located on the vehicle and/or cord- and plug-connected equipment through receptacles mounted on the vehicle or on the generator.

28.9.2.3. The non-current-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are bonded to the generator frame.

28.9.3. Neutral Conductor Bonding. A neutral conductor shall be bonded to the generator frame when the generator is a component of a separately derived system. **(T-0)** The bonding of any conductor other than a neutral within the generator to its frame shall not be required.

28.9.4. Metallic Encased Tools. The tools and equipment being powered by generators shall contain three-wire cords with grounded plugs. **(T-0)**

28.9.5. Fixed Wiring Systems. Portable and vehicle-mounted generators that supply fixed wiring systems shall be grounded in accordance with NFPA 70, Article 250, *Grounding*. **(T-0)**

28.10. Repairs and Adjustments.

28.10.1. Repairs and adjustments shall be made to energized circuits only when a power-on condition is essential. **(T-1)** Refer to applicable TO for additional guidance.

28.10.2. Repairs and adjustments of components, when the equipment slides are extended from their cabinets and voltages are applied, shall be permitted only when specified by applicable TOs, manufacturer's instructions or approved isolation and troubleshooting methods. **(T-1)** Personnel not essential to the operation shall be removed from the area before power is applied. **(T-1)** When high voltages are present or transmitters of 1-kW power rating or higher are involved, unit commander will approve procedures and adjustments not specified by TO or manufacturer's instructions. **(T-1)** Additionally, use insulated gloves when directed by TOs or the manufacturer's instructions. Ensure insulated matting is used and a qualified safety observer is present. **(T-1)**

28.11. Power Distribution Panels.

28.11.1. Power Distribution Panels and Interlocks. Power distribution panels and interlocks shall be secured to prevent personnel contacting energized circuits. **(T-0)** When equipment must be removed from service for inspection or repair, the appropriate circuit breaker or interlock shall be locked open (off), if possible, and posted with a danger tag, warning sign, AFVA or other suitable identification until the equipment is again ready for use. **(T-0)** Tape shall not be used to "lock" open circuit breakers. **(T-0)** Refer to **Chapter 17** for additional guidance and information on signs and visual aids.

28.11.2. Fuses and Circuit Breakers. The inside cover of fuse(s) and circuit breaker panels (or area adjacent if not equipped with a cover) shall indicate in writing the equipment controlled by which fuse or circuit breaker. **(T-0)** Whenever possible, over-current devices shall be installed in electrical circuits of a size and type to interrupt the current flow when the current exceeds the current rating of the equipment or exceeds the capacity of the conductor, whichever is smaller. **(T-0)** Replace blown fuses by the type required by the manufacturer or manufacturer's instructions. **(T-0)** When possible, use insulated fuse pullers when removing or replacing clip type or flat-mount cartridge fuses. Wire, foil, solder and similar materials shall not be used as substitutes for fuses. **(T-0)**

28.11.3. Carbon Blocks and Heat Coils. Prior to removal of operating carbon blocks or heat coils, a measurement of line potential shall be made using a voltmeter having a minimum input impedance of 20,000 ohms per volt to ensure the foreign electromotive force which energized these protective devices is no longer present. **(T-1)** Do not remove carbon blocks and/or heat coils if the foreign electromotive force is still present. **(T-1)**

28.12. Radar and Microwave Equipment.

28.12.1. Radar and microwave equipment are sources of non-ionizing radiation. Personnel shall be instructed in the hazards of non-ionizing radiation and shall not be exposed to non-ionizing radiation levels above the permissible exposure limits outlined in AFI 48-109. **(T-0)**

28.12.2. Exercise caution when working on or adjacent to transmitter antennas. A transmitter connected to an antenna being inspected or worked on shall be locked out and de-energized in accordance with hazardous energy control procedures in **Chapter 21**. **(T-1)** Ensure adjacent antennas, which create hazardous levels of RF radiation at the work location, are secured. **(T-1)** Ensure employees remove all jewelry prior to performing any task on equipment. **(T-0)** Review the site standard operating procedures for radiation hazard control and site RF hazards reports and drawings. This will ensure locations where RF hazards exist are known and appropriate measures (shutdown or blanking of antennas) are taken to prevent exposure of personnel working in those areas. A danger tag, warning sign, AFVA or other suitable identification advising others of the nature of work in progress shall be posted on the console of the transmitter and in all other critical locations. **(T-1)**

28.12.3. Employees shall not look into an open waveguide that is connected to an energized source of microwave radiation. **(T-1)**

28.12.4. A non-ionizing radiation warning sign shall be posted in areas where a hazard may exist. **(T-1)** Refer to AFI 48-109 for additional guidance.

28.13. Entering Manholes, Handholes and Unvented Vaults. All requirements in **Chapter 23** shall be met before, during and after any entry operation.

28.13.1. Manholes, vaults and handholes shall be positively identified as to utility type (communication, electrical power distribution, sewer, etc.) prior to entry. **(T-0)** In the absence of positive identification, personnel shall coordinate with the installation occupational safety office to establish positive identification. **(T-1)**

28.13.2. Unidentified cables shall be positively identified as to the utility type. **(T-1)** Cables shall be evaluated using a nonintrusive device, such as a clamp-on voltmeter, to determine the absence or presence of electrical voltage and current prior to beginning any work on the cable. **(T-1)** Although discouraged, a small percentage of manholes, vaults, or handholes may be joint use. In these few instances, extreme caution shall be used and the communication cable shall be positively identified. **(T-1)** When requested, the installation BCE electrical shop shall provide an electrician to assist in determining guarding and safe procedures. **(T-1)**

28.14. Cables.

28.14.1. Aerial Cables. Maintain minimum distances (42 inches up to 87,000 volts and 48 inches over 87,000 volts) between power and communications cables on joint-use poles. **(T-0)** If minimum distances cannot be maintained, de-energize the power line before performing installation or maintenance work. Employees shall comply with the requirements in UFC 3-560- 01, Table 3-1.. **(T-0)**

28.14.2. Observe caution when installing messenger strand so the loose ends do not make contact with power lines. **(T-0)**

28.14.3. When crossing over roadways, railroads, walkway, etc., ensure proper overhead clearances are maintained. **(T-0)**

28.14.4. Before riding or placing a ladder against an aerial strand, test the strand by suspending approximately 300 pounds in the middle of the span. **(T-0)** An easy test method is to place a rope over the strand and have two (2) employees suspend their weight on it.

28.14.5. Cable cars shall not be ridden over power lines (primary or secondary). **(T-0)**

28.14.6. Check handlines for serviceability prior to use. **(T-0)** The line employee shall remove the handline from the safety harness when they reach the work position and secure it to the pole. **(T-0)**

28.14.7. Use safety straps and safety harnesses while working on elevated work platforms such as aerial splicing platforms, pole platforms, ladder platforms and terminal balconies. **(T-0)** Wear insulating rubber gloves when handling suspension strand that is being installed on joint-use poles. **(T-0)**

28.14.8. Underground and Buried Cables. Refer to TO 31W3-10-12, *AF Comm Command (E-I) Standard Installation Practices – Outside Plant Cable Placement*, for guidance and requirements.

28.14.9. Pressurized Cables. Refer to TO 31W3-10-16, *Outside Plant Cable Pressurization*, for information and guidance.

28.14.10. Trenching and Excavations. Refer to TO 3lW3-10-12, *Outside Plant Cable Placement*, US Army Corps of Engineers Manual (EM) 385-1-1, *Safety and Health*

Requirements Manual, and 29 CFR § 1926.652, *Excavations — Requirement for Protective Systems*, for information and guidance.

28.15. Special Purpose Vehicles. See AFI 24-302 for additional guidance.

28.15.1. Inspection. Prior to operation, visually inspect the vehicle and check vehicle documentation, e.g., AF Form 1800, *Operator's Inspection Guide and Trouble Report.*

28.15.2. Truck-Mounted Winches. Telephone line and maintenance trucks are equipped with front- and/or back-mounted drum-type winches. A safety observer will stand to the front and well clear of the winch when used. **(T-0)** Winches are extremely powerful tools and extreme caution shall be exercised when used. **(T-0)** The winch operator shall be thoroughly trained and familiar with both the operation of a winch gear train and power takeoff lever movement. **(T-0)**

Winch operators shall wear leather gloves when handling a winch line and never hand feed the line onto the drum. **(T-1)** Inspect the winch line before use for defects such as broken or worn strands, kinks, flat spots and worn eye loops. **(T-1)** Remove damaged or badly kinked winch lines from service. **(T-1)** Winch lines shall not be rigged to pull against the flange of the winch drum. **(T-1) Note:** Some winches are designed for pulling while others are designed for raising or lowering. Winches shall be used for their designed purpose. **(T-1)**

28.15.3. Cable Reels. The safe handling, moving, and positioning of cable reels require well-trained operators in good physical condition. Pre-planning the move and final positioning will identify any problems with the surface condition and the best methods to use. Always use a spotter when backing cable reel trailers. Caution shall be used when handling cable reels and cable reel trailer. **(T-0)** A full reel of large cable may weigh as much as 10 tons. Therefore, it is necessary to carefully control the movement of the reel. Never permit the reel to tilt. On uneven or soft ground, provide a substantial runway of heavy planks. **(T-0)** Level the reel by blocking it in a manner that prevents tilting. After positioning in the desired storage location, block the reel to prevent rolling. **(T-0)**

Chapter 29

BATTERIES – MAINTENANCE, HANDLING AND STORAGE REQUIREMENTS

29.1. Scope. DAF battery shops, rooms and areas contain space and equipment for shipping, receiving, cleaning, charging, discharging, storing and repairing storage batteries for aircraft, vehicles and ground support equipment. Personnel engaged in these activities shall use approved Air Force Technical Orders (TOs) and manufacturer's instruction, where applicable. **(T-1)**

(**Note:** Commercial manufacturer's manuals are not authorized for DAF use on aircraft batteries and must be converted to technical data by the appropriate AF Engineering Support Office or Systems Program Office. **[T-1]**) The battery shop, room or area shall be designed to eliminate certain hazards associated with battery maintenance. **(T-1)**

29.1.1. Refer to 29 CFR § 1910.178, *Powered Industrial Trucks;* 29 CFR § 1926.403, *General Requirements (Electrical);* 29 CFR § 1926.441, *Batteries and Battery Charging;* and NFPA 70, including Article 480, *Storage Batteries*, and **Chapter 5**, *Special Occupancies*, for requirements regarding battery maintenance and operations. **(T-0)**

29.1.2. Refer to DAFMAN 32-1084 for guidance on battery facility requirements. Whenever a facility deficiency is identified, appropriate controls and corrective actions are required. If the deficiency involves a local requirement and cannot be corrected, a waiver letter shall be obtained from the applicable base agency. **(T-1)**

29.2. Safety.

29.2.1. An approved and certified Occupational and Environmental Health Risk Assessment shall be accomplished by the installation BE on battery maintenance and operations. **(T-1)** The assessment shall include PPE requirements and required battery maintenance and operations procedures. **(T-1)**

29.2.2. Electrical components and systems shall be de-energized and isolated from other energized circuits and/or power sources before working on, servicing, removing or replacing a battery, unless specifically directed by a TO or specific requirement. **(T-1)** Refer to **Chapter 21** for additional guidance on hazardous energy control.

29.2.3. Battery Equipment and Charging Operations. Only trained and qualified personnel shall be permitted to change, maintain or charge batteries. **(T-1)** Qualified personnel or those accompanied by qualified personnel shall be allowed access to battery shops, rooms or areas. **(T-1)** Refer to ACGIH's *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance*, for additional guidance.

29.2.4. When working with corrosives, an emergency shower or eyewash unit shall be provided for emergency use. **(T-0)** Refer to **Chapter 9** for additional information on emergency showers and eyewash units.

29.3. General Facility and Equipment Requirements for Battery Rooms and Areas. This paragraph addresses general requirements for lead acid and lithium type batteries utilized in aerospace, ground transportation, electrical ground infrastructure, office equipment, etc.

29.3.1. There are three common lead-acid battery technologies: flooded, gel and absorbed glass mat. A valve-regulated lead-acid battery, e.g., the absorbed glass mat and the gel battery

(gel cell), is a type of low- maintenance lead-acid rechargeable battery. Because of their construction, valve-regulated lead-acid batteries do not require regular addition of water to the cells. The charging, maintaining or storage of each battery type shall follow the manufacturer's instructions and recommendations. **(T-1)**

29.3.2. For the architectural requirements for the storage, charging, ventilation, exhaust and thermal management of Lithium Ion (Li-Ion) batteries for mobile applications and equipment. Refer to UFC 3-520-05, *Stationary and Mission Batteries*, paragraphs 3-3 through 3-6 and associated subparagraphs. **(T-0)** The installation of stationary battery applications using Li-Ion technologies are prohibited in occupied facilities per UFC 3-520-01, paragraph 3-11.1.4. **(T-0)**

29.3.3. Doors. Battery shop exit doors shall swing outwards. **(T-1)** Refer to **paragraph 2.7** for roll up door requirements.

29.3.4. Floors, walls, ceilings, doors and other painted surfaces in battery rooms and areas shall be painted with an acid-alkali-resistant epoxy-poly-urethane paint. **(T-1)** An acid-alkali-resistant epoxy-poly-urethane paint with primer shall be used. **(T-1)** These paints provide the most protection against corrosion.

29.3.5. All mechanical equipment and fixtures shall be designed and specified to withstand the corrosive acid-alkali atmosphere from battery operations. **(T-1)**

29.3.6. Racks and Tools. Racks used to support batteries during charging shall be made of or coated with non-sparking materials and designed to permit free access for servicing batteries. **(T-1)** Metal racks shall be protected with an acid-alkali resistive coating and the actual supports on which a battery rests shall be made of non-conductive materials or be suitably insulated. **(T-1)** Tools used during battery charging or servicing shall be non-conductive or coated with non-conductive materials. **(T-1)**

29.3.7. Work Surfaces. Work surfaces shall be non-conductive, and resistant to both acid and alkali. **(T-1)** Whenever possible, battery servicing and maintenance shall be performed on elevated, non-conductive racks. **(T-1)** These racks shall allow air to flow under the battery to provide additional cooling to dissipate heat generated during charging and discharging. **(T-1)**

29.3.8. Charging Bench Floor Matting. Provide three-foot wide non-slip matting in front of all charging benches. **(T-1)** The matting protects personnel from electric shock and slipping hazards. Matting shall conform to TO 00-25-232, *Control and Use of Insulating Matting for High-Voltage Application.* **(T-1)**

29.3.9. Battery Charging. Refer to 29 CFR § 1910.178(g) for additional guidance.

29.3.9.1. Chargers shall be turned off before a battery is connected or disconnected. **(T-1)** Failure to follow this practice can cause sparks, arcing and pitting of contact surfaces of mating plugs or connectors. Connections between a battery and charger shall be through a mating plug or connector assembly. **(T-1)** Before performing work on charger plug contacts, workers shall ensure chargers are turned off and disconnected from the input power source. **(T-1)**

29.3.9.2. Work shall not be conducted on batteries while they are being charged or discharged unless otherwise specified by the applicable TO. **(T-1)** Refer to **Chapter 21** for additional lockout/tagout guidance.

29.3.9.3. Charger leads shall be kept off the floor and out of aisles to avoid damage and potential tripping hazards. **(T-1)** Overhead leads shall be plainly marked and be high enough to keep personnel from walking into them. **(T-1)**

29.4. Fire Prevention.

29.4.1. Explosive Hazards. Always assume explosive gases exist in and around batteries, unless positive steps have been taken to eliminate them. For this reason, smoking, open flames, sparks, arcs and other sources of ignition shall be prohibited in the immediate vicinity of batteries that are being charged or discharged. **(T-1)**

29.4.2. Protection from Sparks. The following spark ignition sources shall not be permitted in the vicinity of batteries:

29.4.2.1. Shorting out a battery with metal tools or objects. **(T-1)**

29.4.2.2. Connecting or disconnecting batteries while they are in use. **(T-1)** Also, connecting or disconnecting a battery from a charger before turning the charger off, or while removing or installing a battery in a vehicle when current is flowing in the battery circuit.

29.4.2.3. During vent cap removal. **(T-1)** If the battery is equipped with removable vent caps and removal is required for service by the battery manufacturer, combustible gases shall be flushed out of each cell with a gentle stream of air (the use of proper mechanical ventilation), or manually (e.g., by fanning each vent opening with a stiff piece of cardboard or other suitable non-conductor). **(T-1)** PPE, to include face and hand protection, shall be worn at all times. **(T-0)**

29.4.2.4. Installing or replacing electrical components in the presence of flammable or combustible liquids. **(T-1)** The employee shall keep battery ground cable disconnected until liquids are no longer present. **(T-1)**

29.4.2.5. Cleaning batteries or terminals. **(T-1)** Never clean batteries with metal brushes or other metal devices, which may generate sparks or contact both terminals and short circuit the cells.

29.5. Ventilation Systems.

29.5.1. The ventilation system shall ensure the maximum gas-air mixture generated during charging is maintained below 25 percent of the lower explosive limit. **(T-1)** The installation BE's Occupational and Environmental Health Risk Assessment will identify ventilation needs for battery shops, rooms and areas in accordance with ACGIH's *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance*. **(T-1) Note:** NFPA 70, Article 480.9(A), *Ventilation*, requires adequate ventilation to prevent classification of a battery location as a hazardous (classified) location. Without adequate ventilation, NFPA 70, Article 500, *Hazardous (Classified) Locations*, requires installation of explosion proof lighting fixtures and receptacles.

29.5.2. Ventilation in battery charging rooms shall be sufficient to keep rooms or areas maintained between 68°F and 85°F, unless permitted by a TO or other appropriate guidance. **(T-1)**

29.5.3. Batteries shall never be operated, charged or discharged at temperatures above 120° F, if normal service life is expected. **(T-1)** Floor fans with explosion-proof motors can help keep battery temperature from rising above 120ºF.

29.6. Storage and Handling.

29.6.1. Chemical Spills and Environmental Issues.

29.6.1.1. Precautions shall be taken to prevent the electrolyte from spilling. **(T-1)** Batteries shall not be laid on their side unless permitted by TO. **(T-1)** Batteries shall not be transported without being properly secured with straps or other restraint devices. **(T-1)**

29.6.1.2. Spill control procedures shall be developed and coordinated with the installation Occupational Safety office, BE, CE and Environmental Management office. **(T- 1)**

29.6.1.3. Dispose of waste batteries and fluids in a manner consistent with approved hazardous waste disposal procedures and applicable environmental regulations. Contact the installation Environmental Management office for waste disposal guidance.

29.6.2. Vented lead-acid and vented nickel-cadmium batteries shall be maintained and stored in separate rooms or areas. **(T-0)** The battery shop supervisor shall ensure all visitors entering the battery shop receive a safety briefing on the hazards located in the battery room or area before entry is authorized. **(T-1)** If maintenance is performed while visitors are in the battery shop, the visitors shall also wear required PPE, as required and prescribed in **paragraph 29.2.1**. **(T-1)**

29.6.3. Sealed lead-acid batteries and sealed nickel-cadmium batteries do not require a dedicated battery room or area, and can be charged in the same battery room or area as long as a five-foot minimum clearance is maintained between the different batteries. A sealed lead-acid battery can be charged in a dedicated nickel-cadmium battery shop as long as a minimum distance of five (5) feet is maintained between the different battery chemistries.

29.6.4. The electrolyte in lead-acid batteries contains water. These batteries are subject to damage in freezing temperatures and shall be stored in temperature-controlled areas. **(T-1)** Lower battery charges shall allow for freezing at higher temperatures. **(T-1)**

29.6.5. Batteries of different chemistries shall be stored as directed by the installation Occupational Safety office, BE, CE and Environmental Management office. **(T-1)** Ensure nickel-cadmium and silver-zinc batteries are serviced in areas isolated from lead-acid batteries. Batteries of different chemistries must be kept at least five (5) feet apart when charging, discharging or being serviced. **(T-1)**

29.6.6. Batteries received during cold weather or which cannot be disposed of during warm weather, shall be stored in heated or protected storage areas (temperature-controlled) to avoid broken cases and/or contamination of storage areas from electrolyte spill caused by freezing or overheating. **(T-1)**

29.6.7. Industrial motive power batteries vary widely in the number of cells, size, weight and configuration. Handling these batteries is different from handling automobile batteries and shall not be attempted without proper equipment. **(T-1)** The battery weight is usually stamped on the steel tray near one of the lifting ears. The battery manufacturer shall be consulted if the weight of a battery is not known and it cannot be weighed. **(T-1)**

29.7. Electrical.

29.7.1. Electrical test equipment shall be de-energized prior to being disconnected from energized circuits or power sources unless specifically directed by the appropriate TO. **(T-1)**

29.7.2. Receptacles and lighting switches shall be located outside the battery maintenance or storage area. **(T-1)** Lighting fixtures shall be protected from physical damage by guards or isolation. **(T-1)**

29.7.3. Flexible cords used for charging shall be suitable for the type of service used and approved for extra-hard usage. **(T-1)** Connectors shall have a rating not less than the current-carrying capacity of the cord. **(T-1)**

29.7.4. Refer to **paragraph 2.3** on the wear of jewelry and eyeglasses/safety goggles.

29.7.5. Refer to **Chapter 8** for additional guidance.

29.8. Installation and Care of Vehicle and Support Equipment Batteries.

29.8.1. Batteries shall always be installed in a level position to prevent leakage of electrolyte. **(T-1)** Excessive tightening of hold-down brackets can distort or crack the battery case. Cable clamps shall not be pounded on battery terminals, but shall be spread until they can be seated properly. **(T-1)**

29.8.2. When removing a battery from a vehicle, the battery ground cable shall be disconnected first to prevent the possibility of a spark. **(T-1)** Upon reinstallation, the battery ground cable shall be installed and tightened last to prevent a short or spark and possible explosion. **(T-1)**

29.8.3. Some vehicles have two or more batteries, hooked in parallel, with one or more of the batteries remotely located. When the positive and negative cables are removed from one battery, the spark potential can still exist until the ground cable has been removed from the other batteries. Personnel shall consult the appropriate TO for proper maintenance and procedures working on vehicles with two or more batteries. **(T-1)**

29.8.4. When removing or replacing a battery, if there is a possibility of shorting out the battery, the battery terminals shall be covered with a non-conductive material, such as rubber or a piece of plywood. **(T-1)**

29.8.5. Vehicle Battery Jump-Starting. Battery jump-starting procedures shall only be accomplished by trained and qualified personnel. **(T-1)** Follow TO guidance for proper jump-start procedures. If not available, follow manufacturer‘s instructions.

29.8.6. The battery in most industrial trucks also serves as a counterweight for the carried load. A replacement battery shall never be installed when its service weight is not within the range of battery weights marked on the truck nameplate. **(T-1)** A lighter weight battery could change the truck‘s center of gravity and upset a loaded truck.

29.8.7. Visual inspections are usually sufficient to determine the condition of contacts, which shall be cleaned or replaced if they show evidence of oxidation or pitting. **(T-1)** Excessive heating of current-carrying parts indicates a poor electrical contact which shall be investigated. **(T-1)**

29.9. Aircraft Battery and Electrical System Specific Requirements.

29.9.1. Aircraft Electrical System Maintenance. Only personnel qualified on aircraft battery and electrical systems shall perform maintenance on aircraft battery and electrical systems. **(T-1)** Specialists shall follow TO guidance whenever troubleshooting aircraft electrical systems. **(T-1)** When the TO does not cover a specific troubleshooting procedure, reference the aircraft wiring schematics.

29.9.2. Electrical systems shall be de-energized whenever possible. **(T-1)** If the approved procedure requires work on an energized circuit, the sequence of steps shall be followed and other maintenance personnel must be informed of this action. **(T-1)** If the system has been de-energized, procedures shall include a provision to effectively lockout or tagout the power source while work is in progress. An AFTO Form 492, *MX Warning Tag*, authorized by AFI 21-101, shall be used in accordance with local procedures. **(T-1)** Refer to **Chapter 21** for additional guidance on hazardous energy control.

29.9.3. Aircraft Battery Shop Requirements. Batteries shall never be charged while in the aircraft, unless permitted by the aircraft TO. **(T-1)** Battery chargers shall carry at least one permanently affixed warning sign, which reads: *Warning—Keep 25 Feet Clear of Aircraft Engines and Fuel Tank Areas*. **(T-1)** Refer to NFPA 70, Articles 511.10 and 513, for additional guidance on Class I locations and aircraft hangars.

Chapter 30

MOTOR VEHICLE – OPERATIONS AND MAINTENANCE

30.1. Scope. This chapter provides information for safe operations in vehicle maintenance operations, and is not intended to be all-inclusive. It addresses general safety guidelines for vehicle maintenance facilities and operations, including refueler maintenance facility operations, equipment usage, and ventilation and exhaust requirements. Additionally, it covers the use, handling and storage of solvents, such as MIL-PRF-680C, *Performance Specification: Degreasing Solvent*, welding operations, mobile maintenance and vehicle repair pit requirements. **Note:** Refer to **Table 30.1** for a list of additional references for motor vehicle operations and maintenance guidance.

Table 30.1. Additional Guidance for Motor Vehicle – O&M.

Additional Guidance for Motor Vehicle – O&M
AFI 24-302, *Vehicle Management*
AFMAN 24-306, *Operation of Air Force Government Motor Vehicles*
AFMAN 48-146, *Occupational and Environmental Health Program Management*
TO 36-1-191, *Technical and Managerial Reference for Vehicle Maintenance*
TO 42B5-1-2, *Gas Cylinders (Storage Type) Use, Handling and Maintenance*

30.2. Specific Hazards.

30.2.1. Vehicle maintenance hazards include, but not limited to, hazardous noise, compressed gases, pressurized air, toxic materials, flammable or explosive mists, particulates and vapors. During servicing of single piece rim wheels, pressurized air in the tire may release suddenly either by bead break-in or by the bead slipping over the rim flange. Brake and clutch assemblies on military vehicles may contain asbestos, which poses an inhalation hazard. Inhalation of mists and vapors from nearly all fuels, paints, solvents, thinners, cleaning chemicals, strippers and epoxies can be hazardous depending upon the material's toxic characteristics and amount and method of exposure.

30.2.2. Many chemicals/solvents can cause skin irritations, burns and/or defatting of the skin. These chemicals/solvents can also be absorbed through the skin and cause internal damage. In addition, paints containing epoxy or polyurethanes can cause employee sensitization, which causes an allergic reaction to a given substance. Sensitivity usually occurs after exposure of a few days to a few months. After sensitivity is established, exposure to even a small amount of the sensitizing material will likely produce a severe reaction. Refer to AFI 90-821 for additional guidance and information on chemical exposures.

30.3. General Safety.

30.3.1. Keep street clothing and protective clothing in separate lockers. **(T-0)** Work clothing shall be stored in metal lockers, vented at top and bottom. **(T-1)**

30.3.2. Approved self-closing metal waste containers shall be provided wherever rags or waste are impregnated with flammable or combustible materials and all such rags or waste deposited therein immediately after use. **(T-1)** In accordance with 29 CFR § 1910.107(g)(3), the contents

of waste containers shall be disposed of at least once daily or at the end of each shift. **(T-0)** Contact the installation Environmental Management office for waste disposal guidance. **(T-1)**

30.3.3. Backing of government-owned motor vehicles.

30.3.3.1. Government-owned motor vehicles equipped with back-up warning alert systems will be maintained in an operational fashion as designed and not modified. **(T-0)**

30.3.3.2. Backing of government-owned motor vehicles and the usage of spotters will be in accordance with AFMAN 24-306.

30.3.3.2.1. Government-owned motor vehicle operators will immediately stop if they lose visual contact with the spotter or notice the spotter is dangerously positioned between the vehicle and another object. **(T-1)** In such cases, vehicle operators will secure the vehicle, exit and make an on-the-spot correction before continuing operations. **(T-1)**

30.3.3.2.2. Spotters should position themselves away from the vehicle's path of travel where they maintain visual contact with the vehicle operator. **(T-1)**

30.3.4. Respiratory protection is required if prolonged breathing of chemical vapors, mists or fumes is expected or if working in confined spaces when the atmosphere is oxygen deficient or hazardous. A supplied breathing air system with quick access emergency egress air supply may be needed. BE's occupational and environmental health risk assessment identifies recommended controls.

30.4. Occupational Health.

30.4.1. Refer to **paragraph 2.2.2** for additional guidance on hazardous noise or noise level surveys.

30.4.2. Stationary internal combustion engine-driven equipment shall not be operated inside buildings unless an exhaust system, approved by BE, is installed and used. When equipment is operated adjacent to buildings, the exhaust shall be directed away from the building. **(T-1)** Ventilation shall be adequate to provide fresh air and prevent accumulation of JP-4, gasoline, carbon monoxide and other hydrocarbon vapors. **(T-1)** Refer to **paragraph 30.6** for additional guidance on ventilation.

30.4.3. Jet engine fuels containing toxic aromatics shall be handled with the same precaution(s) as gasoline. **(T-1)**

30.4.4. First Aid. First aid kits shall be approved by installation medical services in accordance with **paragraph 1.9**. **(T-1)**

30.5. Facility and Equipment Requirements for Vehicle Maintenance Operations.

30.5.1. Proper layout, spacing and arrangement of equipment and machinery are essential. The installation Occupational Safety office, F&ES Flight, BE and CE shall coordinate on all layout plans. **(T-1)** Refer to **Chapter 7** for additional guidance.

30.5.2. Only authorized shop personnel shall be allowed on shop floor. **(T-1)**

30.5.3. Vehicle operators and mechanics shall sound vehicle horns before backing and intermittently during the entire backing operation unless vehicles are equipped with backup alarms. **(T-1)** Vehicle operators shall stop and sound horn prior to entering and leaving the

maintenance shop. **(T-1)** A spotter shall be posted when moving large equipment and vehicles backwards or in close quarters. **(T-1)** Refer to **paragraph 12.2.10** for additional backing/spotter guidance.

30.5.4. Shop entrances and exits shall be clearly marked and lighted to prevent mishaps. **(T-0)** Appropriate traffic signs shall be posted at entrances and exits. **(T-1)** To minimize mishaps, a maximum speed limit of five (5) miles per hour shall be enforced in and around shops. **(T-1)** The operator shall sound the vehicle horn prior to entering or exiting facilities to alert nearby personnel. **(T-1)**

30.5.5. Floor slopes, drains and oil/water separators in shops shall be constructed and maintained using guidance from the installation Environmental Management office. **(T-1)** Oil separators shall be cleaned at a frequency determined by the installation Environmental Management office. **(T-1)** The shop supervisor shall maintain the letter identifying the cleaning frequency and document compliance with the cleaning frequency. **(T-1)** Drains shall not be connected to sanitary sewers, except the effluent from oil separators shall be connected to sanitary sewers. **(T-1)**

30.5.6. When jacking a vehicle, consult the operator's or maintenance manuals for proper jacking procedures.

30.5.7. No person outside the range of prompt and easy communication with other employees shall perform work with a risk of serious injury unless a second person is available to assist in an emergency.

30.5.8. Employees shall never use ramps on soft earth. They shall ensure the ramps rest on a firm, level surface. **(T-1)**

30.5.9. Machinery and Machine Guarding. Supervisors shall maintain technical data, as well as manufacturer's operator instructions for all machinery and shop equipment in their area of responsibility. Machinery and shop equipment shall be maintained and operated by qualified personnel. Machine guarding and power transmission guarding not covered in this manual, shall be in accordance with equipment manufacturer's instructions or 29 CFR § 1910, Subpart O, *Machinery and Machine Guarding*, as applicable. Refer to **Chapter 11** for additional guidance.

30.5.10. Hand Tools: Portable Powered and Non-powered. Specific criteria unique to a certain tool shall be contained in the technical data requiring use of the tool. **(T-1)** To determine required tools and equipment, consult TO 32-1-2. Allowance Standards 403, *General Purpose Tools*, and Allowance Standards 457, *Vehicle Maintenance, Locomotive Maintenance, and Vehicle Operations*, and General Services Administration catalogs shall be used to determine additional requirements necessary for a particular maintenance mission. **(T-1) Note:** Refer to **Chapter 11** for specific requirements on hand tools.

30.5.11. Roll-up Doors. Refer to **paragraph 2.7** for roll up door requirements.

30.6. Fire Prevention.

30.6.1. The installation F&ES Flight shall be consulted for specific shop requirements. **(T-1)** **Note:** Refer to **Chapter 6** for additional guidance.

30.6.2. Open Flames. Flame-producing equipment shall not be used in refueler maintenance shops. **(T-1)** Other vehicle maintenance shops may use flame-producing equipment if all safety procedures are followed and requirements in **Chapter 20** are complied with.

30.7. Ventilation.

30.7.1. Local Engine Exhaust Ventilation.

30.7.1.1. The vehicle maintenance work area shall have a suitable exhaust ventilation system either under the floor with readily available adapter hoses or an overhead system arranged so connecting hoses can be raised when not in use. **(T-1)** In shop areas with under floor systems, adapters shall be used on equipment having vertical exhaust stacks to conduce the exhaust to the floor connections. **(T-1)** Carbon monoxide (CO) concentration shall be monitored by BE and levels kept under occupational and environmental exposure limits listed in AFMAN 48-146. **(T-1)** The facility owner/operator shall ensure a proper calibration schedule for the airborne gas analyzer. **(T-1)**

30.7.1.2. Exhaust ducts shall be protected against mechanical damage. **(T-1)** In-floor ducts shall be flush with the floor, level when closed and capable of withstanding vehicle and equipment traffic or the maintenance operation being performed. **(T-1)** In-floor ducts shall be equipped with a fluid collection system that prevents drainage into the installation sanitary sewage system. **(T-1)** This can be accomplished by sump pumps, a fuel and/or oil separator, a combination thereof, or by routing collected fluids to the shop's main drainage system. Overhead ducting shall be properly supported and located to avoid damage from moving vehicles and equipment. **(T-1)**

30.7.1.3. When not in use, ducting shall be stowed in a way that prevents damage to the equipment and does not cause a hazard to personnel. **(T-1)**

30.7.2. General Engine Exhaust Ventilation. Minimum general ventilation rates are specified in ACGIH's *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance*. This ventilation, either natural or mechanical, is in addition to local exhaust ventilation and is required to remove vehicle exhaust gases and fuel vapors.

30.7.3. The following operations or processes may produce airborne contaminants that exceed occupational and environmental exposure limits. The vehicle maintenance supervisor shall have these and similar operations evaluated by BE and shall document the results, along with any corrective actions taken. **(T-1)**

30.7.3.1. Spray painting, spray cleaning, solvent cleaning or stripping operations.

30.7.3.2. Open surface tanks (dip tanks, etc.).

30.7.3.3. Welding, soldering, torch cutting and metalizing.

30.7.3.4. Abrasive blasting operations.

30.7.3.5. Metal cutting, grinding, buffing and polishing operations.

30.7.3.6. Machine shop operations (lathes, etc.).

30.7.3.7. Battery shops. Refer to **Chapter 29** for additional guidance.

30.7.3.8. Open tanks on refueler vehicle.

30.7.3.9. Brake lining discs.

30.7.3.10. Clutch linings.

30.7.4. In accordance with AFMAN 48-146, BE's risk assessment identifies controls.

30.7.5. If ventilation system deficiencies exists, the vehicle maintenance supervisor shall use current BE occupational and environmental health risk assessment to determine interim control measures needed. **(T-1)**

30.7.6. Periodic Testing. In accordance with AFMAN 48-146, BE shall perform periodic evaluations. **(T-1)** BE shall provide evaluation results to the vehicle maintenance supervisor. **(T-1)** If a shop has a manometer or similar piece of equipment that measures the ventilation system's air flow, then only the monitoring data needs to be reviewed annually by BE and the shop supervisor.

30.8. Cleaning With Solvents.

30.8.1. General Requirements.

30.8.1.1. A metal tank or container approved for flammable or combustible liquid shall be used to immerse articles or materials for cleaning, finishing, treating or similar processes whenever flammable or combustible cleaning materials are used. **(T-1)** The metal tank or container shall be labeled with the contents. **(T-1)** Care shall be taken to avoid solvent spillage. **(T-1)**

30.8.1.2. Care shall be exercised in the correct selection of solvents. **(T-1)** The lower the flashpoint, the higher the risk of ignition at low temperatures. The flashpoints of various solvents differ widely due to their chemical properties. These properties determine the flammability, thus the need to understand the difference between solvents.

30.8.1.3. The following items shall not be used as cleaning solvents: acetone, benzene, carbon tetrachloride, gasoline, isopropyl alcohol, methanol, methyl ethyl ketone, naphtha (solvent), perchloroethylene, toluene, trichloroethylene or turpentine. Commercial cleaning solvents or other non-flammable emulsion type cleaning liquids shall be considered for use whenever possible. **(T-1)**

30.8.1.4. Flammable cleaning solvents, jet fuel or AVGAS shall not be used to clean floors or clothing. JP-8 may be used for parts cleaning provided the requirements of **paragraph 30.9.1.1** and any TO or manufacturer's restrictions are met.

30.8.1.5. Cleaning rooms shall be equipped with an adequate mechanical ventilation system and blowers and exhaust systems shall conform to NFPA 91. Refer to ACGIH's *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance,* and AFMAN 48-146 for additional guidance. **(T-1)**

30.8.1.6. There shall be no open flames, spark-producing devices or heated surfaces having a temperature sufficient to ignite vapors in any vapor area. **(T-1)**

30.8.1.7. There shall be no electrical equipment in the immediate vicinity of cleaning tanks subject to splashing or dripping of cleaning tank liquids, unless approved for use in that environment. **(T-1)**

30.8.1.8. There shall be no open flames or spark-producing devices in any floor space outside a vapor area or within 20 feet thereof (not separated by tight partitions), except as specifically permitted in NFPA 86. Areas in the vicinity of dip tanks shall be kept as clear of combustible stock as practical and shall be kept entirely free of combustible debris. **(T-1)**

30.8.1.9. Periodic inspection or tests of all dip tank facilities shall be made, including associated ventilation and fire protection equipment. **(T-1)** Any defects shall he promptly corrected. **(T-1)**

30.8.1.10. *DANGER - NO SMOKING* signs shall be conspicuously posted in the vicinity of dip tanks. **(T-1)**

30.8.1.11. Areas in the vicinity of dip tanks shall have manual fire extinguishers suitable for combustible liquids. **(T-1)** Protection systems shall be provided for tanks of 150 gallon capacity or more, or 10 square feet or more of liquid surface area. **(T-1)** Refer to NFPA 34, *Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids*, for additional guidance.

30.8.2. Specific Requirements.

30.8.2.1. Personal Protective Equipment.

30.8.2.1.1. When handling parts cleaned in degreasing solvent, all personnel shall wear rubber gloves and keep the inside of gloves clean and dry. **(T-1)** Rubber gloves and an apron shall be worn when acids are poured or dumped. **(T-1)** ANSI/International Safety Equipment Association (ISEA) Z87.1-compliant eye protection with side shields shall also be worn. **(T-1)** Consult BE regarding the occupational and environmental health risk assessment. Refer to **Chapter 14** for additional guidance.

30.8.2.1.2. Contact lens wearers shall wear appropriate eye and face protection. **(T-1)** Contact lenses may trap toxic or dangerous substances that are harmful to the eye. Contact lenses decrease the effectiveness of emergency eyewash fountains and sometimes compound the severity of an injury. Soft contact lenses may absorb and be contaminated by chemicals, their vapors and/or fumes. **Note:** Employees shall advise supervisors if they wear contact lenses. **(T-1)**

30.8.2.2. Vehicle Engine Cleaning. Starters, generators, alternators, distributors or magnetos shall be protected (covered with waterproof paper or plastic), so internal mechanisms are not exposed to water spray or cleaning agents. Remove the air cleaner and cover the carburetor throat or air intake with waterproof paper or plastic. **(T-1)** Follow TO 36-1-191 when cleaning installed engines.

30.8.2.2.1. Employees shall wear PPE listed in **paragraph 30.9.2.1** when cleaning engines. **(T-1)**

30.8.2.2.2. When cleaning tanks are located in an isolated room or facility, users shall obtain permission from the appropriate supervisor to use the tank. **(T-1)** A buddy system shall be used, when required by management or safety, to ensure assistance is available if a mishap or emergency occurs. **(T-1)**

30.8.2.2.3. Solvent Storage and Handling. Bulk solvents shall be stored in well-ventilated rooms, physically separated from other storage and operations. **(T-1)** Caution and warning labels shall not be removed. Leaking drums shall be removed

outdoors immediately so vapors or liquid will not collect and become a hazard. **(T-1)** Contact the installation Environmental Management office for proper disposal guidelines for leaking drums. Drip pans shall not be used to catch spilled liquids unless these pans drain into a closed container. Approved containers with the solvent name clearly marked on the container shall be used. **(T-1)** The BE shall help determine the adequacy of ventilation in areas where solvents will be used, prior to their use. **(T-1)** Through BE's occupational and environmental health risk assessment, appropriate ventilation, if any, is recommended.

30.8.2.3. Oil and Hydraulic Fluid Spills. The organization responsible for the spill shall contain and clean the spill using the applicable method, such as compound, oil and water absorbent. **(T-1)** Contact the installation Environmental Management office for additional guidance.

30.9. Paint Shop.

30.9.1. General Requirements. To ensure safe and efficient operation, all painting activities shall be performed in accordance with accepted safety standards and **Chapter 27.**

30.9.2. Specific Requirements.

30.9.2.1. Personal Protective Equipment. BE's occupational and environmental health risk assessment outlines PPE, if required. Refer to **Chapter 14** for additional guidance.

30.9.2.2. Housekeeping. Good housekeeping is essential to safe paint shop operations. Paint rooms shall be kept clean and their equipment stored in an orderly manner.

30.9.2.3. Spray Booths. All high volume low pressure spraying shall be accomplished in a paint booth to minimize health, fire and explosion hazards. **(T-1)** The walls of these booths shall be made of fire-resistant material that can be easily and frequently cleaned. **(T-1)** Refer to **Chapter 27** and ACGIH's *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance,* for construction and installation of ventilating systems for paint-spraying operations.

30.9.2.3.1. Walls. Walls and floors of spray booths may be covered with thin paper bags or a cellophane bag having a thickness of .003 inches or less to protect them from paint deposits. Coverings shall be replaced frequently to prevent the accumulation of deposits. **(T-1)** This paper shall be removed and disposed of in accordance with state and federal hazardous waste regulations. **(T-1)** Contact the installation Environmental Management office for disposal guidelines. Soap-like, water-soluble materials or coatings which can be stripped, or other similar materials that can be easily washed down, may be used to protect the walls and floors of spray booths from paint accumulation, provided they do not pose an environmental pollution problem. Protective paper wall coatings shall not be used for dry or dusty paint substances that can be removed from the booths by adequate ventilation. Refer to NFPA 33, *Spray Application Using Flammable and Combustible Materials,* for additional guidance. **Note:** Paint facilities with overhead

sprinklers shall have sprinkler heads covered with a paper bag to prevent paint overspray from clogging the heads. **(T-1)**

30.9.2.3.2. Direction of Spray. Personnel shall always spray paint toward the exhaust portal to minimize accumulation of harmful mists and vapors in the booth and to minimize any potential health hazards from airborne contaminants. **(T-1)** Spray guns shall never be pointed toward other personnel.

30.9.2.3.3. Hand Work. Adequate exhaust ventilation shall be provided in booths when hand-spray painting. **(T-1)** BE's occupational and environmental health risk assessment identifies controls. Refer to **Chapter 14** for additional guidance. Care shall be taken to ensure hoses do not present a tripping hazard for personnel or are cut by passing vehicles. **(T-0) Caution**: Some paints and additives contain toxic isocyanates. Ensure all recommendations and warnings listed on the container label are followed. Adequate NIOSH-approved respiratory protection shall be worn during the entire paint process. **(T-0)** Refer to 29 CFR § 1910.134(d)(1)(ii).

30.9.2.4. Ventilation. Mechanical ventilation shall be provided in all paint spray booths to prevent accumulation of flammable and injurious vapors. **(T-0)** Refer to ACGIH's *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance*, and 29 CFR § 1910.107, *Spray Finishing Using Flammable and Combustible Materials*, for additional guidance.

30.9.2.5. Interlocks. Electrical equipment for electrostatic hand spraying shall be interlocked with spray booth ventilation controls so spraying cannot be done unless the ventilation fans are operating. **(T-0)** Refer to 29 CFR § 1910.107 for additional guidance.

30.10. Air Compressors.

30.10.1. General Requirements.

30.10.1.1. Only qualified personnel shall repair or adjust pressure-regulating equipment. **(T-0)**

30.10.1.2. All personnel operating air compressors shall be familiar with air compressor operating instructions. **(T-0)**

30.10.2. Specific Requirements.

30.10.2.1. All new air tanks and safety valves shall be constructed, installed and maintained in accordance with ASME's *Boiler and Pressure Vessel Code, Section VIII*. **(T-1)** The ASME's code seal is permanently stamped on tanks meeting this criteria.

30.10.2.2. Air receivers shall be installed so all drains are easily accessible. **(T-1)** Air receivers shall be installed with sufficient clearance to permit a complete external inspection and to avoid corrosion of external surfaces. **(T-1)**

30.10.2.3. A drain pipe and valve shall be installed at the lowest point of the air receiver to remove accumulated oil and water. **(T-1)** The drain valve shall be opened and the receiver completely drained daily to prevent accumulation of excessive amounts of liquid in the receiver. **(T-1)** Air receivers shall be stenciled to reflect this requirement (exclude air receivers with automatic drains). **(T-1)**

30.10.2.4. Every air receiver shall be equipped with a readily visible pressure indicating gauge and with one or more spring-loaded safety valves. **(T-1)** The total relieving capacity

of such valves shall prevent receiver pressure exceeding the maximum allowable working pressure by more than 10 percent. **(T-1)**

30.10.2.5. No valve of any type shall be placed between the air receiver and its safety valve or valves.

30.10.2.6. All safety valves shall be tested at regular intervals by installation BCE or designated representative to ensure the valves are operational, and will repair and replace the safety valves, if faulty/non-operational. **(T-1)**

30.10.2.7. Installed compressed air line outlets shall have the delivered air pressure tagged or marked showing maximum working pressure. **(T-1)**

30.10.2.8. Air hoses shall not be placed where they may create tripping hazards. All hoses shall be inspected to ensure they are properly connected to pipe outlets before use. **(T-1)** Hoses shall not be kinked to stop air flow. The control valve shall be used to turn off the air. **(T-1)** Water hose type clamps or wire connections shall not be used to replace or repair broken fittings.

30.10.2.9. When used for approved cleaning, compressed air shall be regulated to less than 30 psi and only when effective chip guarding and eye protection is used. **(T-0)** Compressed air shall not be routinely used to blow dry parts since this process can increase the inhalation hazards to employees.

30.10.2.10. Vehicles shall not be parked or left running near air intakes of compressors used to supply breathing air to painters.

30.10.3. Compressed Air. Compressed air is used in many shop operations: spray painting, tire inflation, fuel line cleaning and others. Compressed air can be used safely when handled with care and according to accepted safety standards. Eye protection shall be used at all times when cleaning with compressed air. **(T-0)**

30.10.3.1. Personnel with cuts/lacerations on their hands or fingers shall not hold parts that have been washed in cleaning solvent if using compressed air to blow dry the parts. Personnel shall wear neoprene or rubber gloves to avoid problems from contact with solvents. **(T-1)**

30.10.3.2. A vacuum system or water hose shall be used to remove dust, etc., from large surfaces. **(T-1)**

30.10.3.3. Compressed air shall not be used to clean clothing or body parts.

30.10.3.4. Compressed air shall not be used to “spin-dry” or “air-dry” bearings, unless permitted by the applicable TO.

30.10.3.5. Never point compressed air toward other personnel.

30.10.3.6. Assume all brakes contain asbestos, unless proven otherwise. Personnel shall utilize the OSHA Wet Method, in accordance with 29 CFR § 1910.1001, Appendix F, *Work Practices and Engineering Controls for Automotive Brake and Clutch Inspection, Disassembly, Repair and Assembly*. **(T-0)** Cleaning materials shall be disposed of in accordance with local guidance. **(T-1)** Consult the installation Environmental Management office for further disposal guidelines. Never use compressed air to clean clutch and brake assemblies.

30.11. Compressed Gas Cylinders. (Note : Refer to **Chapter 19** for additional guidance. Vehicle maintenance shops use acetylene and oxygen in welding, R-12 and Freon as refrigerants, and liquid petroleum gas (butane-propane) as a motor vehicle fuel. These cylinders may contain pressures up to 3,600 psi. Cylinders are designed and constructed in accordance with DOT regulations and bear the DOT identification. This stamping is generally found near the neck of the cylinder. Subsequent re-inspections shall be stamped in the same area. **(T-0)** The cylinder contents shall be legibly marked on each cylinder in large letters. **(T-0)** Refer to MIL-STD-101C, 29 CFR §§ 1910.101, *Compressed Gases*, 1910.102, *Acetylene*, 1910.103, *Hydrogen*, 1910.104, *Oxygen*, 1910.105, *Nitrous Oxide*, and applicable TOs for additional guidance. Non-government owned cylinders shall be tagged or otherwise marked to indicate cylinder contents. **(T-0)**

30.12. Lifting Devices.

30.12.1. Inspection. Many lifting device problems can be detected prior to use if properly inspected. Periodic inspections shall be performed by qualified inspection or maintenance personnel. **(T-1)** Test and certification of cranes and hoists shall be performed by experienced, qualified inspectors. Certification, inspection and test reports shall be available on the premises where the crane or hoist is located, in the supervisor's office or in a central maintenance shop. **(T-1)** Refer to **Chapter 12** for additional inspection guidance.

30.12.2. Responsibilities. Responsibilities for periodic inspection, records, maintenance and test of lifting devices and separate lifting aids shall be as follows:

30.12.2.1. Permanently Installed Equipment (Real Property Installed Equipment). The installation BCE shall be responsible for Real Property Installed Equipment inspection requirements. **(T-1)** Real property installed-equipment includes installed equipment attached to and made part of buildings and structures, e.g., air conditioning/heating systems, but not movable equipment such as plant equipment.

30.12.2.2. Mobile Equipment. The vehicle maintenance officer and/or superintendent shall be responsible for mobile equipment inspection requirements. **(T-1)**

30.12.2.3. Fixed Shop and Portable Equipment (Equipment Authorized Inventory Data). The responsible activity shall be responsible for fixed shop and portable equipment inspection requirements. **(T-1)**

30.12.2.4. Hoists and Cranes. Refer to specific technical data. If none is available, consult the installation BCE or safety representatives. Refer to **Chapter 12** for additional guidance.

30.12.3. Specific Requirements.

30.12.3.1. Hydraulic Vehicle Lifts.

30.12.3.1.1. Employees shall stand to one side of the vehicle as it is driven on or off the lift. **(T-1)** The load shall rest squarely on the lift. The operator shall close the vehicle doors, hood and trunk and make sure there is no one inside the vehicle prior to raising it, except to facilitate repairs. **(T-1)** This applies to vehicle lifts equipped with automatic locking devices that shall not allow the vehicle to descend with loss of power. The operator shall know the load limits of the lift and adapter and ensure it is not overloaded. **(T-1)** The operator shall not lock the hoist controls in the open or shut position, but operate them manually. All vehicle lifts shall be equipped with a safety device to prevent accidental lowering. **(T-1)** The device can be a simple mechanism

such as a safety leg, which locks in a vertical position as the lift is raised, or a restricted orifice device, which permits controlled lowering during hydraulic failure. As an added safety feature, air-oil operated hydraulic lifts shall be equipped with a lock which prevents raising by air if the oil supply is low. **(T-1)** This is a removable device which prevents compressed air entering the lift cylinder assembly. The arrangement prevents the plungers being raised above the oil supply in the air-oil reservoir.

30.12.3.1.2. Roll-on lifts shall be equipped with stop chocks to prevent the vehicle moving while the lift is hoisting, lowering or in the elevated position. **(T-1)** Stop chocks shall be automatic (springing into position when the vehicle is on the lift). **(T-1)**

30.12.3.1.3. All vehicle lifts shall be marked with the manufacturer name, lift capacity and date of installation. **(T-1)** These markings shall be stamped or etched on a metal plate permanently attached to the lift in a position where it can be inspected. **(T-1)**

30.12.3.1.4. All vehicle lifts shall be equipped with "dead man" controls, which automatically return to *NEUTRAL* or *OFF* when released by an operator. **(T-1)** Controls shall be conveniently located near a lift, if feasible. **(T-1)**

30.12.3.1.5. A lift shall not be used and an appropriate hazard warning tag shall be attached if it:

30.12.3.1.5.1. Jerks or jumps when raised. **(T-1)**

30.12.3.1.5.2. Slowly settles downward after being raised. **(T-1)**

30.12.3.1.5.3. Slowly rises, either when in use or when not in use. **(T-1)**

30.12.3.1.5.4. Comes down very slowly. **(T-1)**

30.12.3.1.5.5. Blows oil out of the exhaust line. **(T-1)**

30.12.3.1.5.6. Leaks oil at the packing gland. **(T-1)**

30.12.3.2. Electric Vehicle Lifts.

30.12.3.2.1. Inspect the lift daily. Never operate it if it has damaged parts which render it unsafe. Make repairs with original equipment parts, if possible.

30.12.3.2.2. Operating controls are designed to close when released. Do not block open or override them.

30.12.3.2.3. Never overload the lift. The manufacturer's rated capacity is shown on the lift nameplate.

30.12.3.2.4. Do not operate the lift if any safety devices are inoperative.

30.12.3.2.5. Allow only trained and authorized personnel to position the vehicle and operate the lift.

30.12.3.2.6. Never raise the vehicle with anyone inside, except to facilitate repairs. (**Note:** This applies to vehicle lifts with automatic locking devices that do not allow the vehicle to descend with loss of power.) Do not allow anyone under the vehicle when raising or lowering the lift. When operating the lift, stand outside of it and keep hands clear of moving parts.

30.12.3.2.7. Always keep the lift area free of obstructions, grease, oil, trash and other debris.

30.12.3.2.8. Before driving the vehicle over the lift, position arms and supports to provide unobstructed clearance. Do not hit or run over lift arms, adapters or axle supports. This could damage the lift or vehicle.

30.12.3.2.9. Position the vehicle on the lift carefully. Position lift supports to contact at the vehicle manufacturer's recommended lifting points. Raise lift until supports contact the vehicle. Check supports for secure contact with vehicle. Raise the lift to desired working height. **Caution**: Raise the lift high enough for the locking device to engage whenever someone is working under the vehicle.

30.12.3.2.10. Do not attempt to move the vehicle when the lift is off the ground.

30.12.3.2.11. With some vehicles, removal or installation of components may cause a critical shift in the center of gravity and result in raised vehicle instability. Refer to the vehicle manufacturer's service manual for recommended procedures when vehicle components are removed.

30.12.3.2.12. When performing maintenance on electrical lifts, ensure electrical power is disconnected unless required for checking unit operation.

30.12.3.2.13. Before lowering lift, ensure tool trays, stands, etc., are removed from under the vehicle and vicinity of the lift. **(T-1)** Release locking devices before attempting to lower the lift.

30.12.3.2.14. Lower lift slowly.

30.12.3.2.15. Before removing vehicle from the lift area, position lift arms and supports to provide an unobstructed exit.

30.12.3.3. Jacks. Vehicle maintenance personnel shall not use hydraulic floor jacks, post jacks or mechanical jacks to support vehicles while repair is accomplished. The vehicle shall be blocked and placed on approved axle or frame stands before a repair operation is started. **(T-1)**

30.12.3.3.1. The rated load of the jack shall be legibly and permanently marked in a prominent location by casting, stamping or other suitable means. **(T-1)**

30.12.3.3.2. Shop personnel shall not use a leaking or faulty jack. Defective jacks shall be taken out of service immediately, tagged and not used until repaired. **(T-1)**

30.12.3.3.3. Shop personnel shall exercise care in positioning jacks under vehicles, making sure the cap is properly located to preclude the jack slipping after the load is applied. **(T-1)** A flat piece of wood, thick enough to withstand the load, may be placed between the jack cap and vehicle lift point to help prevent the jack cap from slipping.

30.12.3.3.4. All jacks shall be properly lubricated at regular intervals and only lubricants recommended by the manufacturer shall be used. **(T-1)**

30.12.3.3.5. Improper jacking can cause serious injury or property damage. The following jacking procedures shall be used:

30.12.3.3.5.1. Equipment shall be properly chocked prior to jacking. **(T-1)**

30.12.3.3.5.2. Jack stands shall be used any time equipment is jacked for maintenance. **(T-1)**

30.12.3.3.5.3. Equipment shall be removed from jacks as soon as possible. **(T-1)**

30.12.3.3.5.4. Equipment shall be jacked to the minimum height required for the particular task. **(T-1)**

30.12.3.3.5.5. Personnel shall only remain under a jacked unit for the time required to place axle or frame stands for support. **(T-1)**

30.12.3.3.5.6. Personnel shall not position any portion of themselves under the tire or wheel of jacked equipment. **(T-1)**

30.12.3.3.5.7. Supervisors are responsible for ensuring jacks and jack stands of sufficient capacity are available and utilized.

30.12.3.3.5.8. Employees shall ensure placement of jack does not cause damage to the equipment. **(T-1)**

30.12.3.3.5.9. Jacks and jack stands shall be inspected and maintained in accordance with equipment TOs. **(T-1)** If no technical data exists, manufacturer's manuals may be used as long is it meets criteria in 29 CFR § 1910, Subpart P, *Hand and Portable Powered Tools and Other Hand-Held Equipment*.

30.12.3.3.5.10. Defective jack stands shall be taken out of service immediately and tagged for disposition. **(T-1)**

30.13. Wheel and Tire Maintenance.

30.13.1. Employee Training.

30.13.1.1. Extensive damage to equipment and serious injury to personnel may result from careless or improper demounting, mounting and inflation of tires on both single piece and multi-piece rim wheels. To ensure safety of equipment and personnel, all personnel involved in wheel dismantling or buildup operations shall be thoroughly familiar with applicable TOs, rim manuals, OSHA 3421, *Servicing Multi-Piece and Single-Piece Rim Wheels*, and this publication for the particular wheel involved. **(T-1)** Precautions outlined in these publications shall be strictly adhered to when working on wheels and rims. **(T-1)** As an added safety measure, procedures shall be reviewed prior to starting tire maintenance operations. **(T-1)**

30.13.1.2. The supervisor shall ensure all employees who service multi-piece or single piece rim wheels are trained in the proper servicing techniques and practices applicable to the type of wheels being serviced. **(T-1)** A mechanic's level of proficiency shall be established by demonstrating his or her familiarity with and ability to use the information contained in the charts, rim manuals, TOs and this publication.

30.13.1.3. The supervisor shall ensure each employee demonstrates and maintains the ability to service rim wheels safely, including the following tasks:

30.13.1.3.1. Inspection of rim wheel components. **(T-1)**

30.13.1.3.2. Mounting of tires, including inflation within a restraining device or other safeguard required by this chapter. **(T-1)**

30.13.1.3.3. Use of the restraining device, barrier and other equipment required by this chapter. **(T-1)**

30.13.1.3.4. Handling of rim wheels. **(T-1)**

30.13.1.3.5. Inflation of tire when a rim wheel is mounted on the vehicle. **(T-1)**

30.13.1.4. The supervisor shall evaluate each employee's ability to perform these tasks and to service rim wheels safely and shall provide additional training as necessary to ensure each employee maintains proficiency. **(T-1)**

30.13.2. Tire Servicing Equipment.

30.13.2.1. The supervisor shall ensure a restraining device for servicing multi-piece rim wheels is available and used. **(T-1)**

30.13.2.2. When servicing single piece rim wheels, the employee shall use a restraining device or barrier, except where the rim wheel is bolted to the vehicle during inflation. **(T-1)**

30.13.2.3. Supervisors shall ensure restraining devices and barriers meet the following requirements:

30.13.2.3.1. Each restraining device or barrier shall withstand the maximum force transferred to it during an explosive rim wheel separation occurring at 150 percent of maximum tire specification pressure for the type wheel being serviced. **(T-1)**

30.13.2.3.2. Restraining devices and barriers shall prevent rim wheel components being thrown outside or beyond the device or barrier for any rim wheel positioned within the device. **(T-1)**

30.13.2.3.3. A restraining device or barrier shall not contain a solid flat surface against which the rim wheel can lie or lean during inflation, such as the bed or table of a tire changing machine. **(T-1)**

30.13.2.3.4. Restraining devices and barriers shall be visually inspected prior to each day's use and after any explosion or explosive separation of the rim wheel components. **(T-1)** Any restraining device or barrier exhibiting damage such as the following defects shall be immediately removed from service:

30.13.2.3.4.1. Cracks at welds. **(T-1)**

30.13.2.3.4.2. Cracked or broken components. **(T-1)**

30.13.2.3.4.3. Bent or sprung components caused by mishandling, abuse, tire explosion or rim wheel separation. **(T-1)**

30.13.2.3.4.4. Pitting of components due to excessive corrosion. **(T-1)**

30.13.2.3.4.5. Rust or other structural damage. **(T-1)**

30.13.2.3.4.6. Inoperative air pressure warning light or gauge. **(T-1)**

30.13.2.3.4.7. Leaking, cracked or deteriorating hoses. **(T-1)**

30.13.2.3.5. NDI techniques may be used to verify existence of cracks or other damage to welds whenever a tire/wheel failure occurs inside a restraining device, a weld is found to be severely rusted or whenever a weld's integrity is in doubt.

Note: Accomplish a one-time NDI of all welds on locally manufactured restraining devices or commercially procured devices when weld integrity has not been documented.

30.13.2.3.6. Restraining devices or barriers removed from service and requiring structural repair, such as component replacement or re-welding, shall not be returned to service until certified, by the manufacturer or a Registered Professional Engineer. **(T-1)** This certification shall ensure the restraining device or barrier will withstand the maximum force transferred during a rim wheel separation at 150 percent of the maximum tire specification pressure for the rim wheel being serviced or as required by the applicable TO, whichever is greater. **(T-1)**

30.13.2.4. The supervisor shall ensure a hose assembly consisting of the following components is used for inflating rim wheels:

30.13.2.4.1. A clip-on chuck. **(T-1)**

30.13.2.4.2. A sufficient length of hose to allow the employee to stand outside the trajectory. **(T-1)**

30.13.2.4.3. An in-line valve with a pressure gauge or an adjustable regulator. **(T-1)**

30.13.2.5. An approved tire inflator cage appropriately sized for tires being serviced shall be used for inflating multi-piece wheels. **(T-1)** A regulator gauge, shutoff valve, service hose and lock-on type chuck shall be used with the cage to control the air when inflating. **(T-1)** In addition, a bleed valve shall be used to relieve pressure in the hose when the tire is filled. **(T-1)** Refer to TO 36-1-191 for additional guidance.

30.13.2.6. A current OSHA 3421, along with OSHA charts entitled "*Demounting and Mounting Procedures for Truck/Bus Tires*," and "*Multi-piece Rim Matching Chart*," shall be available and posted in the service area. **(T-1)**

30.13.2.7. A current rim manual and TO 36-1-191, containing instructions for the types of wheels being serviced, shall be available in the service area. **(T-1)**

30.13.2.8. The supervisor shall ensure only tools recommended in the rim manual for the type of wheel being serviced are used to service rim wheels. **(T-1) Warning**: Failure to observe precautions outlined in this publication may result in faulty positioning of the tire and/or rim parts, causing the assembly to burst with explosive force sufficient to cause serious physical injury or death.

30.13.3. Wheel Component Acceptability.

30.13.3.1. Multi-piece wheel components shall not be interchanged except as provided in the charts or applicable rim manual. **(T-1)**

30.13.3.2. Multi-piece wheel components and single piece wheels shall be inspected prior to assembly. **(T-1)** Any wheel part bent out of shape, pitted from corrosion, broken or cracked shall not be used and shall be rendered unserviceable and discarded. **(T-1)** Damaged or leaky valves shall be replaced. **(T-1)**

30.13.3.3. Rim flanges, rim gutters, rings, bead seating surfaces and bead areas of tires shall be free of any dirt, surface rust, scale or loose or flaked rubber build-up prior to mounting and inflation. **(T-1)**

30.13.3.4. The size and type of the tire and wheel shall be checked for compatibility prior to assembly of the rim wheel. **(T-1)**

30.13.4. Safe Operating Procedure – Multi-piece Rim Wheels. The supervisor shall establish a safe operating procedure for servicing multi-piece rim wheels and shall ensure employees are instructed in and follow that procedure. **(T-1)** The procedure shall include, as a minimum, the following elements:

30.13.4.1. Tires shall be completely deflated by removing the valve core before a rim wheel is removed from the axle. **(T-1)** If the axle and rim are secured by wedges and lug nuts, loosen the lug nuts out to the end of the stud, but do not remove. Lightly tap on wedges to break them free. When all wedges are broken free, lug nuts can be removed. Wedges can become dangerous projectiles if these procedures are not followed. Employees shall use mechanical devices, such as dollies, to help them remove or mount large, heavy tires. **(T-1)**

30.13.4.2. A nonflammable rubber lubricant shall be applied to bead and rim mating surfaces during assembly of the rim wheel and inflation of the tire, unless the wheel or tire manufacturer advises against its use. **(T-1)**

30.13.4.3. Tires mounted on multi-piece rims shall only be inflated when constrained by a restraining device or placed in a tire cage. **(T-1)** Tires on multi-piece rims mounted on vehicles that are more than 20 percent under-inflated shall not be re- inflated until inspected by a qualified person and the tire certified safe to re-inflate. **(T-1)** Safeguards, such as chains or remote control inflation systems, shall be used to encase the wheel and tire during the re-inflation process. **(T-1)** Supervisors shall ensure no personnel are in the trajectory area during tire re-inflation. **(T-1).** Heat shall not be applied to a multi-piece rim with a tire mounted on it. **(T-1) Exception:** After the tire is completely deflated, the lug nuts may be heated briefly to facilitate their removal.

30.13.5. Safe Operating Procedure – Single Piece Rim Wheels. The supervisor shall establish a safe operating procedure for servicing single piece rim wheels and shall ensure employees are instructed in and follow that procedure. **(T-1)** The procedure shall include as a minimum the following elements:

30.13.5.1. Tires shall be completely deflated by removing the valve core before demounting. **(T-1)** Mechanical devices, such as dollies, shall be used to mount or remove large, heavy tires. **(T-1)**

30.13.5.2. Mounting and demounting of tire shall be performed only from the narrow ledge side of wheel. **(T-1)** Care shall be taken to avoid damage to tire beads while mounting tires on wheels. **(T-1)** Tires shall be mounted only on compatible wheels of matching bead diameter. **(T-1)**

30.13.5.3. A nonflammable rubber lubricant shall be applied to bead and wheel mating surfaces before assembly of the rim wheel and inflation of tire. **(T-1)**

30.13.5.4. If a bead expander is used to seat the beads, it shall be removed before the valve core is installed and before the tire is inflated to more than 10 psi. **(T-1)**

30.13.5.5. Tires may be inflated above 10 psi only when contained within a restraining device, positioned behind a barrier or bolted on the vehicle with lug nuts fully tightened.

Tires shall never be serviced above the pressure stamped on the tire sidewall, unless the manufacturer recommends a higher pressure.

30.13.5.6. When inflating a tire, employees shall not place a rim wheel where it will rest against or within one foot of any flat solid surface, as measured from the sidewall. **Exception**: Hold-down components of a restraining device may be placed within one foot of the sidewall.

30.13.5.7. Tires shall not be inflated to more than their recommended operating pressure. The proper tire inflation pressure, tire size and load range can be found on the vehicle information/data plates or stenciled on the door jamb/glove box or as specified in the Dash-1 TO or owner's manual. If this information is not available, TO 36-1-191 shall be used to obtain the recommended tire pressure. **(T-1)** Refer to **paragraph 30.13.5.5** for additional guidance.

30.13.5.8. Employees shall stay out of the trajectory when inflating a tire. **(T-1)**

30.13.5.9. If the tire beads are not fully seated by the time the tire is inflated to its recommended pressure, the tire shall be deflated and rim wheel disassembled. **(T-1)** The wheel and tire shall be rechecked for compatibility, re-lubricated, repositioned and then re-inflated in accordance with **paragraphs 30.13.5.2** thru **30.13.5.7**. **(T-1)**

30.13.5.10. No heat shall be applied to a single piece wheel when a tire is mounted on it. **Exception**: After the tire is completely deflated, the lug nuts may be briefly heated to facilitate their removal.

30.13.5.11. Cracked, broken, bent or otherwise damaged wheels shall not be reworked, welded, brazed or otherwise heated, except as provided in **paragraph 30.13.5.10**.

30.13.5.12. High pressure air shall not be used to inflate tires.

30.13.5.13. Rims shall be inspected and maintained in accordance with the individual equipment manufacturer's rim manuals or TO 36-1-191. **(T-1)**

30.13.6. Demounting, Mounting and Inflating All Types of Tires.

30.13.6.1. Personnel shall:

30.13.6.1.1. Respect the potential power and explosive force of air under pressure. **(T-1)** Serious mishaps have resulted from lack of awareness of the explosive potential of compressed air. Respect it as you would an explosive!

30.13.6.1.2. Make sure all tools are in good condition – not damaged, dented or deformed. **(T-1)**

30.13.6.1.3. Remove valve core and exhaust all air from the tire (or tires, in the case of a dual assembly), before demounting. **(T-1)** Probe the valve stem with a wire as a final check to ensure the valve is not obstructed by a foreign material. **(T-1)** **Caution**: Do not stand in front of valve opening, as dirt particles may be blown into eyes.

30.13.6.1.4. Block vehicle so it cannot roll forward or backward after it is lifted. **(T-1)**

30.13.6.1.5. Place large hardwood blocks under the jack, regardless of how hard or firm the ground appears. **(T-1)**

30.13.6.1.6. Place safety jack stands – or crib up with blocks – at an appropriate spot under the vehicle, in case the jack slips. **(T-1)**

30.13.6.1.7. Check rim diameter to ensure it exactly matches rim diameter molded on tire. **(T-1)**

30.13.6.1.8. Clean and inspect used rim parts thoroughly. **(T-1)**

30.13.6.1.9. Use new tubes and new flaps in new tires. **(T-1)**

30.13.6.1.10. Inspect inside of tire for loose cords, cuts, penetrating objects or other carcass damage. Tires that are damaged beyond simple repair shall be removed from service. **(T-1)** Remove dirt, debris and liquids from inside of tire before tube is installed.

30.13.6.1.11. Lubricate with approved rubber lubricant, such as thin vegetable oil or soap solution. **(T-1)**

30.13.6.1.12. Use a clip-on chuck and extension hose with remote control valve and pressure gauge, long enough to allow you to stand to one side – not in front of the assembly – during inflation. **(T-1)**

30.13.6.1.13. Center tire properly on rim before inflating. **(T-1)**

30.13.6.1.14. Securely lock wheel down or place assembly in safety cage or portable safety device before attempting to inflate tire to seat beads. **(T-1)**

30.13.6.1.15. Position the vehicle crane boom in the center of the hub prior to inflation of off-the-road tires in field service work. **(T-1)**

30.13.6.1.16. Check for proper flange and lock ring seating. **(T-1)**

30.13.6.1.17. Adjust air pressure to manufacturer's recommended cold operating pressure after beads have been seated. **(T-1)**

30.13.6.1.18. Inspect valve cores for proper air retention. Replace damaged or leaky cores. **(T-1)**

30.13.6.2. Personnel shall not:

30.13.6.2.1. Work on tire and rim assemblies until they review applicable safety practices and procedures. **(T-1)**

30.13.6.2.2. Loosen lug nuts on dual equipment with split or multi-piece rims until all air is exhausted from both tires. **(T-1)** A broken or cracked rim part under pressure may blow apart and seriously injure or kill if lugs are removed before air is exhausted.

30.13.6.2.3. Apply heat or do repair work on an inflated tire, rim or wheel assembly. **(T-1)** Heat can increase tire air pressure sufficient to burst the tire or rim.

30.13.6.2.4. Re-inflate a tire that has been run flat or seriously under-inflated without demounting that tire and checking tire and tube for damage. **(T-1)**

30.13.6.2.5. Mix rim parts of different manufacturers unless approved by those manufacturers. **(T-1)**

30.13.6.2.6. Rework, weld, heat or braze rim parts. **(T-1)** Always replace damaged parts with same size, type and make.

30.13.6.2.7. Reuse tubes or flaps that have buckled or creased. **(T-1)**

30.13.6.2.8. Use a tube in a tire larger or smaller than that for which the tube was designed. **(T-1)**

30.13.6.2.9. Inflate beyond recommended bead seating pressure. **(T-1)**

30.13.6.2.10. Stand over tire when inflating. **(T-1)**

30.14. Maintenance Operations.

30.14.1. Body Shops.

30.14.1.1. Jagged edges of mangled fenders, decks and quarter panels can be razor sharp. Protective gloves shall be worn when handling them. **(T-1)**

30.14.1.2. A full protective plastic face shield plus safety glasses or goggles shall be worn while cutting or grinding glass. **(T-1)** If handling large sheets of glass, gloves shall be used for a better grip and to keep hands from being cut. **(T-1)**

30.14.2. Welding in Vehicle Maintenance Shops.

30.14.2.1. General Precautions.

30.14.2.1.1. Inspect all equipment regularly. **(T-1)** Equipment with worn, leaky or burned hoses or damaged cables and connections shall not be used.

30.14.2.1.2. Never weld or cut gas tanks, oil barrels or drums without first purging and inerting them. **(T-1)**

30.14.2.1.3. Weld behind flame resistant screens or in booths to protect other employees from flying sparks and flash burns. **(T-1)** Refer to **Chapter 20** for additional guidance.

30.14.2.1.4. Always provide adequate ventilation. **(T-1)** Arrange work so air movement pulls fumes away from the breathing zone. **(T-1)**

30.14.2.1.5. Wear clean, oil free, flame resistant clothing while welding. **(T-1)** Wear protective gloves and apron (hearing protection may be required for some welding operations). **(T-1)**

30.14.2.1.6. Wear special welder's goggles as specified in **Chapter 20** (a welding helmet may also be required). **(T-1)**

30.14.2.1.7. Provide a suitable fire extinguisher and pails of sand in the vicinity of the welding area. **(T-1)** Mount fire extinguishers (if space permits) on portable welding carts used in locations where adequate fire extinguishers are not available. **(T-1)**

30.14.2.1.8. Always mark hot work either with a sign or with chalk on the work itself. **(T-1)**

30.14.2.1.9. Store welding equipment securely when not in use. **(T-1)**

30.14.2.1.10. Have welding tasks evaluated by BE to determine the need for (and type of) respiratory protection. **(T-1)**

30.14.2.2. Gas Welding.

30.14.2.2.1. Store cylinders in areas that are isolated, protected, ventilated, dry and removed from any heat source. **(T-1)**

30.14.2.2.2. Store oxygen cylinders and welding gas cylinders at least 20 feet apart or separate them with a flame resistant barrier at least 5 feet high when not connected for use. **(T-1)**

30.14.2.2.3. Keep oxygen cylinders at least 35 feet away from oil, oil pits and grease. **(T-1)**

30.14.2.2.4. Keep cylinder valve caps in place when cylinders are not connected for use. **(T-1)**

30.14.2.2.5. Shut cylinder valves off tightly when not in use. **(T-1)**

30.14.2.2.6. Do not use acetylene with the tank pressure less than 15 psi.

30.14.2.2.7. Always leave the shutoff wrench on the valve stem. **(T-1)**

30.14.2.2.8. Secure all tanks with a chain or fire resistant strap. **(T-1)**

30.14.2.2.9. Ensure cylinder contents are identified before use. **(T-0)**

30.14.2.3. Electric Arc Welding.

30.14.2.3.1. Carefully spread out cables while performing work. **(T-1)** Avoid placing cables in walkway areas to prevent tripping hazards. **(T-1)**

30.14.2.3.2. Join ground and electrode cables with connectors designed for that purpose. **(T-1)**

30.14.2.3.3. Do not allow splices in the cable within 10 feet of the electrode holder. **(T-1)**

30.14.2.3.4. To avoid electrical shock, check all connections, ground the work piece, do not weld in wet locations and do not use wet machines until they are dry and tested. **(T-1)**

30.14.2.3.5. Store electrode holders in a safe location away from objects which conduct electricity. **(T-1)**

30.14.3. Mobile Maintenance. Vehicles used routinely for mobile maintenance shall include as part of their equipment: baking soda for neutralizing acid spills, adequate fire extinguishers, container of water and eye and/or face protection for use by individual performing vehicle jump start procedures. **(T-1) Note:** In cold climate regions, effort shall be made to prevent container of water from freezing. **(T-1)**

30.14.4. Air Conditioning Maintenance. Gas and liquid coolants used in automotive air conditioners shall be handled with care, especially those stored under pressure. **(T-1)** Eye and face protection and gloves shall be worn while servicing or purging these systems. **(T-1)**

30.14.5. Radiator Maintenance.

30.14.5.1. Never open a pressurized radiator while the engine is hot. Use eye protection and caution when boiling out radiators. **(T-1)** The cleaning solutions contain caustic

chemicals that will burn if splashed on the skin or face. Flush the skin with water if splashed.

30.14.5.2. Wear protective gloves when handling a damaged radiator because it may have jagged metal edges. **(T-1)**

30.14.6. Fuel Tank Repairs.

30.14.6.1. Vehicles with leaking fuel tanks shall be removed from the shop immediately. **(T-1)** Ground the siphon tank and pump out remaining fuel into a safety can. **(T-1)**

30.14.6.2. If the tank requires welding, cutting or soldering, clean out all fuel and fuel vapors. **(T-1)** The best way to do this is by steam cleaning. Steam the tank, both inside and outside, for at least 10 minutes. Flush out the tank with hot water for five (5) minutes. Then dry the inside and outside thoroughly, using warm air. After cleaning, check for fuel odor and, if needed, repeat the cleaning process. Test the tank for vapors prior to any welding.

30.14.7. Refueler Vehicle Maintenance Areas.

30.14.7.1. Open flames and spark-producing devices are prohibited within 50 feet of the refueling maintenance shop when a refueling vehicle is undergoing maintenance and fuel vapors are likely to be present. There shall be no smoking within 50 feet of a refueler maintenance building. **(T-1)** Danger signs shall be posted in the immediate area and worded as follows: *NO OPEN FLAME OR IGNITION SOURCE BEYOND THIS POINT* or the nearest commercially available equivalent. **(T-1)** Refer to **Chapter 18** for additional guidance.

30.14.7.2. Static Grounding.

30.14.7.2.1. Aircraft refuelers shall have a static ground system in serviceable condition. **(T-1)** Refueling equipment in a refueler maintenance facility or undergoing maintenance shall be connected to a serviceable ground at all times, except when the vehicle is in motion. **(T-1)** Refueling maintenance support equipment shall be grounded. **(T-1)**

30.14.7.2.2. Storage bins shall be grounded if located inside the maintenance bay. **(T-1)**

30.14.7.2.3. Ramp ground rods shall have resistance values of 10,000 ohms or less. **(T-1)** These static grounds do not require retesting unless damaged or if the system has a deficiency. Any static ground which measures greater than 10,000 ohms shall be removed or replaced. **(T-1)** Static ground test data shall be maintained by the installation BCE. **(T-1)**

30.14.7.2.4. Fuel nozzle static grounding shall be in accordance with TO 00-25-172. Only approved 75 amperes ground clips shall be used in accordance with TO 00-25-172. **(T-1)**

30.14.7.2.5. Alligator clips shall not be used to ground or bond aircraft and support equipment. Only specified ground wire shall be used in the shop or on refueling equipment. **(T-1)** Ground cables shall be inspected weekly for broken strands. **(T-1)** Repaired or newly constructed grounding cable assemblies shall be checked for continuity. **(T-1)** User shall check bonding devices on all aircraft refueling units and associated equipment to ensure proper bonding prior to use. **(T- 1)**

30.14.7.3. The supporting Air Force weather organization, in accordance with the weather support document, shall advise the Fuels Management Flight of adverse or mission-limiting weather, such as thunderstorms, lightning, strong winds, heavy rain, snow or freezing precipitation. **(T-1)** All maintenance on fuel systems of fuel servicing vehicles shall cease work conducted outside. The supporting Air Force weather organization shall advise the Fuels Service Center when the adverse weather advisory is terminated. **(T-1)** Refer to **Chapter 3** for additional information on weather.

30.14.7.4. As an extra precaution, personnel shall ground themselves prior to entering a refueler maintenance shop. **(T-1)** Several methods can be used to discharge static electricity from the body. If the facility or building is metal, it shall be grounded and bonded. **(T-1)** Personnel can ground themselves by touching their hand to the bare metal. By touching their bare hand to the door knob they are grounded (if the door is metal and sufficiently bonded to the metal structure).

30.14.7.5. Certain areas in the refueler vehicle maintenance facility may become hazardous when working on fuel systems, fuel leaks occur or excessive vapors exist due to venting. If the working environment has flammable vapors greater than 20 percent of the lower explosive limit, the operation shall be shut down until the vapors are removed to maintain a safe working environment. **(T-1)**

30.14.7.6. Whenever major maintenance is required to the main tank, all fuel and fuel vapors shall be cleaned out from the tank pumping system and filter separator and the tank purged prior to any maintenance. **(T-1)** Cleaning procedures shall comply with TO 36Y31-1-1, *Removal of Rust and Sediment from Fuel and Oil Servicing Truck and Trailer Tanks and Application of Coating, Interior, Fuel and Water Resistant*. **(T-1)** Precautions outlined in the applicable TO of the equipment being serviced shall be followed. **(T-1)**

30.14.7.7. When fuel filter elements are changed, old filters shall be disposed of in accordance with installation Environmental Management office regulations. **(T-1)**

30.14.7.8. A minimum of two (2) persons, one qualified in the task to be performed and the other a safety observer to provide assistance, shall be available in the refueling maintenance site whenever repairs are done on a vehicle fuel system. **(T-1)** For minor maintenance after duty hours, the Vehicle Flight Commander may waive, in writing, the two-person policy if all safety precautions are taken and a qualified 5-skill level mechanic does the work. **Note:** A vehicle operator for the type of equipment being repaired may be the second person. Refer to AFI 24-302 for additional guidance.

30.14.7.9. Personnel performing maintenance on fuel trucks shall not wear shoes with exposed nails or metal plates.

30.14.7.10. Clothing containing more than 65 percent nylon, rayon, wool or polyester shall not be worn as outer garments when working with/around low flash point fuels. Flak vests shall not be worn during aircraft fuel servicing operations or during fuel operations where low flashpoint vapors may be present. In all cases (e.g., servicing with any fuel), an employee wearing a flak vest will always ground or bond him or herself when approaching an aircraft and prior to beginning work. **(T-1)** If no spark occurs during bonding or grounding, normal work may begin. However, if a spark does occur during bonding or grounding, the employee will ground or bond him or herself frequently during all work

phases. **(T-1) Note:** Commanders may authorize wear of body armor/flak vests and Gortex-type clothing in combat areas. Outer garments shall not be removed or put on in the work area. Matches or lighters shall not be handled or removed from pockets.

30.14.7.11. All tools used in the refueling maintenance shop shall be approved for such use. **(T-1)**

30.14.7.12. Axle stands, rated at least 10 tons, shall be used for axle support on refuelers. **(T-1)**

30.14.7.13. Hydraulic jacks, rated at least 10 tons, shall be used when lifting refueling vehicles. **(T-1)**

30.14.8. Refueler Maintenance Buildings.

30.14.8.1. An empty refueling vehicle containing fuel vapors is a potential bomb and shall be treated as such. **(T-1)** Except under conditions listed below, no other vehicular equipment will be serviced or repaired in refueler maintenance shops when fuel servicing vehicles are present. **(T-1)**

30.14.8.1.1. Vehicle(s) containing only JP-5, JP-8, JP-10 or other high flashpoint fuels may be serviced or repaired in refueler maintenance shops with fuel servicing vehicles present.

30.14.8.1.2. Vehicle(s) containing only JP-4, AV-gas, Mo-gas or other low flashpoint fuels may be serviced or repaired in refueler maintenance shops only if no other fuel servicing vehicles are present. **Note:** For remote/austere locations or where vehicle maintenance services are distant to the location where refueling vehicles are assigned, commanders may authorize minor maintenance (e.g., lubrication, oil and filter changes, headlight and tire changes) in facilities not designed for refueler maintenance if the refueler vehicle is used to transport and operates on only high flashpoint fuels (e.g., the refueler transports and operates only on JP-8). **Note:** While the exceptions provide commanders additional flexibility, organizations shall still perform and document an appropriate risk assessment prior to introducing other vehicles into a refueler maintenance facility or performing maintenance on refuelers in other than a refueler maintenance facility. **(T-1)** Risk assessments shall be coordinated with the installation F&ES Flight and Occupational Safety office. **(T-1)**

30.14.8.1.3. Because of the large number of fueling vehicles and carts normally assigned, an AF installation shall have a separately sited maintenance and repair facility, unless approved by AFCEC/COSM. **(T-1)** It shall be physically separated from other inhabited structures and any other source of ignition by at least 50 feet. **(T-1)** Due to space restrictions and the low number of fueling vehicles and carts normally assigned to an Air National Guard unit, a separately sited maintenance and repair facility, separated from other inhabited structures and any other source of ignition by at least 50 feet, is recommended. Refer to AFI 24-302 and DAFMAN 32-1084 for additional guidance.

30.14.8.2. The refueling maintenance shop should be located near the refueling vehicle parking area to minimize travel distance and help keep refuelers off installation streets.

30.14.8.3. The shop should be located so the installation F&ES Flight will have immediate and direct access on paved roads. **(T-1)** One or two minutes saved in response time may mean the difference between saving or losing the facility.

30.14.8.4. Both external and internal earth grounds shall be provided for the refuelers and a lightning protection system provided for the structure. **(T-1)**

30.14.8.5. Separate locker areas, washing areas and eating areas shall be provided for employees. **(T-1)** Adequate PPE for exposure to liquid fuels and vapors shall be provided. **(T-1)** Refer to AFI 24-302 and DAFMAN 32-1084 for additional information.

30.14.8.6. The amount of space required for refueler maintenance areas is determined by the number of refueling vehicles assigned. Refer to DAFMAN 32-1084 for specific requirements.

30.14.8.7. Contamination from floor drains is a potential fire, safety and health hazard. Floor drains shall be kept clean at all times. **(T-1)** Solvent or fuel shall not be used to clean floor drains. **(T-1)** Protective clothing such as goggles, rubber boots and gloves shall be worn during drain cleaning. **(T-1)**

30.14.9. Vehicle Maintenance Repair Pits.

30.14.9.1. Vehicle repair pits shall be guarded. **(T-1)** The type of guard used is dependent on the location, reason for the opening and frequency of use. Where railings are used, they shall be permanently attached leaving only one exposed side. **(T-1)** The exposed side shall have a removable railing kept in place when not in use. **(T-1)** It shall be painted yellow to designate caution. **(T-1)**

30.14.9.2. A vertical barrier shall be placed at the floor level, along open edges of the pit, to prevent materials, tools, etc., from dropping and striking employees. **(T-1)**

30.14.9.3. All pits equipped with steps shall have handrails and approved lighting in accordance with NFPA 70. **(T-1)** Steps shall be painted, coated or made with an approved nonskid material to prevent slippage. **(T-1)**

30.14.9.4. Adequate explosion-proof lighting shall be installed in pits or portable explosion-proof extension lights furnished. **(T-1)**

30.14.9.5. Pits shall be built with drains equipped with oil or grease traps and shall not be connected to sanitary sewers. **(T-1)** In addition, local exhaust should be provided to remove vapors. Refer to BE's occupational and environmental health risk assessment for additional guidance. Exhaust fans used in pit ventilation systems shall be suitable for use with fuel vapors, e.g., have explosion-proof motors and non-sparking blades in accordance with NFPA 70. **(T-1)**

30.14.9.6. Pit contamination is a potential fire, safety and health hazard. Pits shall be cleaned regularly with soap and water or an approved caustic solution, but not flammable or combustible solvents. **(T-1)** PPE, including goggles, rubber boots and gloves, shall be worn during pit cleaning. **(T-1)**

30.14.9.7. To prevent accumulation of hazardous gases, the vehicle engine shall not be operated while a vehicle is positioned over a repair pit, unless required by manufacturer's instructions or TO.

Chapter 31

COMPOSITE MATERIALS

31.1. Scope. Composite materials (e.g., fiberglass, carbon fiber, Kevlar) are widely used in DAF operations. These materials can present potentially serious health and safety hazards to personnel unless specific precautions are taken. Environmental, Safety and Occupational Health (ESOH) personnel shall evaluate any operations involving composite materials. **(T-1). Paragraph 1.6,** *Job Hazard Analysis,* AFI 90-802, Air Force Pamphlet (AFPAM) 90-803, *Risk Management (RM) Guidelines and Tools,* and AFI 90-821 shall be observed and adhered to when working with composite materials. **(T-1).** For additional information, the OSHA Technical Manual, Section III, Polymer Matrix Materials: Advanced Composites, is available at **https://www.osha.gov/dts/osta/otm/otm_iii/otm_iii_1.html.** Composite operations involving confined spaces shall follow guidance in **Chapter 23.**

31.2. Specific Responsibilities. Functional managers and supervisors shall:

31.2.1. Ensure all personnel who work with or handle composite materials receive training associated with required tasks. **(T-0)**

31.2.2. Ensure workers performing composite repair and fabrication tasks, or handling or using hazardous materials, receive hazard communication training in accordance with AFI 90-821. **(T-0)**

31.2.3. Ensure safety data sheets (SDSs) are available for all hazardous materials used in composite work tasks. **(T-0)**

31.2.4. Ensure workers handling and storing flammable or combustible chemicals are trained in fire prevention and protection. **(T-0)** Refer to **Chapter 6** for additional guidance.

31.2.5. Ensure appropriate spill and containment control procedures, and materials are readily available in areas where composite materials are stored, dispensed or used. **(T-0)**

31.2.6. Ensure appropriate PPE is available and worn when handling composite materials and chemicals. **(T-0)** Refer to **Chapter 14** for additional guidance.

31.2.7. Coordinate with the installation Environmental Management office to establish procedures for hazardous waste disposal. **(T-1)**

31.3. General Requirements.

31.3.1. Many of the chemicals and materials used in composite fabrication and repairs pose serious health or fire hazards and must be used and handled with care. (**Warning:** Do not exceed manufacturer's maximum batch size or a violent exothermic reaction may result.) Workers shall refer to the TO and/or SDS prior to starting any work when hazardous materials or chemicals are involved or needed for the process. **(T-1)**

31.3.2. Training. All personnel who work with composite materials shall be trained on the hazardous properties of chemicals and materials used. **(T-0)** As a minimum, job safety training shall include need for and use of approved PPE; maintenance and care of PPE; safe chemical handling procedures; and emergency treatment practices in case of exposure, ingestion or inhalation of liquids, vapors or dusts from composite operations. **(T-1)** This training shall be documented in accordance with AFI 91-202. **(T-1)**

31.3.3. Hazard Communication. Workers shall receive hazard communication training. **(T-0)** Refer to AFI 90-821 for additional guidance.

31.3.4. Eyewash and Emergency Showers. Emergency shower facilities for composite repair shops shall be installed in accordance with **Chapter 9**. **(T-1)**

31.3.5. Exposure Monitoring. Supervisors shall consult with BE to ensure workers who may be potentially exposed to airborne composite materials are monitored, and appropriate respiratory protection requirements are established in accordance with AFI 48-137. **(T-1)** Additional protective equipment for workers handling composite materials shall be provided in accordance with **Chapter 14.**

31.3.6. Fire Protection. All facilities and operating areas shall have fire protection appropriate in accordance with **Chapter 6**. **(T-1)**

31.3.7. Ventilation Requirements. Ventilation for all composite repair and fabrication shops, as well as locations where composites are installed and repaired (e.g., on-aircraft repairs) must be based upon the recommendations of BE's occupational and environmental health risk assessment and installed in accordance with the manufacturer's instructions. **(T-1)**

31.3.8. Handling Flammable and Combustible Liquids and Materials. Refer to **Chapter 22** regarding appropriate procedures for handling flammable and combustible materials.

31.3.9. Storage Of Composite Materials. Composite materials, including resins and catalysts, shall be stored in accordance with technical order requirements or, if not available, the manufacturer's instructions. **(T-1)** If neither are available, storage shall be in accordance with locally developed guidance prepared in coordination with the installation F&ES Flight, Occupational Safety office, BE and Environmental Management office. **(T-1)**

Note: Composite materials may be destroyed or damaged by improper storage conditions.

31.3.9.1. Storage Inside Buildings. When the inside storage is incidental and not the primary purpose of the area, storage shall comply with **Chapter 22** of this instruction, NFPA 30 or the manufacturer's suggested guidelines. **(T-1)**

31.3.9.2. Outside Storage. To minimize the potential for environmental contamination, the installation Environmental Management office shall coordinate on the siting of all outside storage areas. **(T-1)** Refer to **Chapter 22** and NFPA 30 for additional guidance and information.

31.3.10. Electrical Requirements for Flammable Vapor Areas. Facility wiring shall be installed and maintained in accordance with NFPA 70E and UFC 3-600-01 guidance, and any specialized criteria necessary to maintain the safety of the operation. **(T-0)** Design and installation shall be in accordance with UFC 3-600-01. **(T-1)**

31.3.11. Powered and Non-powered Equipment and Tools Used Near Flammable and Combustible Materials. Tools and equipment used in composite operations shall be procured, installed and maintained such that they pose no ignition source to chemicals, chemical byproducts and finished products of the operation. **(T-1)**

31.4. Specific Applications.

31.4.1. Laboratories. All laboratories shall have fire protection appropriate for their fire hazard classification. **(T-0)** For additional details, refer to NFPA 45, *Standard on Fire Protection for*

Laboratories Using Chemicals, and AFI 90-821 for occupational exposure to hazardous chemicals in laboratories. Refer to **paragraph 22.6.1** for storage and handling of flammable and combustible materials.

31.4.2. Military Exchanges, Commissaries and Associate Retail Stores. Facilities offering un-reacted composite materials (e.g., auto body fillers, fiberglass repair kits) shall ensure the materials are kept in their original containers and that all manufacturer's precautions and use information is provided to purchaser at time of sale. **(T-1)** Damaged or leaking packages shall be removed from sale and disposed of properly. **(T-0)** Contact the installation Environmental Management office for disposal guidelines. In rooms or areas accessible to the public, storage shall be limited to quantities needed for display and normal merchandising purposes. **(T-1)** For storage of flammable and combustible materials, refer to **Chapter 22** and NFPA 30.

31.5. Hazardous Waste Disposal. Supervisors shall coordinate with the installation Environmental Management office to establish a hazardous waste material list for their unit and establish procedures for hazardous waste disposal. **(T-1)** Refer to AFMAN 32-7002 for additional guidance.

31.6. Special Mishap Considerations. Composite material mishaps require special handling. Although burning composites may be extinguished, these materials may continue to smolder and outgas toxic vapors. The installation F&ES Flight, BE and Environmental Management office shall establish appropriate measures to handle mishaps involving composite materials. **(T-1)** Special firefighting and debris handling requirements are identified in TO 00-105E-9, *Aerospace Emergency Rescue and Mishap Response Information (Emergency Services)*.

31.7. Use of Composite Materials in New System Acquisition, and System and Process Modifications. New system acquisition or modification of existing systems and processes shall be carefully reviewed for fire protection, occupational safety, health (bioenvironmental concerns), and environmental impact prior to use by the Air Force Systems Program Office, Item Manager or Design/Process Engineer, and the technical data developing organization. **(T-1)** When composite handling/repair/fabrication processes are turned over to a contractor, the contracting officer shall ensure associated DAF fire, safety, health and environmental data is provided to the contractor. **(T-1)**

Chapter 32

PRECISION MEASUREMENT EQUIPMENT LABORATORY

32.1. Scope. This chapter addresses the hazards and safety requirements associated with Precision Measurement Equipment Laboratory (PMEL) operations. Refer to AFMAN 21-113, *Air Force Metrology and Calibration (AFMETCAL) Management*, for additional information and guidance on the Air Force's Metrology and Calibration program requirements. **Note:** Due to the inherent differences between Communication-Electronic maintenance and PMEL operations, guidance in **Chapter 28** does not apply to PMEL operations.

32.1.1. Housekeeping. A high standard of housekeeping is essential to safe operations in laboratories. Dry floors are essential to physical safety. Liquid spills on floors shall be immediately cleaned and dried to minimize the possibility of slipping and falling. **(T-0)** In addition, wet floors provide a conductive surface which may cause electrical shock, injury or death. All work and storage areas shall be kept clean and free of unnecessary obstructions. **(T-0)** Equipment and materials shall be stored in a safe and orderly manner. **(T-1)** Refer to **Chapter 2** for additional guidance on housekeeping.

32.1.2. Supervisor Responsibilities. Supervisors shall ensure:

32.1.2.1. Personnel are trained on the location, selection and use of fire extinguishers, alarm systems, main power switches and evacuation procedures. **(T-0)**

32.1.2.2. CPR training is provided for workers required to perform work on energized high voltage electric circuits. **(T-0)** Refer to **paragraph 1.9** for additional guidance on CPR training requirements.

32.1.2.3. Personnel performing maintenance on ionizing radiation equipment receive the proper ionizing and non-ionizing radiation safety training from the installation Radiation Safety Officer. **(T-1)**

32.1.2.4. Fire extinguishers are properly mounted, readily accessible, in a serviceable condition and clearly visible. **(T-0)**

32.1.2.5. All exits are clearly identified, posted with signs, doors unlocked, easily accessible and clear paths of egress are provided. **(T-0)** Consult the installation F&ES Flight for guidance on emergency lighting and exit requirements.

32.1.2.6. All new chemicals, machines and processes are evaluated by the installation Occupational Safety office, F&ES Flight, Environmental Management office and BE, as appropriate, prior to introduction into the work area. **(T-0)** Once approved, supervisors shall ensure all personnel are trained prior to using the new chemicals, machines or processes. **(T-0)** Training shall be documented, as required, for personnel, and the supervisor shall keep a list of trained personnel on each chemical, machine or process. **(T-1)**

32.1.2.7. Housekeeping requirements are complied with in accordance with **Chapter 2** of this instruction.

32.2. Hazards. Personnel engaged in PMEL operations are exposed to several potential hazards. They include, but are not limited to, exposure to electrical and electromagnetic energy, hazardous chemicals/materials and flammable and combustible liquids and gases. PMEL personnel are also

subject to physical injuries associated with on-site job environments. Particular attention must be given to protection against exposure to toxic chemicals and ionizing radiation, because the effects of any exposures are not always immediately apparent. Potential health hazards can be managed by following guidance in this publication, adhering to proper work procedures, engineering controls and facility design, and by using proper PPE and clothing.

32.2.1. Electrical Hazards. All sources of electrical energy are potentially hazardous if proper safety precautions are not routinely followed. Personal injury from electric shock, arcing and resulting physical reactions may cause severe or fatal injuries. Safe electrical work practices, safe equipment and approved grounding procedures are essential to prevent electrical mishaps. Personnel working on, with or near energized electrical circuits or equipment shall adhere to guidance in **Chapter 8** and **Chapter 21**. **(T-1)**

32.2.2. Radiation Hazards. Radiation is electromagnetic energy in the form of waves or particles that radiate into space from an emitting source. Hazardous radiation in PMEL operations may be classified as either ionizing radiation or non-ionizing radiation.

32.2.2.1. Ionizing Radiation. Radioactive materials found in calibration sources, detection instrument check sources and electron tubes produce ionizing radiation. Calibration sources pose the greatest hazard because of the intensities involved and can become hazardous when broken or touched directly. Refer to 29 CFR § 1910.1096, *Ionizing Radiation*, and AFMAN 48-148 for guidance on ionizing radiation hazards and DAFMAN 48-125 for guidance on use of ionizing radiation detection devices.

32.2.2.2. Non-ionizing Radiation. Refer to AFI 48-109 and 29 CFR § 1910.97, *Nonionizing Radiation*, for guidance on management of hazards associated with non-ionizing radiation. **Caution**: Employees with pacemakers and other electrically active implanted medical devices must not be allowed to work in areas where the function of their device may be adversely affected by exposure to known non-ionizing radiation or electromagnetic fields. **(T-0)** All PMEL employees should be made aware of this requirement. If there are questions, refer the employee for a medical assessment in coordination with the installation BE office.

32.2.2.3. Laser Radiation. Laser energy presents a significant hazard to the eyes and skin under direct or reflected viewing conditions. The use of optical viewing aids, e.g., binoculars, telescopes, can significantly increase the eye hazard from laser radiation, particularly when used to view a point source of radiation. The radiant energy entering the eye is increased by the magnifying power of the optical device. Refer to AFI 48-139 for additional guidance and information on managing laser radiation hazards.

32.2.2.4. Radio Frequency Radiation. Radio frequency radiation produces heat in body tissues. Absorption by specific body organs depends upon the frequency and intensity of the radio frequency radiation. It is possible for a person to absorb damaging amounts of radio frequency radiation in deep tissue and organs with little or no sensation of skin heating. Refer to AFI 48-109 for additional guidance and information on managing radio frequency radiation hazards.

32.2.3. Chemical Hazards. PMEL operations use and may expose personnel to hazardous chemicals. OSHA defines a hazardous chemical as any chemical which is a physical or health hazard. This definition clearly applies to most of the chemicals typically used in PMEL

operations. Refer to AFMAN 48-146 for additional guidance and information on the management of hazards associated with chemical exposure.

32.2.4. Compressed Oil and Gas Hazards. Some testing and calibrating operations require use of compressed oil at pressures of 30,000 psi. An oil leak above 4,000 psi produces a high velocity stream of oil that may penetrate the skin and inject oil into body tissue. These high-pressure injections can cause severe localized circulatory system damage and loss of the injured extremity. Even low pressure, high volume systems pose a danger to personnel because of the amount of energy stored in the system. **Warning**: Injected oil may be life threatening and requires immediate medical treatment. Refer to **Chapter 19** for additional guidance on hazards of compressed gases.

32.2.5. Fire Hazards. Flammable and combustible liquids shall be properly handled, stored and used. **(T-0)** Refer to **Chapter 22** and **Chapter 6** for additional guidance. Also, consult the installation F&ES Flight for guidance on the selection and placement of fire extinguishers within the workplace.

32.2.6. Laser Eye Protection. Appropriate laser eye protection shall be worn when working with laser equipment. The installation Laser Safety Officer and BE's Occupational and Environmental Health Risk Assessment shall be consulted for the type of laser eye protection required. **(T-1)** Lasers shall be used in a controlled area and protection provided by required warning devices. **(T-0)** Refer to AFI 48-139 for additional guidance.

32.2.7. Respiratory Protection. Inhalation of toxic levels of hazardous materials may cause adverse health effects. These exposures may be short-term or long-term (chronic), low-level or high-level (acute), or both. Health effects from these exposures may vary from minor irritation and temporary illness to permanent organ damage, cancer and death. The proper use of approved respirators shall protect the wearer from toxic levels of airborne chemicals. **(T-0)** AFI 48-137 provides guidance on the proper use and application of respiratory protection. Installation BE's Occupational and Environmental Health Risk Assessment will identify respiratory protection, if necessary. **(T-3)** Refer to Chapter **14** and **29** CFR § 1910.134, *Respiratory Protection,* for additional guidance.

32.3. Ventilation Systems. As a minimum, PMEL cleaning areas and work areas must have appropriate ventilation. **(T-0)** Ventilation shall continue for a sufficient time after job completion to minimize residual vapors and provide adequate makeup air. **(T-0)** Refer to ACGIH's *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance*, AFMAN 48-146, and FC 4-218-01F, *Air Force Criteria for Precision Measurement Equipment Laboratory Design and Construction*, for additional information on workspace ventilation, including information on permissible exposure levels, flow rate requirements and design criteria. Installation BE will determine what, if any, periodic testing of ventilation systems is required. **(T-1)**

32.4. Electrical Safety for PMEL Operations. Refer to **Chapter 8** and **Chapter 21** for additional guidance and information during PMEL operations.

32.4.1. Laboratory Floors. The floor covering of calibration/repair areas shall be as specified in FC 4-218-01F. **(T-0)** Floor coverings that are damaged or do not meet specified requirements, shall be repaired or replaced. **(T-0)** Insulated mats (Black – 24 inches wide / Blue – 36 inches wide / Green – 36 inches wide), or suitable substitutes, are required when personnel are exposed to and working on energized high voltage circuits.

32.4.2. Equipment Grounding. Refer to the manufacturer's instructions or 29 CFR §§ 1910.303, *General Requirements*, 1910.304, *Wiring Design and Protection*, 1910.305, *Wiring Methods, Components, and Equipment for General Use* and 1910.308, *Special Systems*, for guidance and information.

32.4.3. Facility Ground. The facility ground shall be marked at its connection to the ground buss bar. **(T-1)** The facility custodian shall visually inspect the electrical and grounding systems on a monthly basis for security and damage. **(T-1)** After repairs, they shall be tested for continuity and polarity by a qualified electrician. **(T-1)** Refer to AFMAN 32-1065 for additional guidance.

32.4.4. Buss bars shall be clean, free of corrosion and connections periodically checked for tightness. **(T-1)**

32.4.5. Equipment Electrical Safety Devices.

32.4.5.1. Interlocks shall not be disabled during maintenance or adjustments unless prescribed by the manufacturer's instructions or applicable TOs. **(T-1)** During these periods, a sign stating "Danger Interlocks Disabled" or other suitable commercially available substitute shall be placed on the equipment. **(T-1)** Interlocks shall not be permanently disabled or bypassed. **(T-1)** Refer to **Chapter 17,** Chapter **21,** and **29** CFR § 1910.306, *Specific Purpose Equipment and Installations*, for additional information on hazardous energy control procedures and requirements.

32.4.5.2. Only authorized maintenance personnel shall perform repair work on equipment with defective interlocks. **(T-1)** Refer to 29 CFR §§ 1910.303, 1910.305 and 1910.306 for additional guidance regarding interlocks.

32.4.5.3. When personnel are exposed to and working on energized high voltage circuits, e.g., greater than 600 volts, nominal, safety observers trained in CPR shall be present, unless the area supervisor determines the risk of the operation does not warrant a safety observer. **(T-0)** Personnel shall follow guidance in UFC 3-560-01 when an arc flash exists. **(T-0)**

32.4.6. Fuses and Circuit Breakers. Refer to NFPA 70, Article 408.4(A), *Circuit Directory or Circuit Identification*, for circuit breakers/fuse box identification additional guidance and information.

32.4.6.1. Circuit breakers or fuses shall be installed in all electrical circuits to interrupt the current flow when it exceeds the current carrying capacity of the conductor and/or circuit. **(T-0)** Do not bypass circuit breakers and fuses. Refer to 29 CFR § 1910.306 for additional guidance.

32.4.6.2. Equipment fuses shall always be replaced by fuses of the size and type required by the TO or manufacturer's instructions. **(T-1)** Use insulated fuse pullers to remove and replace cartridge fuses. Do not use wire, foil, solder or other conductive materials as substitutes for fuses. A lower amperage fuse of the same type may be used as a temporary measure until the proper fuse is available. Refer to 29 CFR § 1910.306 for additional guidance.

32.4.7. Grounding Sticks. A grounding stick shall be available for use at electronic workstations where residual voltages may be encountered during maintenance on de-energized equipment. **(T-1)**

32.4.8. Adjustments and Testing of Equipment. Electrical power shall be disconnected before technicians perform adjustments or repairs not involving alignment of mechanical/electrical components. **(T-0)** Adjustments with power on shall only be accomplished when required by applicable TOs or manufacturer's instructions. **(T-1)** Technicians performing the adjustment/alignment shall use insulated tools to minimize the possibility of shock or damage to equipment components. **(T-1)** Refer to **Chapter 21** for proper hazardous energy control procedures.

32.4.9. Electrical Safety Boards. Refer to **paragraph 8.12** for required items included in an emergency equipment kit or board.

32.5. Radioactive Material Safety.

32.5.1. Radioactive material shall be handled in a manner that results in as low as reasonably achievable exposures to personnel. **(T-1)** The installation Radiation Safety Officer (RSO) and BE shall prescribe special procedures and precautionary measures as necessary. **(T-1)** In overseas areas, disposal procedures shall be coordinated with the installation RSO and BE, who, in turn will coordinate with the host nation. Refer to AFMAN 40-201 for additional guidance.

32.5.2. Personnel shall not handle or expose a radioactive source except as required in the performance of duty. **(T-1)** Personnel involved in the actual use of radioisotopes shall receive formal training in their use and any precautionary measures, followed by continuing OJT. **(T-1)** No one shall be authorized to use, handle or access any area with an exposed or open ionizing radiation source without the worker and task being evaluated by the installation Radiation Safety Officer for possible entry into the US Air Force Dosimetry Program and placed on the dosimetry program, if deemed necessary. **(T-1)** Refer to DAFMAN 48-125 for additional guidance and information.

32.5.3. In restricted areas where radioactive material is used or stored, appropriate placards shall be conspicuously posted at each entrance and around the exterior perimeter of each area so at least one placard is clearly visible from any direction of approach. **(T-0)** Obstacles, such as rope, barricades, etc., shall be used to discourage unauthorized entry into controlled areas. **(T-1)** Individual containers of radioactive material within the area shall be appropriately identified. **(T-1)**

32.5.4. Pregnant military personnel must report to Public Health (PH), and civilian workers are encouraged to report to PH, who will, in coordination with BE and the Primary Care Manager, document health risks and preventive actions. **(T-1)** For military personnel, an AF Form 469, *Duty Limiting Condition Report*, will be completed and sent to the supervisor. **(T-1)**

32.5.5. Eating or drinking in any area in which a radiation ingestion hazard may exist is strictly forbidden. **(T-0)** Personnel working with radioactive materials shall wash their hands and face before eating or drinking and upon leaving a contaminated area. **(T-1)**

32.5.6. Regardless of radiation intensity, radioactive items used in PMEL operations shall not be carried in pockets or clothing of personnel. **(T-1)**

32.5.7. In addition to placards, positive measures, such as locked or guarded gates or doors, shall be established to prevent unauthorized entry into high radiation areas, as defined in AFMAN 48-148. **(T-1)** Entry of personnel into a high radiation area will energize a conspicuously visible or audible alarm signal designed to alert personnel present or cause the exposure to terminate.

32.5.8. If containers of radioactive materials are broken or damaged, the area shall be cleared of all personnel not required in evaluation of the condition, recovery of the radioisotope or decontamination of the area or material. **(T-1)** Once the area is cleared, it shall be secured. **(T-1)** If radioactive material becomes airborne, doors and windows shall be closed and ventilation equipment turned off. **(T-1)** The PMEL supervisor and installation Radiation Safety Officer shall be notified immediately. **(T-1)** A survey of the area shall be conducted to determine the extent of the radiological hazard. **(T-1)** Personnel who have been, or may have been, exposed shall be monitored to determine the extent of medical action required. **(T-1)** The Radiation Safety Officer shall direct the decontamination or recovery operation, as necessary. **(T-1)** Broken or damaged items shall be safely packaged and disposed of. **(T-1)** Refer to AFI 40-201 for additional disposal and handling instructions.

32.6. Equipment/Component Cleaning.

32.6.1. Vacuuming using a nonmetallic wand and suction nozzle is the preferred method for cleaning electronic equipment. If compressed air is used, the air pressure shall be limited to the lowest possible level. **(T-1)** Generally, five (5) psi is adequate for equipment cleaning. However, pressures shall not exceed 30 psi. **(T-1)** A diffuser nozzle shall be provided. **(T-1)** Refer to TO 00-25-234, *General Shop Practice Requirements for the Repair, Maintenance, and Test of Electrical Equipment,* for additional guidance.

32.6.2. Only approved and authorized solvents shall be used. **(T-1)** Adequate ventilation shall be provided. **(T-1)** BE‘s occupational and environmental health risk assessment shall be consulted if the characteristics of a solvent are in question. **(T-1)** Refer to ACGIH’s *Industrial Ventilation: A Manual of Recommended Practice for Operations and Maintenance*, for additional guidance and information on ventilation requirements. Appropriate PPE, as required in maintenance data and SDS, shall be worn. **(T-0)** Additionally, refer to **Chapter 14** for additional PPE requirements when working around solvents.

32.6.3. Ultrasonic Cleaning. When using ultrasound-cleaning equipment, workers shall always follow the manufacturer’s instructions for parts and equipment cleaning. **(T-1)** Refer to TO 00-25-234 for additional guidance on equipment cleaning and proper use of ultrasonic-cleaning equipment.

32.7. Tools and Equipment.

32.7.1. Insulated tools shall be used when performing work on energized equipment. **(T-1)** Placing rubber grips or tape on un-insulated tools does not make them acceptable insulated tools. Wooden handle tools shall not be used on energized equipment. **(T-1)**

32.7.2. Only wood or fiberglass ladders are acceptable for work on or near electrical equipment. Refer to **Chapter 7** for additional guidance on portable ladders.

32.7.3. Ground wrist straps shall be disconnected when personnel are exposed to or working on energized electrical circuits. **(T-1)**

32.7.4. Industrial equipment such as floor hoists, cranes, drill presses, grinders and polishers may pose hazards to technicians. Consult applicable maintenance, commercial data, **Chapter 11** and TO 34-1-3 for proper operation and maintenance of such equipment.

32.7.5. Radar and Microwave Equipment. Radar and microwave equipment are sources of radio frequency radiation. Personnel shall be instructed on radio frequency radiation hazards prior to working on this equipment and shall not be exposed to radio frequency radiation levels above permissible exposure limits. **(T-0)** Caution shall be observed with any open waveguide connected to an energized source of microwave radiation, as high power densities can be found at the waveguide opening. **(T-1)** A radio frequency radiation warning sign shall be posted in areas where access to power density levels exceed the permissible exposure limit. **(T-1)**

32.7.6. Hydraulic and Pneumatic Pressure Systems. TO 00-25-223, *Integrated Pressure Systems and Components (Portable and Installed)*, provides safe operating procedures for this equipment and shall be followed when using this equipment. **(T-1)**

32.7.7. Calibration/Repair of Fluid Analysis Equipment. Exposure to acids, electric current and petroleum distillates may occur when performing oil analysis operations and maintenance. Workers shall wear appropriate PPE when using this equipment and associated chemicals. **(T-1)**

32.7.8. Calibration/Repair of Radiation Measuring Equipment. Personnel shall follow AFI 48-109, AFI 48-139 and AFMAN 40-201 when calibrating or repairing radiation test, measuring and diagnostic equipment. **(T-1)**

JEANNIE M. LEAVITT
Major General, USAF
Chief of Safety

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

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AF Form 979, *Danger Tag*

AF Form 980, *Caution Tag*

AF Form 981, *Out of Order Tag*

AF Form 982, *Danger Tag: Do Not Start*

AF Form 983, *Danger – Equipment Lockout Tag*

AF Form 1024, *Confined Space Entry Permit*

Adopted Forms

AF Form 55, *Employee Safety and Health Record*

AF Form 103, *Base Civil Engineering Work Clearance Request*

AF Form 469, *Duty Limiting Condition Report*

AF Form 483, *Certificate of Competency*

AF Form 623, *Individual Training Record Folder*

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AF Form 1800, *Operator's Inspection Guide and Trouble Report*

AFTO Form 95, *Significant Historical Data*

AFTO Form 244, *Industrial/Support Equipment Record*

AFTO Form 492, *MX Warning Tag*

DD Form 1574, *Serviceable Tag – Material*

DD Form 1577-2, *Unserviceable (Reparable) – Tag Materiel*

Abbreviations and Acronyms

ACGIH—American Conference of Governmental Industrial Hygienists

AFCEC—Air Force Civil Engineer Center

AFI—Air Force Instruction

AFJMAN—Air Force Joint Manual

AFMAN—Air Force Manual

AFMC—Air Force Materiel Command

AFOSH—Air Force Occupational Safety and Health

AFPAM—Air Force Pamphlet

AFPD—Air Force Policy Directive

AFR—Air Force Reserve

AFSEC—Air Force Safety Center

AFTO—Air Force Technical Order

AFVA—Air Force Visual Aid

AGE—Aerospace Ground Equipment

ANG—Air National Guard

ANSI—American National Standards Institute

ASHRAE—American Society of Heating, Refrigerating and Air-Conditioning Engineers

ASME—American Society of Mechanical Engineers

ASSP—American Society of Safety Professionals

AVGAS—Aviation Gasoline

BAK—Barrier Arresting System

BCE—Base Civil Engineer

BE—Bioenvironmental Engineering

C—Celsius

CAP-USAF—Civil Air Patrol

CBT—Computer-based Training

CE—Civil Engineer or Civil Engineering

CFR—Code of Federal Regulations

CGA—Compressed Gas Association

CH4—Methane

cm—Centimeter

CO2—Carbon Dioxide

CPR—Cardiopulmonary Resuscitation

CSPT—Confined Space Program Team

C2H6—Ethane

dBA—Decibels-A-Weighted

DFPE—Designated Fire Protection Engineer

DoD—Department of Defense

DoDI—Department of Defense Instruction

DOT—Department of Transportation

DRU—Direct Reporting Unit

E-I—Engineering/Installation

EM—Engineers Manual

DAFMAN—Department of the Air Force Manual

F—Fahrenheit

FES—Fire Emergency Services

FLDCOM—Field Command

FOA—Field Operating Agency

FOD—Foreign Object Damage

GFCI—Ground Fault Circuit Interrupter

HAZCOM—Hazard Communication

HAZMAT—Hazardous Material

HMMWV—High Mobility Multipurpose Wheeled Vehicle

HQ—Headquarters

IDLH—Immediately Dangerous to Life and Health

ISEA—International Safety Equipment Association

JHA—Job Hazard Analysis

JP—Jet Petroleum

JSM—Joint Service Manual

kV—Kilovolt

kW—Kilowatt

LEL—Lower Explosive Limit

LFL—Lower Flammable Limit

LH2—Liquid Hydrogen

LN2—Liquid Nitrogen

LNG—Liquefied Natural Gas

LOI—Letter of Interpretation

LOTO—Lockout/Tagout

LOX—Liquid Oxygen

MAJCOM—Major Command

MDS—Mission Design Series

MHE—Material Handling Equipment

MIL-PRF—Military Performance Specification

MIL-STD—Military Standard

MPH—Miles Per Hour

MX—Maintenance

NAF—Numbered Air Force

NATO—North Atlantic Treaty Organization

NDI—Non-Destructive Inspection

NFPA—National Fire Protection Association

NRTL—Nationally Recognized Testing Laboratory

OI—Operating Instruction

OJT—On-The-Job Training

OPEI—Outdoor Power Equipment Institute

OPR—Office of Primary Responsibility

OSH—Occupational Safety and Health

OSHA—Occupational Safety and Health Administration

PCB—Polychlorinated Biphenyl

PFAS—Personal Fall Arrest System

PH—Public Health

PMEL—Precision Measurement Equipment Laboratory

PPE—Personal Protective Equipment

PSI—Pounds per Square Inch

PSM—Process Safety Management

RM—Risk Management

ROPS—Rollover Protection Structure

SABC—Self-Aid Buddy Care

SDS—Safety Data Sheet

SE—Support Equipment

SEG—Occupational Safety

TO—Technical Order

UFC—Unified Facilities Criteria

US—United States

USAF—United States Air Force

USC—United States Code

Terms

Abrasive Wheel—A cutting tool made of abrasive grains held together by organic or inorganic bonding materials.

Air Force Occupational Safety and Health (AFOSH)—An overarching term for the Air Force Occupational Safety and Health Program.

Automated External Defibrillator—A device that analyzes the heart's rhythm and, if necessary, tells the user to deliver a shock to a victim of sudden cardiac arrest. This shock, called defibrillation, may help the heart to re-establish an effective rhythm of its own.

Actuator—A manually operated device used to initiate controls or operator action. An actuator includes, but is not limited to, a push button, toggle switch, foot pedal, hand lever or a hand set timer.

Aerial Device—Any vehicle-mounted device, telescoping or articulating or both, that is used to elevate personnel to job sites above ground. These devices include extendable boom platforms, vertical towers or a combination of the above.

Aerial Ladder—An aerial device consisting of a single or multiple-section extendable ladder.

Aisleway—An established path for powered material handling equipment (or foot traffic) used inside a facility, such as aisleways in a warehouse.

Anchorage—See Fixed Anchorage.

Approved—Listed and approved by the Nationally Recognized Testing Laboratory (NRTL), The Bureau of Mines, National Institute for Occupational Safety and Health, American National Standards Institute, National Fire Protection Association or other nationally recognized agencies that list, approve, test or develop specifications for equipment to meet fire protection, health or safety requirements.

Atmospheric Monitoring—The quantitative analysis of a confined space environment to identify a potentially hazardous atmosphere.

Attendant—A trained individual stationed outside one or more confined spaces who monitors authorized entrants and performs attendant's duties assigned in the permit space program.

Authorized Worker—A worker approved or assigned by the employer to perform a specific type of duty or duties, or to be at a specific location or locations at the jobsite. Example: A worker who locks or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment.

Bearer—A horizontal part of a scaffold on which the platform rests and which may be held in place by ledgers.

Blanking or Blinding—The absolute closure of a pipe, line or duct, by fastening across it a solid plate or cap capable of withstanding the maximum upstream pressure with no leakage beyond the plate or cap.

Bloodborne Pathogens—Bloodborne pathogens are pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, Hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

Body and/or Hand Protection—Any glove, finger guard, arm protector, apron, bib or garment designed to protect the body, arms, hands or fingers from contamination or injury due to absorption or physical contact.

Body Harness—A harness secured about the wearer so fall arrest forces are distributed over the thighs, buttocks, chest and shoulders, or any combination thereof. Includes provisions for attaching a lanyard centered in the back near shoulder level or above the head.

Bonding—The interconnecting of metal raceways, equipment cabinets, shields, etc., to the facility equipment system to eliminate electrical potential of individual pieces of equipment relative to each other.

Boom (Crane)—A member, fixed or telescoping, hinged to the rotating superstructure and used to support the hoisting tackle.

Brace—A tie that holds one scaffold part in a fixed place with respect to another part.

Brake—A friction device for slowing down a conveyor component, bringing conveyor equipment to a controlled stop, holding traveling or traversing equipment in a selected location, preventing reverse travel and controlling over-speed due to the action of gravity.

(1) *Brake, Drag.* A brake that provides retarding force without external control.
(2) *Brake, Holding.* A brake that automatically prevents motion when power is off.
(3) *Brake, Travel.* A brake that retards or stops motion in a horizontal direction.

Bridge—That part of a crane consisting of girders, trucks, end ties, footwalks and drive mechanism that carries the trolley or trolleys.

Breakthrough Time—The time required for a specific chemical to permeate through a particular brand of protective clothing or equipment.

Buddy System—Two people, each responsible for each other's safety, are present in a hazardous situation. There are two (2) types of buddy systems. One involves both persons subjected to the sane hazard at the same time, and each assures the other's well-being and assists if a mishap occurs. The other system is where one person is exposed to the hazard while the other is not and acts as an observer.

Cab—The operator's compartment attached to the crane or monorail carrier in which the operator may ride and from which the motions of the crane or monorail equipment may be controlled. A housing that covers the rotating superstructure machinery or operator's station.

Calibration or Recalibration—A laboratory or bench-top resetting of alarm points, spans and zeros according to manufacturer's specifications.

Capable of Being Locked Out—An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, has a locking mechanism built into it or if lockout can be achieved without the need to dismantle, rebuild or replace the energy isolating device or permanently alter its energy control capability.

Cardiopulmonary Resuscitation (CPR)—A procedure to support and maintain breathing and circulation for a person who has stopped breathing (respiratory arrest) and/or whose heart has stopped (cardiac arrest).

Catwalk—A passageway for persons, elevated above the floor or ground level, such as a foot walk along shafting or a walkway between buildings.

Chain—A series of links pivotally joined together for conveying or transmitting motion or power. General classes of chain are detachable, pintle, combination, roller, rivetless, coil, inverted tooth and bar link chains.

(1) *Chain, Roller Link.* A chain consisting of a series of stamped steel plates fastened with pins, bushings and rollers giving articulation in only one plane.
(2) *Chain, Welded Link.* A chain consisting of a series of interwoven links formed and welded from round bar stock.

Chemical Protective Clothing—Chemical protective clothing is intended to protect the worker from contact with chemicals. It may include items such as: hoods, face shields, chemical goggles, jackets, coats, aprons, bib overalls, coveralls, splash suits, boots, shoe covers and full-body encapsulating suits.

Chuck—A clamp that holds a tool or material being worked in or on a machine.

Climbing Ladder—A separate or built-in ladder with rungs spaced at equal distance and attached to a scaffold or platform so people can climb and descend.

Clutch—A device used to connect and disconnect a driving and driven part of a mechanism that, when connected, transmits rotary motion from the driving part to the driven member.

Coating—An elastomer or other suitable material used to impart physical, electrical or other desired properties when applied to a sling or sling component.

Combination Unit (Emergency Shower and Eyewash)—A unit combining a shower with an eye and face wash, or eyewash with a drench hose, or both.

Combustible Liquid—A liquid having a flashpoint at or above 100o F (37.80^{o} C). Combustible liquids shall be divided into two classes as follows:

(1) Class II liquids have a flashpoint at or above 100° F (37.8^{o} C) and below 140° F (60° C), except any mixture having components with flashpoints of 200° F (93.3^{o} C) or higher, the volume of which makes up 99 percent or more of the total volume of the mixture.
(2) Class III liquids have flash points at or above 140° F (60° C) and are subdivided into two subclasses:
(a) Class IIIA liquids have flashpoints at or above 140° F (60° C) and below 200° F (93.3^{o} C), except any mixture having components with flashpoints of 200° F (93.3^{o} C) or higher, the total volume of which makes up 99 percent or more of the total volume of the mixture.
(b) Class IIIB liquids have flashpoints at or above 200° F (93.3^{o} C).

Competent Person—Competent person is an individual who, by way of training and/or experience, is knowledgeable of applicable standards, is capable of identifying workplace hazards relating to the specific operation, is designated by the unit commander, unit representative or supervisor and has authority to take appropriate actions.

Compressed Gas—Any gas or mixture of gasses in a container having a pressure exceeding 40 psia at 70° F (21.1^{o} C), or a pressure exceeding 104 psia at 130° F (54.4^{o} C), or any liquid having an absolute vapor pressure exceeding 40 psia at 100° F (37.8^{o} C).

Conductor—A substance or device that readily conducts heat, electricity, sound, etc. Definitions of specific conductors follow:

(1) *Conductors, Bridge.* The electrical conductors located along the bridge structure of a crane to provide power to the trolley.
(2) *Conductors, Enclosed.* Bar or wire used to transmit electricity, enclosed to minimize the possibility of accidental contact with the conductor.
(3) *Conductors, Open.* Bar or wire not enclosed, used to transmit electrical current and provide power (frequently used with the crane or monorail carrier).
(4) *Conductors, Runway (Main).* The electrical conductors located along a crane runway to provide power to the crane.

Confined Space—A space large enough and configured so a worker can bodily enter and perform assigned work; has limited or restricted means for entry or exit (for example: tanks, vessels, silos, storage bins, hoppers, vaults, manholes and pits); and is not designed for continuous human occupancy.

Confined Space Program Team—A group of professionals, consisting of representatives from installation Occupational Safety office, F&ES Flight and BE, working together for the purposes of organizing and controlling the installation confined space program. Commanders, functional

managers or their representatives are members of the team when their particular organizations are involved.

Control—The system governing the starting, stopping, direction of motion, acceleration, speed, retardation and function of the moving member in a predetermined manner.

Controller—An electric or mechanical device or assembly of devices for starting, stopping, accelerating or decelerating a system, or which serves to govern in some predetermined manner the power delivered to the system.

Coolant—Oil or other fluid that draws off heat by circulating through a machine or by bathing a mechanical part, such as oil that is applied to a metal cutting operation to dissipate the heat.

Corrosive—Any substance that burns, injuriously irritates or destructively attacks metal, organic tissues or other materials.

Counterweight—A weight used to balance or counter a load. Examples are:

(1) Additional weight attached to the rear of the forklift to provide better weight distribution.
(2) Weight used to supplement the weight of a crane to provide stability for lifting working loads.

Coupler—A device for locking together the parts of a tubular metal scaffold.

Crane—Any machine for lifting and lowering of a load and moving it horizontally, in which the lifting device is an integral part of the machine.

(1) *Crane, Cantilever Gantry.* A gantry or semi-gantry crane in which the bridge girders or trusses extend transversely beyond the crane runway on one or both sides.
(2) *Crane, Crawler.* A crane consisting of a rotating superstructure with power plant, operating machinery and boom, mounted on a base, equipped with crawler treads for travel.
(3) *Crane, Floor-Operated.* A crane which is controlled by an operator on the floor or an independent platform by using a pendant or nonconductive rope.
(4) *Crane, Gantry.* A crane similar to an overhead crane except the bridge for carrying the trolley or trolleys is rigidly supported on two (2) or more legs running on fixed rails or other runway.
(5) *Crane, Overhead.* A crane with a movable bridge carrying a movable or fixed hoisting mechanism and traveling on an overhead fixed runway structure.
(6) *Crane, Remote-Operated.* A crane controlled by an operator not in a cab or pulpit. It is controlled by any method other than pendant or rope control (for example: radio, voice, remote hydraulic control).
(7) *Crane, Storage Bridge.* A gantry type crane of long span usually used for bulk storage of material; the bridge girders or trusses are rigidly or non-rigidly supported on one or more legs. It may have one or more fixed or hinged cantilever ends.
(8) *Crane, Underhung.* A traveling bridge on two (2) or more runway tracks on which hoists and carriers may travel for the purpose of lifting, transporting and lowering loads. It is suspended under its runway tracks system, the trolley of which operates on the bottom flange of the track.
(9) *Crane, Wall.* A crane having a jib with or without trolley and supported from a side wall or line of columns of a building. It is a traveling type and operates on a runway attached to the side wall or columns.

Critical Load—Materials that if damaged or destroyed during a lift would present an unrecoverable loss or unacceptable risk. DAF materials will be designated as critical loads for

purposes of lifting or hoisting by an appropriate Program Manager or the functional manager at the facility where the lift will occur. Items for consideration in making a critical load determination include, but are not limited to:

(1) Personnel injury or significant adverse health impact.
(2) Damage resulting in serious economic consequences (non-availability of necessary funds to repair or replace the item).
(3) Damage resulting in unacceptable delay to schedule (mission impairment) or other destructive programmatic impact, e.g., loss of vital data.
(4) Undetectable damage that would jeopardize future operations or safety of a facility.
(5) Damage that may occur without exceptional care in handling because of close-tolerance installation, high susceptibility to damage or other unusual characteristic.
(6) Damage that would result in significant release of hazardous materials.
(7) Damage that may occur because the item, although noncritical, must be lifted above a critical item, e.g., loads of any sort in close proximity to a nuclear component or near concentrations of hazardous materials.

Critical Temperature—The temperature above which a gas cannot be liquefied by pressure alone.

Crossover—A connecting track with an interlock mechanism on both ends mounted between two interlocking cranes used to transfer a carrier from one bridge to the other.

Cryogen—A cryogenic liquid boils at temperatures below -160o C (-256o F) and is used as a refrigerant. As used in this publication, normally refers to LN2 or LOX.

Cryogenics—The science of refrigeration, with reference to methods for producing very low temperatures.

Cryotainer—A double-walled, insulated container (tank) for storage of a cryogenic fluid.

Cylinder—Generally a compressed gas container having a maximum water capacity of 1,000 lbs. (453.6 kg.). This is approximately the equivalent of 120 gallons (454.2 L).

Daily or Prior—to-Use Inspection—A visual inspection of equipment performed once each day prior to initial use. If the equipment is not used on a daily basis, this inspection is performed prior to each use and is not required on those days the equipment is not used. The use of additional items such as ladders, personnel lifts or special tools or disassembly of lifting equipment is not required by this publication for this inspection. **Note:** The daily or prior to use inspection is not an Operational Test.

Deceleration Device—Any mechanism, such as rope-grab, rip-stitch lanyard or specifically woven lanyard, that serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limits the energy imposed on a worker during fall arrest.

Derrick—An apparatus consisting of a mast or equivalent member held at its upper end by guys or braces, with or without a boom, for use with hoisting mechanism and operating ropes.

Department of the Air Force Military Personnel—These are DAF personnel on Regular Air Force status with the DAF or ANG (under the provisions of either Title 10 or 32) and AFR personnel on military duty status (on active duty, on active duty for training, or inactive duty for training), which includes Air Force Academy cadets and Reserve Officer Training Corps cadets engaged in directed training activities. Includes members of other US military services serving on

extended Regular Air Force status with the DAF or foreign-national military personnel assigned to the DAF.

Department of Defense Civilian Personnel—Includes Senior Executive Service (SES), General Schedule (GS), Defense Civilian Intelligence Personnel System (DCIPS) and federal wage system employees, including ANG and AFR technicians, unless in military duty status. Includes non-appropriated fund employees who are not military personnel working part time; Corps of Engineers Civil Works employees; Youth Opportunity Program and student assistance program employees; Direct-Hire Foreign-national civilians employed by the Air Force (Air Force Foreign Nationals) and Army-Air Force Exchange Service employees.

Department of Defense Military Personnel—These are non-DAF military personnel assigned to an DAF-led joint base.

Designated Person—Selected or assigned by the supervisor or the unit's representative as qualified to perform specific duties.

Design Working Load—The maximum intended load, being the total of all loads including the weight of the workers, materials, equipment and platform.

Dog—A device for gripping or holding material or a machine component in place.

Dolly—A low mobile platform that rolls on casters, used for transporting heavy loads.

Double Block and Bleed—The closure or isolation of a confined space from a line, duct or pipe by locking or tagging two (2) closed in-line valves and locking or tagging open to the outside atmosphere a drain or bleed in the line between the two (2) closed valves.

Drive—An assembly of the necessary structural, mechanical and electrical parts which provides the motive power for a conveyor, monorail, crane, etc.

Dropline—A vertical line attached to a fixed anchorage to which a lanyard is attached.

Emergency Shower—A unit that cascades water over a worker's entire body to remove hazardous chemicals splashed or sprayed on the worker.

Employee—For the purpose of this publication, the term Employee applies to all Personal Services Contractors, Department of Defense Civilian Personnel, Department of Defense Military Personnel and Department of the Air Force Military Personnel, including Space Force personnel.

Energized—A circuit electrically connected to a source of potential difference or an electrical charge. Can also include mechanical, hydraulic and pneumatic pressure differences.

Energy Isolating Device—A physical device that prevents transmission or release of energy including, but not limited to: a manually operated electrical circuit breaker, disconnect switch, slide gate, slip blind, line valve, blocks and similar devices with a visible indication of the position of the device. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

Energy (Shock)—A component of whose primary function is to dissipate energy and limit deceleration forces which the system imposes on the body during fall arrest.

Entrant—Any employee who is trained and authorized to enter a confined space.

Entry—Any action by which a person passes through an opening into a permit-required confined space. Entry includes work activities in the space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the confined space.

Entry Permit—The written authorization for entry under defined conditions into a confined space for a stated purpose during a specified time. The entry permit becomes the written record of circumstances surrounding each entry operation. See **paragraph 23.4.1.2** for entry permit retention instructions.

Entry Supervisor—The person responsible for determining if acceptable entry conditions are present at a permit space where entry is planned.

Equalizer—A device that compensates for unequal length or stretch of a rope.

Equipment Ground—Connection to ground from one or more of the non-current carrying metal parts of apparatus or equipment.

Exit Access—Exit access that is a portion of a means of egress that leads to an exit.

Extendible Boom Platform—An aerial device (except ladders) with a telescopic or extendible boom. Telescopic derricks with personnel platform attachments are considered extendible boom platforms when used with a personnel platform.

Extension Ladder—A non-self-supporting portable ladder, adjustable in length, with two (2) or more sections traveling in guides or brackets arranged to permit length adjustment. Its size is designated by the sum of the lengths of the sections measured along the side rails.

Eyewash Bottle—A squeeze type or plunger-actuated bottle that supplements permanent units, portable units or both.

Eyewash Unit—A unit used to irrigate and flush the eyes only.

Face Shield—A protective device worn in front of the eyes, covering a portion of, or all of, the face.

Facility Ground—A grounding system of 10 ohms or less that the entire third wire ground system, metal raceways, conduits, generators, transformers and other equipment within the facility are connected to.

Fail-Safe—A provision designed to automatically stop or safely control any motion if a malfunction occurs.

Field Check—A method of checking an instrument for a proper response in the field. It is a pass or fail functional check of the instrument. Also known as Bump Test.

Fire Protection—Sprinkler systems and other firefighting or fire protection equipment or systems.

Fire Suppression System—A system which automatically or manually discharges fire extinguishing agent to suppress a fire.

Fixed Anchorage—A secure point of attachment, not part of the work surface, for droplines, lifelines or lanyards. An approved fixed anchorage shall be capable of supporting a minimum deadweight of 5,000 pounds (per person).

Fixed Ladder—means a ladder with rails or individual rungs that is permanently attached to a structure, building, or equipment. Fixed ladders include individual-rung ladders, but not ship stairs, step bolts, or manhole steps.

Flammable Liquid—A liquid having a flashpoint below 100º F (37.80º C) closed cup test and having a vapor pressure not exceeding 40 pounds psi at 100º F (37.80º C). Flammable liquids are categorized as Class 1 liquids and are further subdivided as follows:

(1) Class 1A have a flashpoint below 73º F (22.8º C) and boiling points below 100º F (37.8º C).
(2) Class 1B have flashpoints below 73º F (22.8º C) and boiling points at or above 100º F (37.8º C).
(3) Class 1C have flashpoints at or above 73º F (22.8º C) and below 100º F (37.8º C).

Flange—A collar, disk or plate used to hold an abrasive wheel in position on a rotating shaft.

Flashpoint—The minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid. **Flightline—**Any area or facility including aprons, hardstands and ramps on or in which aircraft may be parked, stored, service or maintained.

Flightline Fire Extinguisher—A wheeled portable fire extinguisher provided for the protection of aircraft. Included are various sizes of Halon 1211, carbon dioxide and dry chemical extinguishers.

Floor—The interior walking surface upon which machinery, aisles and passageways are located. This does not include platforms, walkways or catwalks.

Floor Opening—An opening measuring 12 inches or more in its least dimension in any floor, platform, pavement or yard, through which persons may fall; such as a hatchway, stair or ladder opening, pit or large manhole. Floor openings occupied by elevators, dumb waiters, conveyors, machinery or containers are excluded from this subpart.

Free Fall Distance—The vertical displacement of the fall arrest attachment point on the employee's body harness between onset of the fall and just before the system begins to apply force to arrest the fall.

Functional Manager—The senior operating official at all levels exercising managerial control of an activity or operation. This individual usually can acquire and commit resources for the abatement of occupational safety and health hazards. Functional managers are designated by MAJCOM, FLDCOM, DRU, FOA or installment commanders.

Gauge Pressure—The pressure above or below local atmospheric pressure. Therefore, absolute pressure minus local atmospheric pressure equals gauge pressure. Gauge pressure is commonly designated by the abbreviation psig.

Goggles—A device that protects the eyes and eye sockets. They have contour-shaped eyecups or full facial contact, glass or plastic lenses and are held in place by a headband or other suitable means.

Grounding Stick—A device used to ground electronic circuits and bleed off voltage or static electricity.

Grounding System—Complete ground circuit for any equipment, facility or system.

Guardrail—A protective railing built along exposed sides of stairs and platforms designed to prevent people or objects falling into an open space or stairwell. The top part of a guardrail can serve as a handrail.

Hand-Held Drench Hose—A flexible hose connected to a water supply and used to irrigate and flush eyes, face and body areas.

Hazardous Atmosphere—An atmosphere presenting a potential for death, disablement, injury or acute illness from one or more of the following causes: a flammable gas, vapor or mist in excess of 10 percent of its lower explosive limit (LEL) or lower flammable limit (LFL); an airborne combustible dust at a concentration that meets or exceeds its LEL or LFL; atmospheric oxygen concentration below 19.5 percent or above 23.5 percent; an atmospheric concentration of any chemical substance greater than the occupational and environmental exposure limit (OEEL), which is capable of causing death, incapacitation, impairment of ability to self-rescue, injury or acute illness due to its health effects.

Hazardous Energy Control Program—A program consisting of energy control procedures, staff training and periodic inspections established before a staff member performs any servicing or maintenance on a machine or equipment where the unexpected energizing, start-up or release of stored energy could occur and cause injury. Prior to service, the machine or equipment shall be isolated from the energy source and rendered inoperative.

Hazardous Material—A substance that is explosive, flammable, poisonous, corrosive, oxidizing, irritating or otherwise harmful and may cause personal injury or harm.

Head Protection—A device worn to provide protection to workers when there is the potential for injury to the head from impact and penetration from flying, falling or stationary objects or limited electrical shock, heat or burn. Protection includes a suitable chinstrap and harness to secure the helmet to the head.

Hierarchy of Controls—The means of protecting employees from hazards in order from most effective to least effective.

(1) *Elimination.* The process of physically removing the hazard.
(2) *Substitution.* Replacing he hazard, such as toxic chemical with one that is less hazardous or is not hazardous at all.
(3) *Engineering Controls.* Isolate the people from the hazard.
(4) *Administrative Controls.* Change the way employees work, such as limiting their exposure to noise or heat through job rotation.
(5) *Personal Protective Equipment (PPE).* Protect the worker with PPE.

High Voltage—Any circuit, set of conductors or exposed point of contact in which the potential to ground or between conductors is greater than 600 volts nominal.

Hitch—A sling configuration whereby the sling is fastened to an object or load, either directly or around it.

(1) *Basket Hitch.* A sling configuration where the sling is passed under the load and has both ends, eyes or handles on the hook or single master link.
(2) *Choker Hitch.* A sling configuration with one end of the sling passing under the load and through an, handle or eye on the other end of the sling. Used for turning an object.
(3) *Vertical Hitch.* A method of supporting a load by a single vertical part or leg of the sling.

Hoist—Includes only those components furnished by the hoist manufacturer, such as drums tackle, prime movers, limiting device, mounting bases, etc. When hoists are mounted as integral parts of more complex lifting equipment, they become component parts of that equipment. They are subject to the safety standards and inspection intervals established for the end item.

Hot Work Permit—The written authorization to perform "hot work" operations such as welding, cutting, burning or heating that could provide a source of ignition.

Immediately Dangerous to Life or Health (IDLH)—Any condition that poses an immediate or delayed threat to life that would cause immediate or delayed adverse health effects or that would interfere with a worker's ability to escape unaided from a permit-required space.

Inclined Ladder or "Ship's" Ladder"—A stairway installed at an angle greater than 50 degrees. All stairway criteria, except the angle of rise, applies to inclined ladders.

Inerting—Rendering the atmosphere of a confined space non-flammable, non-explosive or otherwise chemically non-reactive by displacing or diluting the original atmosphere with steam or a gas that is non-reactive with respect to the contents of the space. Nitrogen is a common inerting gas. **Note:** This procedure creates an IDLH oxygen-deficient atmosphere.

Insulated Aerial Device—An aerial device designed for work near energized electrical lines and apparatus.

Interlock—A device that prevents operation of the control that starts a machine in motion until a condition is met, such as the guard being in place.

Intrinsically Safe—As applied to equipment and wiring, equipment and wiring that are incapable of releasing sufficient electrical energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture.

Ionizing Radiation/Ionized Radiation—Electromagnetic or particulate radiation, which may cause ionization and damage within the cells or tissues of the body, and that has sufficient energy to produce direct ionization in passage through a substance. Examples of ionizing radiation are X-rays, gamma rays, alpha particles and beta particles.

Isolation—Positively preventing any unwanted form of energy (or other agent with a serious potential for hazard) from contacting a worker or operation through the use of blanking, double block and bleed or lockout and/or tagout.

Job Hazard Analysis (JHA)—A technique or procedure used by supervisors and workers that focuses on job tasks as a way to identify hazards before they occur. It focuses on the relationship between the worker, the task, the tools and the work environment. Ideally, after you identify uncontrolled hazards, you will take steps to eliminate or reduce them to an acceptable risk level. Specific documentation is required. The prescribing directives for conducting JHAs are AFI 91-202 and 29 CFR § 1910.132.

Kickback—The tendency of blades and cutters to force material being cut or milled up and back toward the operator.

Ladder—means a device with rungs, steps, or cleats used to gain access to a different elevation.

Ladder Stand—A mobile fixed size, self-supporting ladder made up of a wide flat tread ladder in the form of stairs. The ladder stand may include handrails.

Lanyard—A flexible line used to secure a wearer of a body harness to a dropline, lifeline or fixed anchorage.

Lay—The linear distance for one strand to go completely around a rope.

Lifeline—A flexible line for connection to an anchorage connector at one end to hang vertically (vertical lifeline), or for connection to anchorages or anchorage connectors at both ends to span horizontally (horizontal lifeline).

Limiting Device—A mechanical or electrical device designed to limit motion.

Limit Switch—A switch that is operated by some part of the hoist or equipment to limit travel of lifting option to prevent hoist or equipment damage.

Load Block (Lower)—The assembly of hook or shackle, swivel, sheaves, pins, bearings and frame suspended by the hoisting ropes or chains.

Load Block (Upper)—The assembly of hook or shackle, swivel, sheaves, pins and frame suspended from the boom point.

Load Rating—A rating in pounds established by the manufacturer as the maximum safe working load for an individual hoist, crane or related lifting equipment.

Load Test—Also called rated load test. A 100-percent to 125-percent test of the rated capacity (working load limit), as determined by type of equipment and designated by the manufacturer. See individual chapters for applicable equipment—specific test procedures.

Lockout Device—A device that utilizes a lock and key to hold an energy isolating device in the safe position for the purpose of protecting personnel.

Lower Explosive Limit—The lowest concentration of flammable or combustible vapor, which can be ignited by a spark or flame (also referred to as "Lower Flammable Limit [LFL]" in industry).

Master Entry Plan—A written document, which must be reviewed annually by the Confined Space Program Team, that authorizes entry supervisors to issue entry permits. This document defines acceptable entry conditions for routine recurring entries into like spaces.

Maximum Intended Load—The total weight of all loads including the weight of workers, materials and scaffolding.

May—Indicates an acceptable or satisfactory method of accomplishment.

Midrail—A rail approximately midway between the guardrail and platform and secured to the uprights erected along the exposed sides and ends of platforms.

Military-Unique (Workplaces, Operations, Equipment and Systems)—Uniquely military equipment, systems, operations, or workplaces are excluded from the federal regulatory standards distributed by OSHA. However, the DoD Components must apply OSHA and other regulatory safety and health standards to uniquely military equipment, systems, operations, or workplaces, in whole or in part, as practicable. When military design, specifications, or deployment requirements render compliance with existing SOH standards infeasible or inappropriate, or when no standard exists for such military application, the DoD Components must apply risk management procedures. The results of the risk management decision must be communicated to all affected personnel.

Mishap Prevention Sign—A visual display made of some durable material (metal, wood, rigid plastic) intended to caution, warn or provide information.

Mishap Prevention Tag—A visual display, intended to caution or warn, made of materials that will withstand the environmental conditions expected in the workplace and are securely attached in an appropriate manner to ensure visibility, as close to the machine or equipment as possible.

Mobile Scaffold (Tower)—A light, medium or heavy duty scaffold that is mounted on casters or wheels.

Mobile Unit—A combination of an aerial device, its vehicle and related equipment.

Mobile Work Platform—A scaffold that provides a work level, one or more frames high, on casters or wheels, with bracing across or diagonally from the platform to the posts.

National Consensus Standards—Select committees of federal, industrial and private sector personnel develop these standards under the sponsorship of one of the national standards-setting organizations, e.g., American National Standards Institute, National Fire Protection Association and the American Society of Mechanical Engineers. National consensus standards are not directive, unless adopted by a regulatory federal agency or the DAF.

Nationally Recognized Testing Laboratory (NRTL)—Private-sector organizations that OSHA has recognized as meeting the legal requirements in 29 CFR 1910.7 to perform testing and certification of products using consensus based test standards. These requirements are:

(1) The capability to test and evaluate equipment for conformance with appropriate test standards.
(2) Adequate controls for eh identification of certified products, conducting follow-up inspections of actual production.
(3) Complete independence from users, e.g., employers subject to the tested equipment requirements, and from any manufacturers or vendors of the certified products.
(4) Effective procedures for producing its findings and for handling complaints and disputes. An organization must have the necessary capability both as a product safety testing laboratory and as a product certification body to receive OSHA recognition as an NRTL. For a current list of OHSA-approved NRTLs, visit **https://www.osha.gov/dts/otpca/nrtl/nrtllist.html**.

Non-ionizing Radiation—Electromagnetic radiation that does not have sufficient energy to produce direct radiation when passing through a substance. Examples include radiofrequency (RF) radiation, visible light, infrared and ultraviolet.

Nonmilitary-Unique (Workplaces and Operations)—DoD military and civilian workplaces and operations that are comparable generally to those of the private sector. Examples include facilities involved and work performed in the repair and overhaul of weapons, aircraft or vehicles (except for equipment trials); construction; supply services; civil engineer or public works; medical services; and office work.

Non-Permit Confined Space—A space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazards capable of causing death or serious physical harm.

Notice of Hazard—A written warning of a condition, procedure or practice that constitutes an occupational hazard. As used in the context of this publication, Notice of Hazard refers to AF Form 1118.

Nuclear—Certified Equipment—Hoists and related lifting equipment approved for use with nuclear weapons. The Air Force single point of contact for nuclear certification of lifting equipment is HQ AFSEC/SEWE. This office establishes the equipment as certified and ensures the equipment is listed in the Master Nuclear Certification List **https://www.mil.nwd.kirtland.af.mil.mncl**

Occupational and Environmental Exposure Limit—The most appropriate limit adopted from established recognized standards including, but not limited to, those in AFIs and AFOSH Standards, the latest edition of the TLV® Booklet published annually by the American Conference of Governmental Industrial Hygienists, and 29 CFR § 1910.1000 Tables Z-1, Z-2 and Z-3. Occupational and environmental exposure limits are limits of exposure established to protect personnel from hazardous occupational and environmental health threat exposures. Occupational and environmental exposure limits s apply to occupational and environmental health threat exposures for individuals and/or similarly exposed groups of individuals.

Open Riser—The air space between the treads of stairs.

Operational Test—A test of mechanical and electrical controls, limit switches and safety devices through the complete operational range without a load.

Outriggers—Extendible or fixed metal arms, attached to the mounting base, which rest on supports at the outer ends.

Overload Device—A mechanical or electrical device designed to disconnect the driven equipment from the motive power in the event of an overload on the conveyor.

Oxygen-Deficient Atmosphere—An atmosphere containing less than 19.5 percent oxygen by volume.

Oxygen-Enriched Atmosphere—An atmosphere containing more than 23.5 percent oxygen by volume.

Pallet—A low portable platform of wood, metal, or fiberboard used to stack, move, store and transport supplies as a unit.

Pawl (Dog)—A device for positively holding the mechanism, drum, etc., against undesired rotation.

Permit—Required Confined Space—A confined space that has one or more of the following characteristics: contains or has a potential to contain a hazardous atmosphere, contains a material that has the potential for engulfing the entrant, has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section, or contains any other recognized serious safety or health hazard. **Note:** Also see **Table 23.1**.

Permit—Required Confined Space Program—The overall written program an organization develops for controlling and protecting workers from permit space hazards and for regulating entries into permit spaces.

Personal Fall Arrest System—An assembly of components and subsystems used to arrest a person in a fall from a working height.

Phase Change—The passing of a substance from one phase (state) to another (liquid to gas, solid to liquid, etc.).

Piping Systems—Any pipes or conduit used for conveying gases, liquids or semi-liquids, except those carrying solids in air or gas.

Pitch—The angle at which the fixed ladder is inclined against a structure or piece of equipment.

Platform—A walking or working surface elevated above the surrounding floor or ground (such as a balcony or landing) or a personnel carrying device (basket or bucket), which is a component of a mobile unit.

Portable Fire Extinguishers—Manually operated, hand-held or wheeled extinguishers containing a fire extinguishing agent with a means to discharge the agent and direct it onto a fire. **Portable Ladder—**means a ladder that can readily be moved or carried, and usually consists of side rails joined at intervals by steps, rungs, or cleats.

Powder-Actuated Tools—Tools, such as ramsets, where cartridge-type explosives are the source of power.

Pressure Regulator—A pressure and/or temperature activated device used to prevent the pressure from rising above a predetermined maximum, thereby preventing rupture of a normally charged cylinder when subjected to a standard fire test.

Proof Test—A nondestructive tension test performed by the manufacturer or qualified person to verify construction and workmanship of a lifting device. See individual chapters for applicable equipment-specific test procedures.

Proximity Warning Device—A device installed on booms that alerts or warns the operator when the boom is in proximity to energized electric power lines.

Qualified Person—A person who by possession of a recognized degree, certificate or professional standing, or who by extensive knowledge, training and experience, successfully demonstrated the ability to solve/resolve problems relating to the subject matter, the work or the project.

Rated Load—Sometimes called rated capacity or working load limit. The maximum working load, as designated by the manufacturer, for which a crane, individual hoist or related hoisting equipment is designed and built. **Note:** HQ AFSEC/SEW establishes rated load for nuclear-certified hoists.

Rated Load Test—Also called load test. A 100-percent to 125-percent test of the rated capacity (working load limit), as determined by type of equipment and designated by the manufacturer. See individual chapters for applicable equipment-specific test procedures.

Real Property Installed Equipment—Installed equipment attached to and made part of buildings and structures (such as heating systems), but not movable equipment (such as plant equipment).

Remote Control—A control station or any system of controls in which the actuator is situated in a remote location and is not mechanically attached to the device being controlled.

Remote Location—Emergency care that is more than three to four minutes from the workplace.

Rescue Team—A group of two or more personnel typically designated and trained by an organization to perform rescues from confined spaces within that organization.

Retrieval Line—A line or rope secured at one end to a worker's full harness or wristlets, with the other end secured to a lifting or other retrieval device. The retrieval line shall be used to remove an unconscious entrant from a confined space.

Riser—The upright part of a step at the back of a lower tread and near the leading edge of the next higher tread.

Runway—The track and supports (rails, beams, girders, brackets and framework) system upon which the crane or trolley travels.

Runway (Catwalk)—A passageway for persons, elevated above the floor or ground level, such as a foot walk along shafting or a walkway between buildings. It is sometimes called a catwalk.

Safety Data Sheet (SDS)—Electronic, written or printed information on hazardous material prepared in accordance with 29 CFR § 1910.1200, Hazard Communication.

Safety Device—A mechanism or an arrangement used to prevent an unsafe condition, preventing continuation of an unsafe condition, warning of an unsafe condition or limiting or eliminating unsafe effects of a possible condition.

Safety Observer—A worker trained in CPR and qualified to operate the equipment in use. Responsible for placing equipment in safe/neutral mode and administer immediate assistance to a technician in the event of an emergency. The safety observer may be the supervisor.

Scaffold—Any temporary raised platform and all the necessary vertical, diagonal and horizontal parts used for supporting workers and materials or both. Also known as a Scaffold Tower.

Sectional Ladder—A non-self-supporting portable ladder, nonadjustable in length, consisting of two (2) or more sections constructed so it functions as a single ladder. Its size is designated by the overall length of the assembled sections.

Self-Retracting Lifeline and/or Lanyard—A deceleration device which contains a drum-wound line which may be slowly extracted from, or retracted onto, the drum under slight tension during normal worker movement and that, after onset of a fall, automatically locks the drum and arrests the fall.

Service, Normal—That service that involves operation of cranes and hoists with randomly distributed loads within the rated load limit, or with uniform loads less than 65 percent of rated load, for no more than 15 percent of the time of a single work shift for manually operated cranes and hoists, and 25 percent of the time of a single work shift for electric- or air-powered cranes and hoists.

Service, Heavy—That service that involves operation of cranes and hoists within the rated load limit that exceeds normal service.

Service, Severe—That service that involves normal or heavy service of cranes and hoists with abnormal environmental conditions, such as excessively high or low ambient temperatures, exposure to adverse weather, corrosive fumes, dust-laden or moisture-laden atmospheres and hazardous locations.

Shall—Indicates a mandatory requirement.

Sheave—A grooved wheel or pulley used with a rope to change direction and point of application of a pulling force.

(1) *Sheave, Non-running.* A sheave used to equalize tension in two (2) parts of the rope. Because of its slight movement, it is not termed a running sheave.
(2) *Sheave, Running.* A sheave that rotates as the load block is raised or lowered.

Should—Indicates a preferred method of accomplishment.

Side Shield—A device of metal or plastic (or both) or other material, hinged or fixed firmly to the spectacle to protect the eye from side exposure.

Snagging—Grinding that removes relatively large amounts of material without regard to close tolerances or surface finish requirements.

Spectacle, Safety—A device patterned after conventional type spectacle eyewear but of more substantial construction. They may be equipped with side shields. The lenses can be plano- or corrective-protective. They may be made of clear or absorptive filter glass or plastic. Also called Safety Glasses.

Spindle—A rotating or fixed shaft-like member mounted in bearings and connected to the drive mechanism. A device for holding the work piece or a cutting tool is mounted on one or both ends.

Spreader—A curved piece of steel mounted behind a saw blade that prevents internal stresses within wood from clamping down on the saw blade.

Sprocket—A wheel with suitably shaped and spaced cogs or teeth to engage with the links of a chain.

Sprocket, Load—The hoist component that transmits motion to the load chain. Component is sometimes called load wheel, load sheave or chain wheel.

Stairs—A series of steps and landings with three or more risers. Stairs may lead users from one level or floor to another, to platforms, pits, boiler rooms or crossovers, or around machinery, tanks and other equipment.

Step—The crosspiece of a ladder on which a person may step, also called a rung or a cleat. Also means a combination of risers or treads that may be part of a stair.

Stepladder—means a self-supporting, portable ladder that has a fixed height, flat steps, and a hinged back.

Stepstool—means a self-supporting, portable ladder that has flat steps and side rails. For purposes of the final rule, stepstool includes only those ladders that have a fixed height, do not have a pail shelf, and do not exceed 32 inches (81 cm) in overall height to the top cap, although side rails may extend above the top cap. A stepstool is designed so an employee can climb and stand on all of the steps and the top cap.

Stroboscopic Effect—The potential for fluorescent lighting to create the appearance that moving, rotating or vibrating objects are stationary.

Stripper—A device that aids the load chain in leaving the load sprocket.

Swing—Rotation of the crane or other machine superstructure for movement of loads in a horizontal direction about the axis of rotation. A control device for making, breaking or changing connections in an electric circuit. Any device for connecting two (2) or more continuous package conveyor lines. A mechanism that transfers a trolley, carrier or truck from one track to another at a converging or diverging section.

Switch, Limit—A switch operated by some part or motion of a power-driven machine or equipment to alter power to the machine. The purpose is generally to limit the travel of a machine or equipment component.

Switch, Main—A switch controlling the entire power supplied to a system.

Switch, Track—A device with a section of track that can be moved to permit passage of a carrier from an incoming track to one of various outgoing tracks.

System Safety Engineering Analysis—Evaluates and approves new operations previously prohibited due to the perceived risks. A team of engineers (AFMC) conducts actual demonstrations and analysis of the operation to validate overall risk assessment and recommend actions. Past examples include hot pit refueling, integrated combat turn around (ICT) and concurrent servicing.

Tag Line—A rope or cable used to prevent a load from swinging or rotating.

Tagout Device—A mishap prevention tag that is capable of being securely attached and that, to protect personnel, forbids operation of an energy isolating device and identifies the applying individual or authority who has control of the procedure.

Test load—The specific load applied in performance of the load test.

Tread—The horizontal part of a step. An assembly of wheels, bearings and brackets used for supporting and moving suspended loads or for carrying load connecting and conveying elements such as chain, cable or other linkage. The unit carrying the hoist mechanism that travels on overhead bridge rails. A frame on which a pair of load carrying wheels is mounted.

Truck Crane—A crane consisting of a rotating superstructure with power plant, operating machinery and boom mounted on an automotive truck equipped with a power plant for travel. Some variations use a single engine in the truck which also powers the superstructure, or a single engine in the superstructure which also powers the truck.

Tube and Coupler Scaffold—A scaffold that is made up of tubing used as posts, bearers, braces, ties, runners, base supporting posts and uprights that serve to join the various members. This type of scaffold is normally used in fixed locations.

Tubular Welded Frame Scaffold—A sectional, panel or frame metal scaffold mainly built of prefabricated welded sections. This scaffold consists of posts and bearers with connecting parts and is braced with diagonal or cross braces.

USAF Hot Work Permit (AF Form 592)—The written authorization to perform "hot work" operations such as riveting, welding, cutting, burning or heating that could provide a source of ignition.

Wire Rope—A rope composed of steel wires, strands and a core. The individual wires are cold drawn to predetermined size and breaking loads according to use. They are then helically laid or formed around the core, which may be sisal or synthetic fiber, a metallic strand or an independent wire rope. The size, number and arrangement of wires; and the number of strands, the lay and the type of core in a rope are determined by the service for which the rope is to be used.

Work Level—A raised platform, used for supporting workers and their materials, made up of the necessary vertical, horizontal and diagonal braces, guardrails and ladder for access to the work platform.

Attachment 2

SAFETY INSTRUCTIONS TO BE POSTED IN ALL INSTALLATION FUELS LABORATORIES

A2.1. Hazards.

A2.1.1. Body contact with fuel can cause skin or eye irritation.

A2.1.2. Swallowing fuels may cause poisoning.

A2.1.3. Inhaling vapors may cause dizziness. Danger: In confined spaces of pits, fuel vapors may overcome a worker and cause death due to asphyxiation.

A2.1.4. AVGAS with tetraethyl lead are highly toxic to the central nervous system. Tetraethyl lead can be: Inhaled or ingested; directly through contact with petroleum product or indirect contact with tank scale or tank rust.

A2.2. First Aid.

A2.2.1. Remove fuel-contaminated clothing and wash affected skin areas with soap and water.

A2.2.2. If fuels are swallowed, DO NOT induce vomiting. Get medical attention immediately.

A2.2.3. If fuel is splashed into the eyes, immediately flush the eyes with large amounts of water continuously for at least 15 minutes. Get medical attention immediately.

A2.3. Safety Precautions.

A2.3.1. Know the general characteristics of fuels.

A2.3.2. Verify that personal protective and fire protection equipment are available and in working order prior to operations involving fuel.

A2.3.3. All electrical equipment used in fuel operations must be properly grounded unless designed for ungrounded operation.

A2.3.4. Avoid spills. Vapors from fuel can form an explosive environment.

A2.3.5. Always wash hands thoroughly with soap and water after working with fuels.

A2.3.6. Immediately clean up fuel spills.

A2.3.7. Ensure that eyewashes, emergency showers and personal protective and fire extinguishing equipment are available and operational prior to operations involving hydrocarbon fuels.

A2.3.8. Consult the SDS for specific information.

U. S. AIR FORCE HAZARDOUS WASTE MANAGEMENT PLAN

Tinker Air Force Base

4/2/2017

About This Plan

This installation-specific Environmental Management Plan (EMP) is based on the U.S. Air Force's (AF) standardized Hazardous Waste Management Plan (HWMP) template. This plan is not an exhaustive inventory of all hazardous waste (HW) requirements and practices. Where applicable, external resources, including Air Force Instructions (AFIs); AF Playbooks; federal, state, local and Final Governing Standards (FGS); and permit requirements, as applicable, are referenced.

Each section of this HWMP plan begins with standardized, AF-wide "common text" language that addresses AF and Department of Defense (DoD) policy and federal requirements. This common text language is restricted from editing to ensure that it remains standard throughout all plans. The common text language is maintained and updated by the designated Office of Primary Responsibility (OPR) with assistance from the Office of Collateral Responsibility (OCR), as appropriate. Immediately following the AF-wide common text sections, are Installation sections. The Installation sections contain installation-specific content to address state, local and installation-specific requirements. Installation sections are unrestricted and are maintained and updated by AF environmental Installation Support Teams (ISTs) and/or installation personnel.

This document is optimized to be accessed and viewed electronically. The eDASH website at https://cs1.eis.af.mil/sites/edash/ is the primary communication tool for AF EMPs.

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DOCUMENT CONTROL

Record of Updates – The HWMP is updated as changes to waste generation and management practices occur, including those driven by changes in applicable regulations.

Record of Updates

Change No.	Nature of Change	Date of Change	Approved By:
Click here to enter text.	Click here to enter text.	Click here to enter a date.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter a date.	Click here to enter text.

Record of Annual Review – In accordance with (IAW) AFI 32-7042, *Waste Management*, this plan is reviewed annually, updated as appropriate, and approved by the Environmental Safety and Occupational Health Council (ESOHC). Formatting and administrative changes do not require ESOHC review.

Record of ESOHC Annual Review

Review Date	Review Participants	Notes/Remarks	Result in Plan Update? (Yes or No)
3/8/2018	Kyle Barton	No changes were made	No
3/8/2019	Kyle Barton	Minor changes made to Appendix A.	No
3/27/2020	Kyle Barton	No changes were made	No

1.0 OVERVIEW AND SCOPE

This HWMP contains procedures for management of HW. In lieu of federal, state or FGS requirements, AFI 32-7042, *Waste Management*, acts as the main driver for the HWMP. The HW Playbook serves as supplemental guidance to this plan.

Installation Supplement – Overview and Scope

This instruction applies to all generators of hazardous and non-hazardous industrial wastes on Tinker AFB, including wastes generated by both government and contractors. Non-hazardous industrial wastes will be managed in the same manner as hazardous wastes.

2.0 INSTALLATION PROFILE

Installation Profile

Scope of Plan	Tinker AFB's Hazardous Waste Management Plan (HWMP) covers all organizations that generate hazardous and non-hazardous industrial wastes, establishes waste management procedures, and outlines organizational responsibilities. Tinker AFB is home to eight major DoD, Air Force and Navy tenants with critical national defense missions, including: • The Oklahoma City Air Logistics Complex (OC-ALC) is the largest organization on Tinker AFB with more than 9,400 military and civilian employees. It is the largest of three depot repair complexes in the Air Force Materiel Command. It provides depot maintenance on the C/KC-135, B-1B, B-52 and E-3 aircraft, expanded phase maintenance on the Navy E-6 aircraft, and maintenance, repair and overhaul of F100, F101, F108, F110, F118, F119 and TF33 engines for the Air Force, Air Force Reserve, Air National Guard, Navy and foreign military sales. • The 552d Air Control Wing, which is part of the AF's Air Combat Command mobile strike force, is responsible for operations, maintenance, logistics, training, and combat support of E-3 airborne warning and control system (AWACS) aircraft, whose radar and other sensors provide deep-look surveillance, warning, interception control and airborne battle management. • The Navy's Strategic Communications Wing ONE provides a communications link to the submerged fleet of ballistic missile submarines. OC-ALC airframe artisans perform depot work on the Navy's E-6 Mercury airplanes and sailors perform field level work. • The 507th Air Refueling Wing, an Air Force Reserve flying unit, has the primary mission of supporting U.S. Military and NATO aircraft with aerial refueling missions worldwide. • The 38th Cyberspace Engineering Installation Group, which has responsibility for engineering and installation of all communications and electronic facilities for the Air Force worldwide. • The Defense Logistics Agency (DLA) Distribution Oklahoma City, provides the receipt, storage, issue, inspection, and shipment of material, including material quality control, preservation and packaging, inventory, transportation functions, and

	pickup and delivery services in support of the OC-ALC and other Tinker-based organizations. • The Defense Enterprise Computing Center Oklahoma City, which is the local branch of the Defense Information Systems Agency (DISA) that operates computer systems for the base and serves over 100 other bases worldwide. • The Missile Sustainment Division reports to the AF Nuclear Weapons Center (AFNWC). The division manages the program for the long range stand-off cruise missiles and the bomber weapons integration equipment. 72 ABW provides critical base functions and support services to headquarters, AF Sustainment Center, the OC-ALC, and all other associated units. Organizations assigned to 72 ABW include: • 72d Medical Group (72 MDG) • 72d Mission Support Group (72 MSG) • 72d Operations Support Squadron (72 OSS) • 72d Civil Engineer Directorate (72 ABW/CE) • 72d Logistics Readiness Squadron (72 LRS) • 72d Force Support Squadron (72 FSS) • 72d Communications Directorate (72 ABW/SC) • 72d ABW Plans and Programs Office (72 ABW/XP) • 72d ABW Equal Opportunity/Alternate Dispute Resolution (72 ABW/EO/ADR) • 72d ABW Public Affairs (72 ABW/PA) • 72d ABW Comptroller Squadron (72 CPTS) • 72d ABW Staff Judge Advocate (72 ABW/JA) • 72d ABW Safety Office (72 ABW/SE) • Chapel Division (72 ABW/HC) • 72d Security Forces Squadron (72 SFS)

Office of Primary Responsibility (OPR)	72 ABW/CEIEC has overall responsibility for implementing the HW management program and is the lead organization for monitoring compliance with applicable federal, state and local regulations
HW Program Manager	Mr. Kyle Barton
Alternate HW Program Manager	Mr. Kim Kline
Emergency contacts	Refer to Appendix B to this HWMP
Waste registration numbers	OK1571724391
HW generator status	Large Quantity Generator
Universal waste handler status	Large Quantity Handler of Universal Waste
Permitted HW operations	One Permitted Storage Facility – Up to 1-year
Federal or FGS regulatory references	40 CFR 260 through 279
State and local regulatory agencies	Oklahoma Department of Environmental Quality (ODEQ)
State and local regulatory references	Title 252, Oklahoma Administrative Code, Chapter 205: "Hazardous Waste Management."
Approved HW disposal contractors	Contract through Defense Logistics Agency Disposition Services (DLA-DS).
HW accumulation sites	Refer to EESOH-MIS for Complete List.
HW accumulation time limits	90 Calendar Days
HW generator reporting frequency	Monthly, Quarterly, and Biennial

3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The AF environmental program adheres to the Environmental Management System (EMS) framework and its Plan, Do, Check, Act cycle for ensuring mission success. Executive Order (EO) 13693, *Planning for Federal Sustainability in the Next Decade*, U.S. Department of Defense Instruction (DoDI) 4715.17, *Environmental Management Systems,* AFI 32-7001, *Environmental Management*, and international standard, ISO 14001:2004, provide guidance on how environmental programs should be established, implemented, and maintained to operate under the EMS framework.

The HW management program employs EMS-based processes to achieve compliance with all legal obligations and current policy drivers, effectively managing associated risks, and installing a culture of continuous improvement. The HWMP serves as an administrative operational control that defines compliance-related activities and processes.

4.0 GENERAL ROLES AND RESPONSIBILITIES

The major roles/organizations involved in supporting the HW program include:

- Wing/Installation Commander
- ESOHC
- HW Manager/Alternate
- Shop/HW Generator Personnel
- Initial Accumulation Point (IAP) and Hazardous Waste Accumulation Site (HWAS) Supervisors/Managers
- Unit Commanders
- Unit Environmental Coordinators (UECs), see AFI 32-7001 for role description
- Contracting Officer
- Defense Logistics Agency Disposition Services
- Tenant Organizations
- AFCEC

Detailed information about typical responsibilities for these and other roles is available in the HW Playbook. Additional HW management-related roles and responsibilities are described throughout this plan and in referenced documents.

Installation Supplement – General Roles and Responsibilities

Organizational Responsibilities:

Although the 72 ABW/CEIEC is responsible for overall management of the hazardous waste program at Tinker, all base personnel are responsible for compliance. The 72 ABW Commander is ultimately responsible for ensuring compliance with laws governing HW management and proper disposal from all activities on base. Management and disposal of HW by DLA-DS or by contractors does not relieve the installation commander of this responsibility, including proper final disposal and accuracy of the HW manifest. Each generating organization is responsible for conducting proper management and pre-disposal practices when managing its hazardous waste. In addition to that basic responsibility, the following responsibilities are designed to ensure a smooth flow in the hazardous waste management system at Tinker AFB. In the event of regulatory modifications and/or amendments, each generating organization, as advised by 72 ABW/CEIEC, will be responsible for ensuring their actions complies with Federal, State and Air Force requirements. Training requirements, as mandated by AFMAN 32-7002, *Environmental Compliance And Pollution Prevention*, 4 Februarty 2020, states, "All personnel, whose work involves HW and their immediate supervisors, must receive and successfully complete HW training

appropriate to their job responsibilities."

Installation Commander will:

- Ensure that a HW Management Plan (HWMP) is current, available, and followed by installation personnel. Ensure that appropriate HW management practices are emphasized to all installation personnel through education and training, to include shop level training, as needed.

- Sign all installation HW permit applications or other regulatory binding agreements as required; this authority cannot be delegated.

- Sign, or delegate in writing the authority to sign, HW manifests. Installation Commanders shall ensure signature delegation remains with a qualified (trained) DoD employees (civilian, military, guard, reserve, or host nation), or appropriately assigned State employees in the case of the ANG. The person delegated to sign manifests must be physically present during transfer or shipment of waste off-site. For installations where the HW management function is outsourced or there is not a qualified DoD employee, the Installation Commander will send a waiver request to AFCEC/CZ. IAW Sec 2.4.2, NGB/A4 and AFRC/A4 will approve for ANG and AFRC bases respectively in concert with AFEC/CZ.

- Ensure the proper disposal of all wastes from the installation.

- Ensure that employees handling HW have HW responsibilities reflected in their job descriptions.

- Ensure appropriate use of the standardized Air Force HW system, Enterprise, Environmental Safety and Occupational Health – Management Information System (EESOH-MIS), to include tracking of waste generation from shop processes, transfer to central accumulation storage, cost, and turn-in for disposal.

Environmental Safety and Occupational Health Committee (ESOHC) will:

- Review and approve SW and HW policies and guidance, review installation industrial sold waste (ISW) and HW management plans and programs, monitor progress, and advise leadership (refer to AFI 90-801, *Environment, Safety, and Occupational Health Councils* for further guidance).

Civil Engineering Directorate, Environmental Compliance Section (72 ABW/CEIEC) will:

- Serve as the central base coordinator for the hazardous waste program and for questions regarding compliance with Federal, State, DoD and Air Force requirements.
- Set forth policies on all issues related to hazardous waste compliance regulations.
- Chair the Hazardous Waste Working Group (HWWG) and provide space for meetings.
- Maintain EESOH-MIS to include the following: type, quantity, location, process of generation, disposal cost, disposal method and disposal location.
- Represent the base during compliance inspections by Federal, State and local regulatory officials, and respond to inspection related questions.
- Coordinate with the Staff Judge Advocate's Office and respond to inquiries regarding policy or management decisions and interpretation of regulations.

- Advise UECs and 72 FSS/FSDEB on changes to hazardous waste regulations, manuals and other directives as appropriate.
- Review requests from UECs for new, or modifications to current, hazardous waste management sites and ensure appropriate changes are made in the hazardous waste tracking system (HWTS).
- Conduct periodic compliance monitoring visits to determine status of accumulation methods and management procedures.
- Develop, review and update as necessary, base instructions, manuals, contingency plans and other documents dealing with hazardous waste management. This will be performed annually or as significant laws or regulations are passed.
- Monitor and modify as necessary the Resource Conservation and Recovery Act (RCRA) operating permits for Tinker AFB.
- Coordinate with DLA-DS and 72 ABW/JA concerning modifications to permits.
- Ensure proper closure of hazardous waste management sites.
- Coordinate with ODEQ to update and maintain a current Oklahoma State Disposal Plan for Tinker AFB.
- Prepare and transmit reports concerning the generation, shipment and disposal of hazardous wastes. These include the Biennial Report (40 CFR 262.41), Exception Reports (40 CFR 262.42) and monthly and quarterly reports to ODEQ.
- Participate in the 3-year Course Review of the Hazardous Waste Training Course provided by 72 FSS/FSDEB and provide information to ensure its accuracy.
- Oversee operation of the Permitted Storage Facility (PSF), Hazardous Waste Management Facility (HWMF) and the Empty Container Processing Facility (ECPF).
- Provide guidance to those not using the HWMF on pre-disposal processing of hazardous waste property.
- Coordinate with DLA-DS and its disposal contractor to ensure smooth flow of hazardous waste from PSF to ultimate disposal or recycling facilities.
- Assist DLA-DS on disposal contract modifications, claims or disputes.
- Assist Air Force Civil Engineering Center (AFCEC) in developing and modifying the installation hazardous waste management contract, and help resolve any claims or disputes.
- Coordinate with on-base contractors for all shipments of hazardous waste leaving the installation.
- Perform an annual review of waste profiles generated at Tinker AFB.
- Develop and maintain a current file of hazardous waste profile sheets in conjunction with DLA-DS.
- Ensure hazardous waste manifests, for generators not required to use DLA-DS, are properly completed and signed by authorized persons.
- Update “Signature Authority for Uniform Hazardous Waste Manifests” letter authorizing persons to prepare and sign TAFB Manifests and Land Disposal Restriction (LDR) forms.
- Maintain files of manifests and LDR forms from all Tinker AFB generators.

- Ensure a copy of each manifest, with the handwritten signature of the disposal facility owner or operator, is received within 45 days of shipment.
- Maintain files of Certificates of Disposal permanently and the disposal contractor's delivery orders for at least three years.
- Maintain a record of waste disposal cost information within the HWTS.
- Review the 19-2, *Oil and Hazardous Substances Integrated Contingency Plan*, and revise as necessary.
- Attend formal instruction to meet RCRA and DOT requirements IAW AFMAN 32-7002.
- Coordinate any changes to funding requirements for disposal of hazardous and non-hazardous industrial wastes with AFCEC.

72 ABW/CEIEA- Environmental Laboratory will:

- Maintain a credible chemical laboratory capable of producing accurate chemical analysis by methods specified in 40 CFR 261.
- Prepare appropriate reports for analyses requested by 72 ABW/CEIEC.
- Contact 72 ABW/CEIEC with any discrepancies found between samples and sample description.
- Review the Waste Analysis Plan (WAP) annually and update as necessary.

Air Force Civil Engineering Center (AFCEC) will:

- Manage corrective action and remediation projects at Solid Waste Management Units (SWMUs) and National Priorities List (NPL) sites at Tinker AFB.
- Ensure that manifests for shipment of hazardous waste from SWMUs and NPL sites are coordinated through 72 ABW/CEIEC.
- Ensure adequate funding for disposal of hazardous and non-hazardous industrial wastes are programmed.

Units that Generate Any Hazardous Waste will:

- Designate a primary and alternate Hazardous Waste POC for each waste site. The organizations may either designate the POCs in writing, or designate them within EESOH-MIS. This designation shall be made within 5 working days of appointment.
- Ensure that the designated monitors of hazardous waste and their supervisors receive annual RCRA training as required by 40 CFR, such as the initial and annual hazardous waste training courses provided by 72 FSS/FSDEB.
- Supervisors will examine employee training to ensure that adequate site- and task specific familiarization is accomplished, and supplement with on-the-job training, as needed.

- Supervisors will contact the organization's training manager to request training. The training manager will then contact 72 FSS/FSDEB to schedule personnel for training.
- Ensure that supervisors maintain training records for personnel involved in hazardous waste management. The records may be kept in hard copy or electronic format.
- Ensure no accumulation of hazardous waste occurs except at appropriately established management sites.
- For proper characterization of waste streams, provide essential information to the organization's UEC when processes or chemicals change, or if new waste streams are identified.
- Package, mark and label all containers of hazardous waste as instructed herein during accumulation and prior to turn-in to DLA-DS if containers are not processed through the HWMF.
- Take active measures to reduce the volume of hazardous waste generated.
- Coordinate with the Hazardous Materials Management Program (HMMP) to ensure surplus hazardous materials are made available to all potential users.
- Operate and maintain hazardous waste management sites as instructed herein.
- Coordinate with the HWMF for receipt of bar-coded hazardous waste containers and for their return when full.
- Perform Initial Response actions outlined in Section 7.10 of this HWMP upon spilling a hazardous substance or waste. Organization shall clean up all spills that are within the organization's internal capabilities. All others spills shall require activation of the TAFB Plan 19-2, *Oil and Hazardous Substances Integrated Contingency Plan.* emergency response procedures.
- Ensure that statements of work (SOW) for projects that involve generation of hazardous waste are routed to their organization's UEC, who will coordinate with 72 ABW/CEIEC as necessary and to set up Initial Accumulation Points (IAPs). SOWs must include training requirements for all involved personnel. Contracting Officer Representatives (CORs) shall insure that requirements of this instruction are included in the contract and brought to the contractor's attention. CORs may be appointed as IAP managers for their contractors. MILCON projects will provide funding for the disposal of industrial and hazardous wastes and may require contractors to provide those services. If the SOW requires 72 FSS/FSDEB training, a copy of the SOW must be provided to 72 FSS/FSDEB for review prior to entering into the contract.
- Supervisors at hazardous waste management sites shall sign accumulation inspection forms and inventory logs, keep the original copy of these forms and logs for a period of one year and send copies to their UEC. Digital copies are sufficient to meet this requirement.
- When a site is no longer needed, ensure that all hazardous waste management sites comply with the guidelines in this instruction for hazardous waste facility closure.
- Maintain list of hazardous waste streams currently generated within the unit. The listing generated in EESOH-MIS is adequate for this requirement and should be used.
- For IAP Manager Inspection responsibilities, see section 7.8 of this plan.
- Conduct self-assessments (as a part of Stage One audit assessment requirements), maintain self-assessment records, and comply with 40 Code of Federal Regulations (CFR 262 Subpart C), Generator Requirements.

- Implement corrective actions.
- Ensure funding is available for HW container/IAP supplies and equipment.

Unit Environmental Coordinators (UECs) will:

- Serve as the coordinator in their organization for disseminating information and providing guidance on proper accumulation and management of hazardous wastes.
- Provide current information to the organization commander, and unit supervisors about hazardous waste issues.
- Coordinate with 72 ABW/CEIEC on meeting needs of the organization's hazardous waste management program and on correcting any deficiencies that may be discovered.
- Represent their organization at all HWWG meetings.
- Ensure that Emergency Response Plan is current and posted at accumulation sites.
- Maintain a current list of waste sites within their organization and coordinate with 72 ABW/CEIEC for approval to establish new sites or change existing waste sites. EESOH-MIS shall be used to maintain this listing.
- Ensure that primary and alternate waste site POCs are current in EESOH-MIS for all waste sites in their organization.
- Coordinate with organizational training manager about number of personnel needing annual Hazardous Waste Training from 72 FSS/FSDEB.
- Ensure original inspection forms and waste inventory logs for initial accumulation points and accumulation sites are maintained at the generation site for at least one year. The copies should be received each month by the UEC.
- The UEC will review the copies of the forms for problem trends and maintain them in an orderly manner for three years for inspection purposes. Electronic versions of these forms are acceptable.
- Conduct an inspection of all hazardous waste management sites within their organization every month, documenting and reporting findings to 72 ABW/CEIEC. For larger organizations, this may be delegated to a Hazardous Waste Monitor within the organization. The required weekly inspections documented on TINKER AFB Form 487, *Initial Accumulation Point Management Aid*, may be used by the Hazardous Waste Monitor as documentation for monthly inspections. If delegated, the UEC will still inspect each site at least semi-annually.
- Serve as the organization's point of contact for all environmental inspections.
- Conduct periodic (annually at a minimum) review of their organization's waste stream inventory. Submit information to 72 ABW/CEIEC upon discovery of new or modified waste streams.
- Oversee coordination with HMMP if unauthorized chemicals appear in waste streams.
- Review their organization's SOWs for projects that involve generation of hazardous waste. Coordinate with 72 ABW/CEIEC for any hazardous waste requirements.

- Attend formal instruction that acquaints the student with the details of RCRA regulations in 40 CFR 260 through 279; applicable State Laws and regulations; DoD, Air Force and local requirements; and in annual refresher classes, updates the student on changes to those rules. This training can be obtained through credible training institutions or companies approved by CEIEC or through AF Training Organizations.

Fire Protection Division (72 ABW/CEF) will:

- Provide technical assistance and advice concerning necessary fire protection for hazardous waste management sites.
- Provide a subject matter expert when requested for initial and annual hazardous waste training.
- Inspect hazardous waste management sites on a periodic basis to ensure compliance with USAF and National Fire Protection Association standards.
- Coordinate on establishment of hazardous waste management sites.

Safety Offices (72 ABW/SE, OC-ALC/SE, and 552 ACW/SE) will:

- Provide technical assistance and advice concerning proper handling and storage procedures at hazardous waste management sites.
- Provide a subject matter expert when requested to discuss safety issues at initial and annual hazardous waste training.
- Inspect hazardous waste management sites on a periodic basis to ensure compliance with USAF and OSHA directives.
- Coordinate on establishment of hazardous waste management sites.
- Provide a representative to HWWG.

Staff Judge Advocate (72 ABW/JA) will:

- Advise CEIEC of proper legal interpretation of hazardous waste laws and regulations and any changes in applicable legal requirements.
- Coordinate on reports, permits, permit fees and inquiries submitted to the ODEQ or EPA concerning hazardous waste management issues.
- Review all proposed contracts relating to hazardous waste management, particularly statements of work and specifications, in the earliest stages of procurement possible.
- Provide representative to HWWG.
- Review modifications to this instruction and other documents pertaining to hazardous waste management.
- Provide legal guidance on all enforcement actions arising out of hazardous waste management activities, including responses to notices of violations, negotiation with regulatory authorities on compliance agreements and defense of Tinker AFB in litigation. Coordinate with higher headquarters and the Department of Justice (DOJ) as required.

Classification Section (72 FSS/FSC) will:

- Upon request from supervisors of areas that produce hazardous waste, advise them of conditions that could make it necessary to describe hazardous waste managers' and operators' duties in their job descriptions.
- If applicable, ensure supervisors properly describe duties in job descriptions and that necessary administrative actions are taken to properly update job descriptions.

Bioenvironmental Engineering Services (72 AMDS/SGPB) will:

- Provide technical assistance and advice concerning personnel protective equipment and safe handling procedures at hazardous waste management sites.
- Provide a subject matter expert when requested to discuss chemical hazard issues at initial and annual hazardous waste training.
- Provide advice on industrial hygiene to all work areas for employee health.
- Coordinate on establishment of hazardous waste management sites.
- Provide representative to the HWWG.
- Provide assistance in disposal of mixed waste.

Occupational Medicine (72 MDG/SGPO) will:

- Ensure employees involved in the handling of hazardous waste receive appropriate occupational health physical examinations.

Industrial Training Branch (72 FSS/FSDEB) will:

- Provide initial and annual training classes for all personnel involved in hazardous waste management and their direct supervisors, enabling them to perform their duties in a manner that meets Federal, State, DoD, Air Force, local statutes, regulations and requirements. EPA requirements are outlined in 40 CFR 264.16 for permitted management sites and 40 CFR 265.16 for non-permitted management sites. Hazardous waste generators are included by reference at 40 CFR 262.34(a)(4). The following elements of training are required:
    - Introduction to the RCRA.
    - Identification of hazardous waste.
    - Accumulation point management.
    - Container use, marking and labeling and on-base transportation.
    - Waste turn-in procedures.
    - Manifesting and off-base transportation of hazardous waste.
    - Spill prevention and emergency response.
    - Waste reduction.
    - Personnel safety and health and fire safety.
- Provide instructors who have attended formal instruction that in the initial phase acquaints the student with the details of the RCRA regulations in 40 CFR 260 through 279; applicable State Laws and regulations; DoD, Air Force and local requirements and in annual refresher classes,

updates the student on changes to those rules. Instructor's training must give priority to using HAF-approved HW education/ training sources such as AFIT Civil Engineer School HW Course WENV 521 and WESS 010 HW Accumulation Satellite seminar, and the Air Force HW web-based training available from AFCEC.

- Review SOW involving FSDT training of contractors.

Defense Logistics Agency Services (DLA-DS) will:

- Advise 72 ABW/CEIEC about how and when segregation of waste streams would increase the probability of recycling the waste.
- Advise 72 ABW/CEIEC when a market is available for reutilizing hazardous materials and wastes that are being generated.
- Verify the suitability of Permitted Treatment, Storage and Disposal Facilities (TSDFs) for all waste shipped through DLA-DS.
- Advise 72 ABW/CEIEC of any changes in defense turn-in document procedures or in packing, marking and labeling requirements.
- Provide a subject matter expert, when requested, for initial and annual hazardous waste training to explain role of DLA-DS and turn-in requirements.
- Complete EPA Form 8700-22, Uniform Hazardous Waste Manifest for all shipments of Tinker AFB hazardous wastes that are shipped off-site through the DLA-DS disposal contract and transmit a copy to 72 ABW/CEIEC within two hours after acceptance by the transporter. If transporter acceptance takes place after duty hours the manifest will be delivered to the Fire Department, if possible, or held until the next duty day and delivered to 72 ABW/CEIEC.
- Request delegation of authority from 72 ABW/CE for personnel who will prepare and sign Hazardous Waste Manifests and Land Disposal Restriction forms. Proof of training will be required to receive that delegation.
- Package, mark, label and offer placards (if these actions have not already been taken) for shipments of hazardous waste from Tinker AFB through the DLA-DS disposal contract according to applicable DOT hazardous materials regulations and DLA-DS requirements.
- Ensure input from Tinker AFB operations by coordinating with 72 ABW/CEIEC and 72 ABW/JA during negotiations for hazardous waste disposal contracts.
- Ensure that Certificates of Disposal are deliverable items in disposal contracts.
- Confirm that each hazardous waste shipment reached the disposal site safely and the disposal site received the shipment described on the manifest.
- Activate the site-specific contingency plan upon spilling a hazardous substance or during any other applicable emergencies.
- Attend initial and annual HW training, or equivalent, which enables them to perform their duties in a manner that meets Federal, State, DoD, Air Force and local laws, regulations and requirements. EPA requirements are outlined in 40 CFR 264.16 for permitted management sites.
- Appoint a Primary and Alternate UEC.

- Maintain a current copy of the RCRA Part B Operating Permit for Tinker AFB, a copy of Tinker AFB Plan 19-2, *Oil and Hazardous Substance Integrated Contingency Plan* and a copy of this instruction.

5.0 TRAINING

HW awareness training is provided to satisfy regulatory requirements and needs. All personnel whose work involves HW, and their immediate supervisors, must successfully complete HW training appropriate to their job responsibilities. Until the employee has received the appropriate HW training, the employee may only handle HW under the supervision of a trained individual. HW training is provided by authorized personnel. Training records are maintained IAW the Recordkeeping and Reporting section of this plan.

Installation Supplement – Training

Personnel involved in hazardous waste management must complete a program of instruction that enables them to perform their duties in a manner that meets Federal, State, DoD, Air Force and local laws, regulations and requirements. EPA requirements are outlined in 40 CFR 264.16 for permitted management sites and 40 CFR 265.16 for non-permitted management sites. Hazardous waste generators are included by reference at 40 CFR 262.34(a)(4).

All personnel, whose work involves HW and their immediate supervisors, must receive and successfully complete HW training relevant to their job responsibilities. Training will occur within six months of an employee's arrival or assignment to HW-related duties. Until the employee has received the appropriate HW training, the employee may only handle HW under the supervision of a HW trained individual. Supervisors and personnel must also successfully complete annual refresher training. Those working at TSDFs and cleanup sites also need to adhere to Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) requirements.

The following elements of training are considered essential:

- Introduction to the RCRA.
- Identification of hazardous waste.
- Accumulation point management.
- Container use, marking, labeling and on-base transportation.
- Waste turn-in procedures.
- Manifesting and off-base transportation of hazardous waste.
- Spill prevention and emergency response.
- Waste reduction.
- Personnel safety and health and fire safety.

Installations must give priority to using HAF-approved HW education/ training sources such as AFIT Civil Engineer School HW Course WENV 521 and WESS 010 HW Accumulation Satellite seminar, and the Air Force HW web-based training available from AFCEC. Personnel may contact 72 ABW/CEIEC for other potential sources for the necessary training.

6.0 RECORDKEEPING AND REPORTING

Recordkeeping

The installation complies with the following U.S. Federal HW recordkeeping requirements.

Summary of HW Recordkeeping Requirements

Record*	Retention Time**	Citation
HW determination documentation	3 years from the date that the waste was last sent to a TSDF	40 CFR 262.40
HW Biennial/Annual Report	3 years from the due date of the report	40 CFR 262.41
HW manifest	3 years from the day the waste was accepted by the initial transporter	40 CFR 262.40
HWAS inspection logs	3 years from the date the inspection was conducted	40 CFR 262.34 40 CFR 265.15 (d) 40 CFR 265.174
Exception reports	3 years from the due date of the report	40 CFR 262.42
Land restricted waste determination	3 years from date the determination was required to be conducted. If not required, 3 years from the date the waste was last sent to a TSDF	40 CFR 268.7
Land restriction notice and certification	3 years from the date the waste was last sent to a TSDF	40 CFR 268.7
Notification of intent to export waste	3 years from the date the HW was accepted by the initial transporter	40 CFR 262.53
EPA acknowledgement of consent (for exports)	3 years from the date the HW was accepted by the initial transporter	40 CFR 262.51 40 CFR 262.53
Waste export confirmation of delivery	3 years from the date the HW was accepted by the initial transporter	40 CFR 262.54
Annual report (required of primary exporters of HW)	3 years from the date the HW was accepted by the initial transporter	40 CFR 262.56
Employee training records (including appointment letters for key HW personnel)	Current personnel: until closure of the site; Former personnel: 3 years from date the individual last worked there	40 CFR 262.34 40 CFR 264.16 40 CFR 265.16

*Permitted Treatment, Storage and Disposal Facilities (TSDF) comply with recordkeeping requirements established in their HW permit.

**Retention Time may be extended during the course of any unresolved enforcement action or as requested by the U.S. Environmental Protection Agency (EPA). The AF, through the Air Force Records Information Management System (AFRIMS), requires that HW-related reports, documents, studies, HW manifests, and disposal records (including contracts) are destroyed 50 years from the date of the record.

Reporting

The HW Manager, and other designated personnel, generate needed reports from EESOH-MIS.

Enforcement actions, spills and inspections are reported via the Enforcement Actions, Spills, and Inspections (EASI) database.

Installation Supplement – Recordkeeping and Reporting

Record Keeping for Waste Sites (TAFB Form 487):

- During the first week of each month, the appropriate inspection form(s) from the previous month shall be sent to the UEC.

- The supervisor of the generating unit shall review and sign the forms before they are sent to the UEC.
- Original copies of the forms shall be maintained by the generating unit for at least one year and be readily available for inspection.
- The UEC will review the forms for problem trends, maintain them in an orderly manner for three years and keep them on hand for inspection.

Personnel Records:

- Supervisors shall maintain job descriptions and training records for their employees. The supervisors shall maintain a tracking list of personnel who need training for their organization. The supervisor shall coordinate with their training manager on training.
- Records should at a minimum include student's name, job title, job description, previous HW training, dates of training, training provider and date of annual refresher course.
- Training records must be maintained as long as the individual is associated with, or for three years after the individual is no longer working with, hazardous waste. The records may be kept in hard copy or electronic format.

7.0 PROCEDURES

This section contains procedures for managing HW from identification, accumulation, offsite transportation and disposal. The HW Manager ensures that appropriate procedures are properly communicated and followed by all necessary personnel.

7.1 Waste Inventory

A current waste inventory can be generated within EESOH-MIS using the Ad-Hoc Reporting Tool or by completing the following steps:

- Log into EESOH-MIS; Select the "Reporting" option; Select "Hazardous Waste" to generate the Waste Site Waste Stream Summary Report

Installation Supplement – Waste Inventory

No additional requirements.

7.2 Waste Identification

The HW Manager determines the nature of waste based on a detailed qualitative analysis of the regulated waste generating process, associated Safety Data Sheet (SDS) information, and coordination with generating activity personnel involved in the use of hazardous materials. If uncertainties about a waste stream exist, the HW Manager pursues waste stream sampling and analysis IAW the Waste Analysis Plan (WAP).

The WAP details the wastes that have been evaluated and analyzed, a description of the testing and analytical methods used, the HW sampling methods used, the location of samples taken for analysis and frequency, sample documentation, sample quality assurance and quality control procedures, and sample request procedures.

Generator knowledge and the results of the WAP are used to minimize waste re-characterizations to those instances where a process change has occurred or the waste stream is highly variable.

Installation Supplement – Waste Identification

WAP

The installation WAP is included in Appendix A to this HWMP.

Profile Sheets

For each waste stream identified that is disposed of through DLA-DS, an AF Form 1930, or equivalent format, will be completed and a copy given to DLA-DS. The AF Form 1930 may also be used for waste streams disposed of through contractors or a contractor prepared profile. A copy of all profile sheets will be reviewed for currency at least annually and updated as necessary. Update of profile sheets will be accomplished by 72 ABW/CEIEC with input from UECs as required.

7.3 Container Management

Container management procedures are as follows:

- Containers storing HW must be in good condition and meet permit, transportation and other applicable requirements. "Good condition" means there should be no severe rusting, no sharp-edged creases or dents, no bulging heads and no severe structural defects.
- Ensure that the waste material will not react with the container itself.
- Use plastic or plastic-lined steel drums to safely store corrosive wastes.
- Immediately transfer the contents of a leaking container to another container or over pack into a salvage drum.
- Containers with free liquid or drum contents on top must be cleaned or over packed in the case of a leak.
- Containers must remain closed at all times except when adding or removing waste. Adequate headspace must be maintained at all times when filling a container to account for content expansion.

Installation Supplement – Container Management

Container Management

- Whenever possible use serialized containers 55 gallons or less in capacity from the HWMF with HWTS generated labels.
- Container (or liner) must be compatible with the waste being contained.
- Container will be under control of the waste manager of the generating organization.
- Each container will be designated for waste generated by a specific process. No other wastes or materials will be placed in a designated container. Contents of container must agree with Profile Waste Stream for which the container was issued.
- Container must not be handled or moved from place-to-place in a manner that may cause them to rupture or leak.

- Never fill container holding liquids to more than 90 percent capacity (four inches from top for a 55-gallon drum).
- Never fill containers beyond manufactured weight capacity.
    - Container capacities vary by size, material, and manufacturer. Contact HWMF at 734-3285 for maximum weight, if maximum weight is a concern.
- A funnel may be left in a container bung if it is attached as an integral part of the container (such as with screw threads) and it has a lid that can be closed and latched.
- Container holding hazardous waste must be placed vertically and be separated from the floor by pallets, enviropacs, wheeled dollies or other means.
- All sealing mechanisms (locking rings, bung caps, bolts and nuts) will be installed and tightened prior to turn-in to the HWMF.
- Once the container is filled, the IAP manager must ensure that the Filled Date is marked on the container's label with an indelible marker.
- The IAP Manager must ensure that the filled container is returned to the HWMF within three (3) calendar days of the filled date. Plan ahead for three-day weekends!
- Containers will be bonded when flammable liquids are transferred from one metal container to another metal container.
- If solids containing flammable liquids are to be placed in plastic bags or directly into plastic containers, then the plastic bags or plastic containers must be anti-static.
- Containers are still considered to be in "Good" condition as long as there are no major dents or creases, severe rusting, or damaged seals that threaten the structural integrity of the container. Minor dents, scratches, surface rust, and touch-up paint may be present.
- At no time may containers be moved from one IAP to a separate IAP.

7.4. Labeling and Marking

Containers used for the accumulation and transportation of HW are properly labeled IAW applicable laws and regulations.

- Each container is properly marked and labeled from initial accumulation area to HWAS to disposal/turn-in. The waste-generating activity ensures that the label on each waste container is clearly visible for inspection. During accumulation at an IAP, HW containers are marked with the following:
    - The words "Hazardous Waste"
    - A description of the contents of the container
    - The hazards associated with the waste

Once an IAP accumulates more than 55 gallons of HW (or 1 quart of acute HW), the IAP site manager marks the container with the date on which 55 gallons (or 1 quart of acute HW) is exceeded, and removes the excess of 55 gallons (or 1 quart of acute HW) within three days.

HW containers 110 gallons or less that are shipped offsite are marked with the following:

- "Hazardous Waste – Federal Law prohibits Improper Disposal. If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency"
- Generator's name and address
- Generator's EPA Identification Number
- Manifest tracking

These markings are:

- Durable
- In English, and/or appropriate host nation language
- Printed on or affixed to the surface of a package or on a label, tag or sign displayed on a background of sharply contrasting color
- Unobscured by labels or other attachments
- Located away from any other markings that might substantially reduce visibility or effectiveness

UW, or a container in which a UW is contained, is labeled and marked clearly with the date the material became a waste and the name of the waste, as described below:

- UW batteries must be labeled with any one of the following phrases: "Universal Waste-Battery(ies)," or "Waste Battery(ies)," or "Used Battery(ies)
- UW thermostats must be labeled with any of the following phrases: "Universal Waste-Mercury Thermostat(s)," "Waste Mercury Thermostat(s)," or "Used Mercury Thermostat(s)
- UW pesticides must be labeled with any of the following phrases: "Universal Waste-Pesticide(s)" or "Waste-Pesticide(s)
- UW lamps must be labeled with one of the following phrases: "Universal Waste—Lamp(s)," or "Waste Lamp(s)," or "Used Lamp(s)

Installation Supplement – Labeling and Marking

Ensure all containers obtained from the HWMF are correctly labeled. It is the responsibility of the requesting organization to ensure the container is correctly labeled. If a container is issued under one container but is needed for another waste stream, the using organization shall contact the HWMF for a new label. The using organization is responsible for coming to the HWMF to obtain the new label. If there are container compatibility issues between the waste streams, a new container will be issued.

7.5 Accumulation Area Management

Accumulation area management procedures are as follows:

1. IAPs are used to accumulate up to 55 gallons of HW or 1 quart of acute HW.
2. If HW or acute HW are accumulated in excess of these amounts, the generator marks the container with the date the amount was exceeded and transfers the container to a HWAS or TSDF within 3 days.
3. HW is accumulated in a HWAS for up to 90 days for a LQG, or 180 days (270 days if waste has to be shipped over 200 miles) for a SQG.
4. HWASs comply with all applicable federal, state, local and FGS accumulation requirements, including proper waste segregation.

Installation Supplement – Accumulation Area Management

Approval to Accumulate Hazardous Waste and Receive Containers

RCRA, Tinker AFB's RCRA Permit and Air Force instructions require hazardous waste to be tracked from the point of generation to ultimate disposal, or cradle-to-grave. Because improper management of hazardous waste could result in serious consequences to Tinker AFB, and to the individuals involved, any accumulation must be approved through the following procedures:

Requesting Approval to Accumulate Waste or Modify Existing Waste Streams

- The generating shop will contact their organization's UEC and identify the requirement for creation or modification of a waste site. UEC will contact the Hazardous Waste Program Manager (HWPM) to see if a new IAP must be established or if any waste can be incorporated into an existing waste stream. For creation of a new IAP, UEC will provide the following items to HWPM:
    - Name and symbol of generating organization
    - Hazardous Materials Shop Code for generating shop
    - Building and post location of potential IAP
    - Primary and Alternate Waste Site Managers names and phone numbers.
    - Description of waste that will be generated including volume and frequency
    - Listing of hazardous materials approved for use by the generating activity
    - Description of the process generating the waste
- HWPM will review all provided information, request additional information as deemed necessary. HWPM will then enter all information into HWTS, assign appropriate profiles and container types, and will respond to UEC with approval/disapproval to accumulate waste. All approved waste accumulation sites will be listed in Tinker AFB's HWTS.

Collection Point (CP) Operating Requirements

Some organizations at Tinker AFB manage a particular process at several different locations, each of which generates only small amounts of the same hazardous waste. This management method provides for small containers, 10-gallons or less in size, to collect those wastes at each location and then be emptied into a centrally located IAP, controlled by that organization, at the end of each work shift or when full, whichever comes first. Basic IAP rules apply to CPs such as: a sound closed container, labeled with contents, isolated if incompatible and operator controlled.

- CPs are to be used only where small amounts of waste are being generated continuously and it would be unduly burdensome to interrupt the work to transport that waste to the IAP.
- Small closeable containers of 10-gallons or less are to be used.
- A conveniently accessible IAP must be designated as the receiving site for the collection point.
- The contents of containers must be transferred to the designated IAP at the end of each work shift, workday or when full, whichever comes first.
- The contents of the container or the words "Hazardous Waste", as appropriate, will be identified on the container with easily readable letters.

IAP Operating Requirements:

This management method is based on the EPA Regulations at 40 CFR 262.34(c)(1) and (2). Each container being used to accumulate hazardous waste is considered an IAP, unless it is a CP. Most of the hazardous waste generated by normal, daily operation is initially collected and managed in a serialized 55-gallon, DOT approved drum. Management procedures for IAPs include the following:

- IAPs must be under the direct control of the generator and at or near the point of generation.
- All IAPs must be at least 50 feet inside Tinker AFB boundaries.
- If IAPs have latching container lids and are not under direct control of the generator, securing devices (such as locks) must be used.
- An Emergency Response Plan and Operational Checklist must be prominently posted at the IAP location.
    - An Emergency Response Plan will contain spill procedures that must be activated in the event of a spill. See Appendix C for an example Emergency Response Plan.
    - An Operational Checklist must list all items that will be visually examined by IAP Manager daily. The Operational Checklist may also be used as a guide for weekly inspections. See Appendix C for an example Operational Checklist.
- Weekly inspections shall be performed and documented on Tinker Form 487 per section 7.8 of this plan. See Appendix C for example Tinker Form 487.
- When the drum has been filled, operators must seal the drum, write filled date on label and have the container moved to the HWMF within three days. See Section 7.7 for filled container turn-in procedures.
- At no time may 2 containers of the same waste stream be actively accumulating.

Waste Site Operating Requirements

Multiple IAPs are collocated in a single storage area. The generator must ensure that each drum is dedicated to a distinctly different waste stream. All approved waste sites will be given a unique Waste Site number by the HWPM and will be listed in the HWTS. All IAP Operating Requirements apply in addition to the requirements below:

- No more than four 55-gallon drums will be placed on a single pallet.
- Incompatible wastes are separated from contact by a dike, berm, wall or other device.

<u>Closure of Waste Site:</u>

- When operations cease at a Waste Site, all contaminated equipment, structures and soil will be properly disposed of or decontaminated.
- 72 ABW/CEIEC will be notified in writing at least one month prior to closure of a container operation and be supplied with a closure plan at least three months prior to closure of a tank operation.

Immediate Removal Location (IRL) Operating Requirements:

Several operations take place at Tinker AFB where large amounts of hazardous waste are generated in a very short span of time. Examples include: cleaning out of a process tank where the operable solutions

have become unusable or sludge has precipitated from the solutions, cleaning of paint application or stripping facilities where sludge has collected, bulk filter changeouts, and remediation sites where contaminated soil and debris have been displaced from their normal situation. The solutions, sludge, soil or debris may be loaded directly into a tank truck or gondola and transported to an off-site facility. Alternatively, the waste may be placed in containers and moved to the HWMF.

- IRLs must follow IAP Operating Requirements above.
    - Only exception is IRLs do not have Weekly Inspection requirements due to never being on-site longer than three calendar days.
- All bulk and non-bulk containers must be removed from the IRL within three calendar days after having waste placed into the containers.
- When enclosed trailer is used for transport of bulk filter changeouts, all filters must be contained within closed cubic yard box liners, then placed within the trailer with the doors securely closed, and transported to HWMF for consolidation within 24 hours of removal.
    - Cubic yard box liners will be provided by the HWMF.

Hazardous Waste Accumulation Site (HWAS) Operating Requirements:

This management method is based on the regulations at 40 CFR 262.34(a), and as a large quantity generator of hazardous waste, Tinker AFB's HWAS are less than 90-day storage locations. The most active HWAS at Tinker AFB is the HWMF. Its purpose is to control the distribution of containers, serve as a central assembly location for containers from IAPs, analyze contents of containers to ensure proper labeling and prepare documents for turn-in of waste containers to the PSF. Other HWASs at Tinker AFB include tanks in the Chemical Cleaning and Plating Shops and bulk storage containers for IWTP, wet-blast, and remediation wastes that that cannot be removed immediately.

<u>HWAS for Drums (HWMF):</u>

<u>Safety and Preparedness:</u>

- A waste that is incompatible with any other waste or material that is placed such that contact between them might occur during a mutual spill must be separated or protected from contact by a dike, berm, wall or other device.
- Spill control and decontamination equipment in good working order, including protective clothing, will be available for immediate use, as well as water at sufficient volume and pressure to supply required equipment.
- All required emergency equipment must be tested and maintained to ensure its reliability during an incident.
- Each HWAS will prepare a Site Specific Contingency Plan (SSCP) that must be included in the Installation's Spill Prevention Control and Countermeasures Plan. The individual SSCPs must include the following items:
    - Names and phone numbers of HWAS Manager and UEC.
    - Map with preferred evacuation route in case of fire, explosion, or hazardous waste emergency.

        - Included on the map will be locations of communications equipment, fire or emergency alarms, fire and spill control equipment, and decontamination supplies.
    - List of all equipment, alarms, and supplies shown on the map along with a description of each items' capabilities.

- A copy of the SSCP will be posted at or near emergency communication devices.
- Emergency Response Plans will be posted in prominent locations in the working area (See Appendix C for Example).
- A freeze-proof emergency eye wash and deluge shower will be located within the immediate work area so that they can be reached in the event of a harmful exposure at the site.
- Outdoor areas where flammables are managed will be clearly marked and signs indicating "No Smoking within 50 Feet" will be prominently posted.
- Sufficient aisle space will be provided and maintained to allow unobstructed movement of personnel and spill or fire control equipment to any part of the site. The following rules are based on AFI 91-501, *Air Force Consolidated Occupational Safety Standard, Chap 22* to AFI 91-203, *Air Force consolidated Occupational Safety Instruction, Chap 22*.
- Outdoor storage container piles will be separated by at least five feet. Also, within 200 feet of each container, there will be a 12-foot wide access way to permit approach of fire control apparatus.
- Indoor storage main aisles will be at least eight feet wide and side aisles at least four feet wide. No container will be more than 12 feet from an aisle. All container piles will be separated by at least four feet.
- The allowable height of container piles is a function of the flammability of the material being stored.

<u>HWAS Manager Responsibilities:</u>

- Maintain an inventory for containers that may be generated in HWTS for HWAS. Inventory must be visually verified once per workweek.
- Perform both daily and weekly inspections and properly document. See section 7.8 for requirements.
- Ensure no HW remains on-site longer than 90 days. Containers will be transferred to PSF within 90-days.
- Ensure that communications equipment, showers, eyewashes, PPE, spill clean-up tools, internal alarm, fire suppression equipment and decontamination equipment are operational at all times and that SSCP is posted and current.
- Activate Spill Plan as necessary if spills or leaks occur.
- Immediately notify HWPM if compliance issues arise.

- Ensure that immediately upon arrival at the HWAS, the Accumulation Start Date is annotated on the container with an indelible pen.
- Insure that proper personal protective equipment (PPE) is worn when opening sealed containers for testing or transfer of contents between containers.

Procedures for Tanks:

- Each tank will be marked with the following information in easily readable letters on an easy to view part of the above ground area of the tank, or for an underground tank, on an aluminum or plastic sign placed above the tank:
    - Contents (include percentages if mixture).
    - Functional address symbol.
    - HW Manager's name and telephone number.
    - The words "HAZARDOUS WASTE."
    - The "Accumulation Start Date."
- Each tank cap must be closed except when being filled, drained or inspected by authorized personnel.
- HW will not be placed in a tank if it is incompatible with the waste previously held unless the tank has been completely rinsed between uses. The rinsing must be recorded on Tinker AFB Form 485, Accumulation Site Inspection Checklist (Tanks) and TINKER AFB Form 132, Tank Inventory Log for Accumulation Sites. See Appendix C for example forms.
- The appropriate controls and practices must be used to prevent spills and overflows from tank or secondary containment systems. These include at a minimum:
    - Spill prevention controls (check valves, dry disconnect couplings).
    - Overfill prevention controls (level sensing devices, high-level alarms, automatic feed cutoff or bypass to a standby tank that exceeds the volume of the top two feet).
    - Maintenance of sufficient freeboard in uncovered tanks to prevent overtopping by wave or wind action or by precipitation.
- An ignitable or reactive waste can be placed in a tank only if:
    - It is managed in a way that it cannot ignite or react.
    - The tank is used solely for emergencies.
- Existing tank systems that do not have a secondary containment system must have a written assessment completed and certified by a professional engineer attesting to the tank system's integrity. This assessment must determine that the tank system is adequately designed and has sufficient structural strength and compatibility with the wastes to be stored to ensure that it will not collapse, rupture or fail. At a minimum, secondary containment systems for tanks require the following:
    - Constructed of or lined with materials that are compatible with the wastes to be placed in the tank system.
    - Sufficient strength and thickness to prevent failure due to pressure gradient, physical contact with the waste to which they are exposed, climatic conditions, the stress of installation and the stress of daily operation.

- Placed on a foundation or base capable of providing support to the secondary containment system and resistance to pressure gradients above and below the system and capable of preventing failure due to settlement, compression or uplift.
- A leak detection system that is designed and operated to detect the failure of either the primary and secondary containment structure or system or any release of hazardous waste or accumulated liquid in the secondary containment system within 24 hours.
- Sloped or otherwise designed or operated to drain and remove liquids resulting from leaks, spills or precipitation. Such liquids must be removed within 24 hours.
- Sufficient capacity to contain 100 percent of the volume of the largest tank within its boundary.
- One or more of the following devices:
  - A liner (external to the tank).
  - A vault.
  - A double-walled tank.
  - An equivalent device approved by CEIEC.

- Waste tanks must be drained and transported off-base to a disposal facility within 90 days of the Accumulation Start Date. See Section 7.7 for turn-in procedures.

<u>Procedures for a New Tank System and Components:</u>

- For installation requirements for new tank systems and their components, the generator will contact their UEC and provide all available tank information prior to use as a waste tank.
- The UEC will provide all information to the HWPM requesting determination of all requirements.
- The HWPM will ensure that all requirements of 40 CFR 267 Subpart J are met.

<u>Closure of a Hazardous Waste Accumulation Site</u>

- When operations cease at an HWAS, all contaminated equipment, structures and soil will be properly disposed of or decontaminated.
- If tank systems are involved, a closure plan will be submitted to 72 ABW/CEIEC describing how the tanks, containment systems, associated equipment and surrounding soil will be disposed of or decontaminated.

Permitted Storage Facility (PSF) Operating Requirements:

At Tinker AFB, 72 ABW/CEIEC operates the PSF for long-term storage of hazardous waste. The need for long-term storage is based on the large volume and variety of hazardous wastes generated at the base. Over 1200 tons of hazardous waste are generated each year, about one-half of which is cycled through DLA-DS. Analysis, labeling and contracting for disposal of that volume of hazardous waste would be very difficult within the 90 days allowed at an HWAS. The PSF allows storage of large enough quantities of specific waste streams to award efficient, cost effective contracts for disposal, or to find recyclers willing to purchase the large quantity of raw material at premium prices.

<u>Operating Permit</u>

- The "Part B" RCRA Operating Permit that is jointly issued by EPA and ODEQ controls operation of PSFs. Because the facility is located entirely on Tinker AFB property, it operates under the same EPA ID number as Tinker AFB: OK1571724391. DLA-DS is the operator of the PSF. Modifications to the "Part B" permit will be coordinated through 72 ABW/CEIEC.
- The "Part B" Permit describes in detail the location and construction of the permitted facilities. Containers are the only holding devices allowed by the permit.
- Refer to the "Part B" Permit for hazardous waste management and handling requirements at the permitted storage facility.

7.6 Transportation

The HW Manager has overall responsibility for the transportation of HW from an IAP to an HWAS, and from an HWAS to the disposal facility. The HW Manager ensures:

- All transportation over public highways is conducted IAW applicable DOT requirements.
- Containers are DOT approved.
- Transporters have the appropriate training.
- Uniform Hazardous Waste Manifest are prepared for offsite transportation.
- All necessary documentation has been completed and records are maintained IAW all applicable federal, state, local and FGS requirements and the AF Records Disposition Schedule.

Installation Supplement – Transportation

Off-Site Tracking of Hazardous Waste Shipments

This section is concerned with the preparation of containers for off-site shipment of hazardous waste and the tracking procedures to be used after shipment to a designated facility. It completes the trail of records that previous parts have followed .

<u>Container Selection</u>

All containers shipped off-site must meet DOT specifications for the waste contained. See 49 CFR 173.

<u>Container Preparation</u>

Before containers are transported off-site, they will be marked in accordance with 49 CFR 172 Subpart D, 40 CFR 262.32(b), and labeled in accordance with 49 CFR 172 Subpart E.

<u>Shipment Documentation (Hazardous Waste Manifest)</u>

A manifest must accompany a shipment of hazardous waste being transported on a public highway. A manifest is the shipping paper for hazardous waste. All generators are required to use the Uniform Hazardous Waste Manifest. Some states have additional requirements beyond the Uniform Hazardous Waste Manifest. Any additional state requirements must also be met.

<u>Responsibility for Originating the Manifest</u>

Federal and State regulations assign responsibility for originating or signing manifests on the generator. At Tinker AFB, the 72 ABW/CEI Division has been delegated to act as generator for all base activities. The 72 ABW/CEI Division has further delegated authority to originate manifests as follows:

- DLA-DS originates manifests for all shipments through the DLA-DS disposal contract.
- All other organizations and their contractors needing to ship hazardous waste off base shall coordinate with 72 ABW/CEIEC, 734-3278.
- DLA-DS will request delegation from Installation Management Division for their personnel who originate manifests.
- All personnel who receive delegation of authority to sign Hazardous Waste Manifests and LDR forms must maintain currency with hazardous waste training requirements. They must also maintain currency with DOT training requirements outlined in 49 CFR 172 subpart H which requires refresher training at least once every three years.

Tracking the Manifest:

- The generator's copy of the manifest will be delivered to 72 ABW/CEIEC within two hours after the initial transporter accepts shipment. For after duty hours the manifest will be delivered to the Fire Department, if possible, or held until the next duty day and delivered to 72 ABW/CEIEC.
- 72 ABW/CEIEC will monitor return of manifest signed by designated facility.
- When copy of manifest signed by designated facility is received, place with generator's copy in files and maintain IAW Section 6.0 of this plan.

Exception Report:

- If a copy of the manifest signed by the designated facility is not received within 35 calendar days after acceptance by the initial transporter, the transporters, the designated facility and/or others will be contacted to verify the status of the waste.
- Submit Exception Report (40 CFR 262.42) will be sent to ODEQ if manifest copy signed by designated facility is not received within 45 calendar days after initial transporter accepts the waste shipment.
- Exception Reports will be kept on file IAW Section 6.0 of this plan.

Shipment Documentation (LDR Notification and Certification):

- If the waste being shipped does not meet applicable treatment standards set forth in Subpart D of 40 CFR 268 or if it exceeds prohibition levels in 40 CFR 268.32 or RCRA 3004(d), the receiving facility must be notified in writing of the appropriate treatment standards and other information set forth in 40 CFR 268.7(a)(1).
- If the waste being shipped is subject to restrictions but can be land disposed without further treatment, the receiving facility must be notified as above and also be provided with a written certification stating that the waste meets applicable treatment standards as outlined in 40 CFR 268.7(a)(2).

- The same person who prepares the manifest shall prepare the above described notification and certification documents. The documents shall accompany the manifest to the designated facility. A copy will be filed with the manifest signed by the designated facility for record keeping purposes.

Certificate of Disposal (COD)

- This document certifies that the waste was treated, or disposed of in a proper manner, where, when and by what method. It has become unfeasible to require all hazardous waste disposal contracts to require CODs be delivered to 72 ABW/CEI.

7.7 Turn In/Disposal

The turn in procedures contained in DoD 4160.12-M. DLA Disposition Services are followed. In the event an alternate route for disposal is needed, a waiver will be obtained with proper justification and approval.

Containers are inspected, prior to turn-in, to ensure that container management procedures have been followed and that containers are properly labeled and in good condition. If the container is not in good condition, contents are transferred to a container that is in good condition.

Installation Supplement – Turn In/Disposal

Procedures for Turn-In of Hazardous Waste by Generators

Container Turn-in through the HWMF

Turn-in of Waste in 55-gallon or Less Drums Obtained from the HWMF

- When a container becomes full, the generator shall mark the Filled Date on the container label, using an indelible pen, and on TINKER AFB Form 487, *Initial Accumulation Point Management Aid*, Part II. Sealing mechanisms shall be properly installed and tightened.
- If the HWMF drum pick-up service is used, the generator must input the pick-up request using the HWTS and specify which of their serialized containers are full and awaiting pickups. As long as the pick-up request is entered prior to 1230 hours the HWMF will pick the container up same day. Requests after this time will be performed same day if time permits or will be first on the list for the following business day.
- The container must be moved to the HWMF within three calendar days after the Filled Date between the hours of 0700 and 1500 on weekdays. Properly trained personnel, using safe handling practices and proper equipment, will accomplish movement of containers.
- If a replacement drum is needed, the generator will request delivery of a new container using the hazardous waste tracking system.
- Prior to turning in a container that has been used during an emergency clean-up operation, notify the UEC, 72 ABW/CEIEC and the HWMF that the container is not labeled correctly and/or is not serialized. Provide all information regarding the contents that is available to the HWMF.

Turn-in of Wastes not in Drums Obtained from the HWMF

NOTE: *The intention of this paragraph is for unusual circumstances such as spills or other unexpected generation of waste.*

- Generating shops will provide all available information to their UEC.
- UEC will provide all information to the HW Program Manager for waste characterization and turn-in procedures.
- Once instructions are provided by HW Program Manager, UEC will provide the instructions to the generating shops and will provide assistance as needed to ensure proper turn in.

Bulk Removal of Hazardous Waste

For removal of large quantities of waste in tank trucks, gondolas, large containers or other such devices, the generator should:

- Work with their UEC to ensure that all information needed to properly dispose of the waste is provided to the HWPM.
- The HWPM will work through available disposal avenues to ensure that bulk waste is removed in a timely manner.

Hazardous Materials Disposal Procedures

Maximum use of hazardous material must be made before sending it to DLA-DS for disposal. Excess hazardous materials that are in original, unopened packages in good condition must be handled as follows:

Transfer through Tinker AFB Channels:

- Contact Hazardous Material Management Program (HMMP) at 736-3597 to determine if authorized users at Tinker AFB or other DoD facilities could use the material.
- If another user is available, follow HMMP guidance for transfer of material. If an alternate user is not available, proceed with Hazardous Materials Inventory Disposition procedures listed below.

Request Disposition of Excess/Expired Materials through HWTS:

- Obtain Hazardous Material Container ID #'s from the HWTS issued container labels. Using the HWTS submit a request for disposition of the materials.
- Once turn-in instructions are provided by HWPM, the generators will proceed with turn-in instructions in a timely manner. Generators may be required to present a copy of turn-in instructions at time of disposition at HWMF.
- HWPM will determine if there are potential sales opportunities through DLA-DS's Reutilization, Transfer, Donation, and Sales (RTDS) Program.

- If materials meet requirements of RTDS program, the HWPM will give first priority to the materials entering this program to divert as many materials as possible from Tinker AFB's waste generation.
- If materials do not meet requirements, the materials will be handled as wastes.

Disposal of Special Category Wastes:

Used Batteries. Nickel-Cadmium, Mercury, Lithium-Ion, Magnesium, Lead-Acid, Silver and other batteries may be managed as Universal Wastes according to 40 CFR 273.

- Battery Recycling. Nickel-Cadmium, Lithium-Ion, Lead-Acid and Nickel Metal Hydride batteries may be turned in to the HWMF at B808. To do so each organization must segregate batteries by type, cover the terminals such that they may not come into contact with any conductive surfaces (tape, plastic cap, plastic bag, etc.), and bring them to Bldg. 808 (HWMF) between 8am and 2pm on normal business days to be accumulated for recycling.
- Small Alkaline Batteries. Small, non-rechargeable, alkaline batteries (AA, AAA, C, D, etc.) are not regulated as hazardous waste according to the EPA. They are only considered solid waste and may be disposed of in a solid waste dumpster. Do not collect these batteries separately. Discard as generated.
- Other Batteries. All other battery types not listed above must be turned in using the Hazardous Materials Disposal Procedures listed above.

Medical and Pharmaceutical Waste. Coordinate with Medical Group (72 MDG) and Bioenvironmental (SGPB) for disposal instructions.

Abandoned Waste. The discovery of an unlabeled or otherwise unidentified container or other accumulation of waste will be handled as follows:

- Report discovery to UEC responsible for that industrial area who will attempt to find the owner within that organization.
- If unable to find the owner of the waste, the UEC will report the discovery to 72 ABW/CEIEC who will conduct a wider search and/or determine available disposal avenues. Once a disposal avenue is obtained, 72 ABW/CEIEC will provide instructions to the UEC for containerization and disposal.

Mixed Waste. This waste must be managed in accordance with both EPA regulations, AFI 40-201 Radioactive materials Management, and the Air Force Radioactive and Recycling Disposal (AFRRAD) Office.

- Control the waste while on site using the appropriate management method.
- Coordinate disposal with the Base Civil Engineer and the Installation Radiation Safety Officer (IRSO) at Bioenvironmental Engineering, who will in turn, coordinate with the AFRRAD office.
- Ensure that the shipping manifest, LDR forms, AFRRAD forms and other tracking procedures are properly completed.

Polychlorinated Biphenyl (PCB) Waste. This waste must be managed in accordance with the Toxic Substances Control Act (TSCA) and EPA regulations at 40 CFR 761. Items removed for disposal must be turned in to the HWMF within 6 months of accumulation start date.

- Control PCBs and PCB items in DOT approved containers. Place a PCB label on container and mark the date of first accumulation on the label. Ensure all items and quantities contained are listed on the label.
- Light ballasts that are not marked "PCB Free" will be considered as containing PCBs.
- Contact 72 ABW/CEIEC at 734-3278 to coordinate proper handling of PCB waste.
- Contact HWMF at 734-3285 to schedule a turn in time and deliver the PCB container to Bldg. 810.

Paint Booth Contract Services. Contractor will obtain DOT boxes from HWMF at Bldg. 808 prior to servicing a paint booth. Contractors will place paint filters and paper removed from paint booth in the boxes and notify HWMF where to pick up the boxes and which organization was serviced.

7.8 Inspection

Inspection processes fulfill the "Check" function of the EMS "Plan, Do, Check, Act" cycle. HWASs are inspected at least weekly to ensure proper accumulation and container management. RCRA Part B permitted storage facilities are inspected according to the inspection schedule established in the permit. All other inspections occur IAW AFI 90-201, *The Air Force Inspection System* and the Commander's Self Inspection Program. Inspection records are maintained IAW the Recordkeeping and Reporting section of this plan.

Installation Supplement – Inspection

Collection Points (CP):

- The generating unit supervisor will include CPs in a daily operational checklist.
- Supervisors will ensure that containers are all emptied when full or at end of each shift, whichever comes first.

Initial Accumulation Point Inspections:

<u>IAP Manager will:</u>

- Perform written weekly inspections using TINKER AFB Form 487, *Initial Accumulation Point Management Aid*. Part I of TINKER AFB Form 487 may be used to document inspection of the management site but an inventory of each container must be maintained in Part II. Should Form 487 Part II become full, the IAP manager may generate a continuation form and will keep the continuation form attached to the original Form 487. Weekly denotes once per working week.
- Use IAP operational checklist that is required to be posted at each IAP as the guide to perform inspection of IAP containers. See Appendix C for example operational checklist.
- Inspection records will be managed IAW section 6.0 of this plan.

HWAS:

HWAS Manager will:

- Perform daily inspections to ensure HWAS and all containers are in good condition. An operational checklist shall be posted to assist in main inspection criteria.
- Conduct written weekly inspections for containers on TINKER AFB Form 486, *Accumulation Site Inspection Checklist (Containers)*, or TINKER AFB Form 485, *Accumulation Site Checklist (Tanks)* as appropriate.
- Inspection records will be stored on-site IAW section 6.0 of this plan.

PSF:

PSF Manager will:

- Conduct written weekly inspection for containers and the facility in accordance with Tinker AFB RCRA Part B Permit.
- Inspection log will be maintained on-site IAW section 6.0 of this plan.

7.9 Waste Minimization

HW manifests include certification that a waste minimization program is in place. Below are key activities and processes that are performed as part of waste minimization and pollution prevention efforts:

- Hazardous material process authorization and hazardous materials management processes –Each process involving use of hazardous materials and generation of waste streams is evaluated and authorized. Process authorization is performed through EESOH-MIS. The HW Manager, HMMP Team and the generating activity make a final determination whether or not the results of the process authorization effort are sufficient to reduce waste toxicity and volume
- Procurement and use of minimal quantities – When a material with environmental risk must be used, minimal quantities are procured to minimize surplus quantities and shelf life exceedances
- Recycling – When the use of hazardous materials is unavoidable, excess or waste material is evaluated for reuse or recycling
- Environmental action planning – Environmental action plans (EAPs) are developed and maintained as part of the overall EMS. EAPs are management plans that translate environmental objectives and targets into actionable plans. Waste minimization efforts are considered during development of EAPs

Installation Supplement – Waste Minimization

No additional requirements.

7.10 Preparedness and Prevention

Preparedness and prevention practices are described in emergency prevention and response plans available through the references section of this plan.

Installation Supplement – Preparedness and Prevention

Spill Discovery and Initial Response Procedures

Any person recognizing an oil, hazardous substance, hazardous material or hazardous waste spill shall immediately:

- Contain the spill, if it can be done safely.
- If spill cannot be contained, activate TAFB Plan 19-2, *Oil and Hazardous Substances Integrated Contingency Plan*.
- Activate emergency alarm system, if any.
- Evacuate the area, if warranted by the type of spill.
- Make sure that all employees shut down their operation and secure their equipment.
- Call the fire department at 911, and give the type, location and size of spill and the name of the individual reporting.
- Inform the Supervisor, Section Foreman or Chief.
- Perform cleanup operations within the unit's capabilities and assist the fire department upon its arrival.
- The supervisor will conduct a roll call of employees and report status to fire department "Incident Commander."

7.11 Waste Specific Procedures

Waste-specific procedures are included in the installation supplement below or maintained as separate operational controls outside of this plan.

Installation Supplement – Waste Specific Procedures

Empty Container Handling Procedures

Most containers that previously held materials used in various operations at Tinker AFB can be disposed of as non-hazardous waste if they meet the definition of "empty" in 40 CFR 261.7. In view of base-wide efforts toward waste minimization and to reduce disposal costs, the procedures outlined below will be followed. While the containers meet the EPA definition of "empty" they must still be given special handling consideration because large numbers of them are frequently accumulated in one place. This increases the threat of fire and release of a toxic substance. The Empty Container Processing Facility (ECPF) in Building 3125 has been established to facilitate these procedures.

For a container to meet the EPA definition of "empty", all wastes have been removed that can be removed using the practices commonly employed to remove materials from that type of container, e.g., pouring, pumping, and aspirating. If chemicals cannot leave the containers through normal means then the residual must not be greater than 1 inch in depth or 3% of the container's total volume, whichever is less. If the containers fail to meet the definition of "empty" then they must be handled as hazardous waste.

<u>Empty Container Processing:</u>

- All empty 5 to 55 gallon metal and plastic containers will be labeled with a six inch by six inch vinyl "EMPTY" label by generating organization. The correct stock number and chemical name of the material previously held if not legible on the containers, generating functional address symbol and telephone number will be written on the label with an indelible ink marker. The

drums shall be placed on pallets, four drums per pallet, and taped together to prevent falling. Generator will call 734-3285 to arrange for container pick up by the HWMF contractor.

- Empty containers less than five gallons in size shall be double-bagged by the organization and placed at the normal waste collection point. The organization shall then contact the HWMF for pick-up. Generator shall ensure that these containers are bagged in such a manner to prevent any drips or leaks.
- Empty aerosol cans shall be accumulated separately in devices labeled "Empty Aerosol Cans" then delivered into a designated container at the HWMF. Personnel at the HWMF shall puncture the aerosol cans in a manner such that the contents are expelled into a 55-gallon hazardous waste accumulation device. The cans will then be air-dried and placed into a 55-gallon drum which will be crushed and sent out to be recycled.
- Empty hand-held compressed gas cylinders will be accumulated separately in accumulation devices labeled "Empty Hand-Held Compressed Gas Cylinders." These shall be delivered into a designated container at the HWMF. These shall be depressurized and sent out to be recycled.
    - Partially full aerosol cans and gas cylinders are handled as excess material. See section 7.7 of this plan for turn-in of excess/expired materials.

Universal Waste Lamp Management Procedures

Universal Waste Lamps are defined as the bulb or tube portion of an electric lighting device designed to produce radiant energy, most often in the ultraviolet, visible and infrared regions of the electromagnetic spectrum. Examples include fluorescent, high intensity, neon, mercury vapor, high-pressure sodium and metal halide lamps. Refer to 40 CFR 273.5 and 273.9 for additional information.

<u>Accumulation Procedures for Waste Lamp Accumulation Sites (WLAS)</u>

For each directorate or other major organization at Tinker AFB that generates UW Lamps, the commander of that organization and its UEC shall choose one or more convenient WLAS and appoint a Waste Lamp Manager for the site. These sites shall be coordinated with the HWPM. All personnel in that organization shall be notified about the purpose and location of these sites.

- All approved WLAS will be listed in HWTS with the appropriate Waste Lamp Manager.
- All types of UW lamps generated by an organization shall be brought to the WLAS and placed in an appropriate container.
- A "Universal Waste Lamp Tracking Log" (template available from 72 ABW/CEIEC) shall be kept in the vicinity of each WLAS.
    - An "Accumulation Start Date" shall be posted on the tracking log reflecting the date the first lamp is placed in the WLAS. The "Clean-Out Date" shall reflect the date lamps and debris are cleaned out and moved to the Waste Lamp Consolidation Site (WLCS) at Building 808.
    - The Waste Lamp Manager will maintain completed "Universal Waste Lamp Tracking Logs" in an onsite file for at least three years.
- The Waste Lamp Manager may use the HWTS to request pickup of full containers and drop off of new empty containers.

    - The Waste Lamp Manager may use manufacturer's containers if used lamps are kept segregated from new lamps and the container is managed in the same manner as containers provided by the HWMF.
- Containers for accumulating UW Lamps shall provide protection from breakage and be appropriate to the type of lamp being accumulated.
- All containers (even manufacturer's containers) holding UW lamps must be labeled with one of the following phrases: "Universal Waste—Lamp(s)," or "Waste Lamp(s)," or "Used Lamp(s)
- Once a lamp is placed in a container, the date must be written on the label with an indelible pen.
- The Waste Lamp Manager is responsible for ensuring that the container is turned in to the WLCS within six months of the accumulation start date or when the container is full whichever comes first. The container may be transported by the generator to building 808 between the hours of 8:00am and 2:30pm Monday through Friday (excluding holidays), or it may be scheduled for pick up through the HWTS.

Waste Lamp Consolidation Site Functions

The WLCS is located in the Hazardous Waste Management Facility, Bldg. 808. The WLCS shall:

- Serve as the central consolidation, packaging, and disposal point for all UW Lamps accumulated on Tinker AFB.
- Consolidates UW Lamps into DOT approved shipping containers once received from WLASs. The smaller containers from the WLASs are then re-issued with new labels until containers are no longer reusable.
    - If two (2) or more containers are consolidated into a single container, the consolidation container will receive the accumulation start date of the oldest bulbs placed in the container.
- Provide adequate temporary storage of UW Lamps to prevent breakage or damage to containers while accumulating sufficient amounts to dispose of in the most cost effective manner.
- Ensure that disposal of all waste lamps at the WLCS occurs within 6 months of the bulbs reaching the WLCS. These 6 months along with the WLAS's initial 6 months ensures that UW Lamps do not exceed their 1-year regulatory time limit on the installation.

Off-Site Shipments

UW lamps received by the WLCS shall be shipped off-site to an acceptable facility within the regulatory time limit. Shipments shall be coordinated through the DLA-DS following proper DOT shipping guidelines for Universal Waste.

- Prior to shipment, all UW Lamps shall be packaged in DOT approved containers appropriate to the type of lamp.
- Records of UW Lamp shipments shall be maintained in accordance with section 6.0 of this plan.

Spill Response

All spills, leakage or releases from UW lamps, such as from accidental breakage, shall be immediately contained then cleaned up and placed in a bag for accumulation at the WLCS.

8.0 REFERENCES

8.1 Standard References *(Applicable to all AF Installations)*

- ADLS – Advanced Distributed Learning Service
- AFI 32-7001, *Environmental Management*
- AFI 32-7042, *Waste Management*
- AFI 32-7086, *Hazardous Materials Management*
- AFI 90-201, *The Air Force Inspection System*
- AFLOA HW Legal and Other Requirements – The Air Force Legal Operations Authority (AFLOA) legal registry lists and provides access to federal (e.g., CFR, U.S. Code), DoD, AF and other legal requirements
- ARCNet – Training resource for Air Force Reserve Command
- DoD 4160.21-M, Defense Reutilization and Marketing Manual
- EASI Database (includes SIRIS)
- eDASH Environmental Action Plan (EAP)
- eDASH Hazardous Waste Home Page
- eDASH Hazardous Waste Training Matrix
- EESOH-MIS Software Module
- Environmental, Safety & Occupational Health Training Network (ESOH-TN)
- Hazardous Waste Playbook

8.2 Installation References

- TINKER AFB Form 485, *Accumulator Site Inspection Checklist (Tanks)*
- TINKER AFB Form 486, *Accumulator Site Inspection Checklist (Containers)*
- TINKER AFB Form 487, *Initial Accumulation Point Management Aid*
- TINKER AFB Form 132, *Tank Inventory Log for Accumulation Sites*
- TAFB Plan 19-2, *Oil and Hazardous Substance Integrated Response Plan*

9.0 ACRONYMS

9.1 Standard Acronyms *(Applicable to all AF Installations)*

- eDASH Acronym Library
- Hazardous Waste Playbook – Acronym Section
- U.S. EPA Terms & Acronyms

9.2 Installation Acronyms

- 72 ABW/CEIEC — Civil Engineering Directorate, Installation Management Division, Environmental Compliance Branch
- AWACS — Airborne Warning and Control System
- CP — Collection Point
- ECPF — Empty Container Processing Facility

- HWMF Hazardous Waste Management Facility
- HWPM Hazardous Waste Program Manager
- HWTS Hazardous Waste Tracking System
- HWWG Hazardous Waste Working Group
- IRL Immediate Removal Location
- OC-ALC Oklahoma City Air Logistics Complex
- ODEQ Oklahoma Department of Environmental Quality
- SSCP Site Specific Contingency Plan
- WLAS Waste Lamp Accumulation Site
- WLCS Waste Lamp Consolidation Site
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10.0 DEFINITIONS

10.1 Standard Definitions *(Applicable to all AF Installations)*

- Hazardous Waste Playbook – Definitions Section

10.2 Installation Definitions

- No additional definitions.

11.0 INSTALLATION-SPECIFIC CONTENT

Hazardous Waste Working Group (HWWG):

- Purpose. The HWWG provides a forum for coordination, dissemination of information and serves as a steering group to guide the overall conduct of the hazardous waste management program.
- Role. The role of the HWWG is to review hazardous waste management policy and make recommendations based upon operational experience. 72 ABW/CEIEC uses this forum to present policy, disseminate information and monitor program effectiveness. Other organizations use this forum to stay current with base policy, call attention to areas of the program that are no longer effective and make recommendations.
- Membership. The chairperson for the HWWG is the Hazardous Waste Program Manager (HWPM) from 72 ABW/CEIEC. Members of the HWWG include UECs, representatives from Contracting Offices, Legal, DLA-DS, Bioenvironmental, the Fire Department and Safety who are appointed by their respective organizational directors. These persons must be knowledgeable of hazardous waste management requirements in their organization. Others involved in hazardous waste management are welcome to attend.
- Responsibilities. The Chairperson ensures that CE policies are represented at HWWG meetings. Other members ensure that responsibilities outlined in this instruction are carried out in their organizations.
- Operating Procedure. Meeting minutes will be recorded, and a copy of those minutes will be distributed to members no later than the next meeting. An agenda will be distributed before the start of the meeting.

Coordination with Regulatory Agencies:

- 72 ABW/CEIEC will serve as the point-of-contact for hazardous waste issues raised by regulatory agencies such as EPA, ODEQ and Air Force IG teams.
- 72 ABW/CEIEC will also produce and submit all reports to regulatory agencies, such as the Biennial Report to EPA, monthly and quarterly reports to ODEQ.

APPENDICES

Appendix A – Waste Analysis Plan (WAP)

Appendix B - Emergency Contacts Tinker AFB

Appendix C – Example Forms and Signage

Appendix A – Waste Analysis Plan

Purpose

The purpose of this Waste Analysis Plan (WAP) is to establish procedures for the analysis of hazardous wastes required before treatment, storage or disposal by RCRA (40 CFR Parts 264.13, 265.13, and 268.7) and Title 252, Oklahoma Administrative Code, Chapter 200-3-2.

Responsibilities

72 ABW/CEIEC is responsible for ensuring that proper analysis of hazardous wastes is accomplished before treatment, storage or disposal. The Tinker Environmental Laboratory will conduct most analysis needed to support hazardous waste management at Tinker AFB. It is capable of performing all normal operational waste stream analysis requirements including the Toxicity Characteristic Leaching Procedure (TCLP). 72 ABW/CEI will maintain a contract with an outside laboratory to provide analysis in case of work overload, an analytical confirmation is needed or when a special procedure is required.

Requests for Analysis

For purposes of quality control, the customer will be asked to complete a Sample Chain of Custody. This form may be submitted to the Laboratory by email, faxed or hand delivered. The following information shall be provided on the Chain of Custody for all samples requested for analysis by the Tinker Environmental Laboratory

- Organization requesting analysis
- Name of person performing sampling and person relinquishing samples to the laboratory
- Date that sample was taken
- Sample ID# or Container # where sample came from
- General Description of waste
- Number of samples
- Grab or Composite Sample
- Types of Analyses being requested

Procedures for Analysis:

All hazardous wastes generated at Tinker AFB will be analyzed as often as waste streams or processes change to ensure characterization is accurate and up-to-date. At the very least, 72 ABW/CEIEC will review the current set of hazardous waste analysis annually. The analytical procedures discussed herein are to be used by the Tinker Environmental Laboratory as well as by laboratories that perform hazardous waste analysis for Tinker AFB. Acronyms are listed in Section 9.0 of the Tinker AFB HWMP, and all periodic elements are identified by standard chemical symbols.

- Representative samples will be collected from required drums, tanks and vats using the sampling procedures outlined in EPA Office of Solid Waste Bulletin No. SW-846, *Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods*. Samples will be submitted to the Tinker Environmental Laboratory or to contract laboratories for analysis as required. Contract laboratories must be certified for each test method by the Oklahoma Department of Environmental Qualities' Laboratory Certification Program.

- Waste analysis will be accomplished as required by 40 CFR Parts 264.13 and 268.7 using methods outlined in EPA Office of Solid Waste Bulletin SW-846. Quality assurance/quality control procedures will meet or exceed all requirements for waste analysis.

- In addition to information for a complete Material Profile Sheet per waste stream sample, all hazardous waste analysis will provide information required by the ODEQ Form 858. The parameters analyzed are: primary chemical and physical form, characteristics, chemical element,

composition, percent solids, specific weight, pH, flash point, organic and inorganic components and heavy metals.

- From these analyses, the HWPM will supply the correct DOT shipping name, DOT hazard class, DOT identification number, EPA hazardous waste number, waste land disposal acceptability and a reason the waste is a "hazardous waste" in Oklahoma.
- Profile Sheets for each waste stream generated will be filed by the HWPM.

Rationale for Analysis

In the Specific Types of Wastes section below, discussed are 16 different types of wastes and the analytical procedures needed for each. The procedures are designed for the efficient analysis of the various categories of wastes. Although not all encompassing, the procedures cover the majority of the waste streams that the base generates. Therefore, additional analytical procedures will need to be added on a case-by-case basis.

- The rationale for selecting the analytical procedures listed in this waste analysis instruction are based on our knowledge of the chemicals used, processes performed and contaminants generated during these processes.
- Except for plating solution rinse water and oils with traces of PCBs, the majority of the hazardous waste streams will contain constituents in the part per million range. Analytical methods will reflect this policy.
- The methods discussed require that the waste being analyzed has been isolated, containerized and not commingled. The problems created by commingling are: risk of mixing incompatible materials, increased difficulty in obtaining a representative sample, increased time and costs of analysis, reduction of resale value of the wastes and additional treatment difficulty and cost increase of disposal.
- EPA methods are cited for various analytical procedures and are designed primarily for trace determinations and may not always be best suited for a given sample. If a method other than the EPA method is used to analyze a sample, the analytical report will be annotated to indicate the method used. Non-EPA methods will be documented and kept on file by the Tinker Environmental Laboratory.

Testing for LDRs

In accordance with 40 CFR Part 268.7, all waste streams must be analyzed to determine if they are restricted from land disposal. The general extraction procedure to be used for this purpose is outlined in Appendix II of 40 CFR Part 261 and is known as the Toxicity Characteristic Leaching Procedure or TCLP. After an extract has been obtained, additional analysis as outlined below are required to test for particular constituents.

Metals Analysis:

- Metals will generally be analyzed by ICP (Inductive Coupled Plasma) or AA (Atomic Absorption). Direct flame aspiration, graphite or atomic emission spectroscopy are all acceptable. EPA 6000 series methods for Sb, As, Ba, Be, Cd, Cu, Pb, Ni, Se, Ag, Tl, V and Zn as listed in SW-846 are recommended.
- Plating solutions may have severe matrix interferences; these are best overcome by the method of standard additions. Ion chromatography is also an acceptable method for determining inorganic cations and anions.
- Plating wastes will routinely be analyzed for Ag, Cd, Cr, Cu, Ni, Pb and Zn. Analysis can be performed for Co and Mo by special request.

- Sludge will be analyzed using the general extraction procedure outlined in Appendix II of 40 CFR Part 261 known as the Toxicity Characteristic Leaching Procedure or TCLP. After an extract has been obtained, additional analysis for soluble metals shall be performed.
- Paint, paint remover and degreasers containing paint chips will be analyzed for Ba, Pb, Cr, Cd, Cu and Zn.
- Cleaners and degreasers will be analyzed for Ba and Mo.
- Hydraulic fluid contaminated wastes will be analyzed for Ba.
- Chromium will be analyzed by ICP methods and the concentration for chromium will be total chrome.

Solvents can be analyzed by GC (Gas Chromatograph) in either liquid or vapor phase. IR (Infrared Spectroscopy) also can analyze solvents.

Hydraulic Oil

Since hydraulic oil may contain phosphate (TCP) or barium naphtenate additives, whenever hydraulic oil is found or suspected in a waste, these additives must be checked. TCP can be analyzed by GC/MS. Barium can be analyzed by Microwave digestion and measuring by ICP.

Specific Waste Type Analysis

Absorbents:

- **Visual Parameters**
  - Solid, dry or absorbed liquid.
  - Color of material.
  - Free liquid.
  - Odor.
- **Physical Parameters**
  - Flash point (Free liquid).
  - Toxicity: solvents, oils, metals, additives, etc.
- **Chemical Parameters**
  - Percent extractable organics, identify by GC or IR.
    - Hydraulic fluid, tricresyl phosphate by GC and Ba by ICP.
    - Transformer oils, PCBs by GC.
    - Fuels/Motor oils, Pb by ICP.
  - Solid, for total Pb, Zn and Ba.

Acids/Plating Shop:

- **Visual Parameters**
  - Color of solution.
  - Phases: number, type and volume.
- **Physical Parameters**
  - pH.
  - Specific Gravity.
  - Reactivity.
    - All acids are incompatible with cyanide and sulfide containing waste.
    - Nitric acid solutions/metals produce nitrogen oxide gases.

        - Strong nitric acid solutions are oxidizers.
        - Concentrated sulfuric acid/water releases heat.
        - Toxicity: heavy metals.

- **Chemical Parameters**
    - Analysis of liquid phase.
        - Total Ag, Cd, Cr, Cu, Ni, Pb and Zn; by ICP.
        - Acid by titration or specific gravity.
    - Analysis of sludge phase.
        - Identify by IR, X-ray Fluorescence, etc.
        - Total Ag, Cd, Cr, Cu, Ni, Pb and Zn; by ICP.

Caustics and Alkaline Cleaners:

- **Visual Parameters**
    - Color of solution.
    - Phases: number, type and volume.

- **Physical Parameters**
    - pH.
    - Specific Gravity.
    - Reactivity.
        - Strong Caustic Solutions/aluminum and zinc produce hydrogen gas.
        - Concentrated caustics/water releases heat.
    - Toxicity: cyanides, sulfides and heavy metals.

- **Chemical Parameters**
    - Analysis of liquid phase.
        - Total Cd, Cr, Cu, Ni, Pb and Zn; by ICP.
    - Analysis of sludge phase.
        - Identify by IR, XRF, XRD, etc.
        - Total Cd, Cr, Cu, Ni, Pb and Zn; by ICP.

Plating Solutions (Metals):

- **Visual Parameters**
    - Color of solution.
    - Phases: number, type and volume.

- **Physical Parameters**
    - pH.
    - Specific Gravity.
    - Reactivity: Tank specific reaction/acid solutions.
    - Toxicity: heavy metals.

- **Chemical Parameters**
    - Analysis of liquid phase.
        - Total Ag, Cd, Cr, Cu, Ni, Pb and Zn; by AA or ICP.
        - Water Content.
        - Acid or Alkali.
        - Special tests as requested.

Chromate Solutions:

- **Visual Parameters**
    - Color of solution.
    - Phases: number, type and volume.
- **Physical Parameters**
    - pH.
    - Reactivity.
        - Many chromate solutions are strongly acidic.
        - Same incompatibilities and reactions as with acid solutions.
    - Toxicity: heavy metals.
- **Chemical Parameters**
    - Analysis of liquid phase.
        - Total Cr, Cd, Cu, Ni, Zn and Pb; by ICP.

Electroless Copper Plating:

- **Visual Parameters**
    - Color of solution.
    - Phases: number, type and volume.
- **Physical Parameters**
    - pH.
    - Toxicity: presence copper.
- **Chemical Parameters**
    - Analysis of liquid phase.

Adhesives, Sealants and Prepegs:

- **Visual Parameters**
    - Color of material.
    - Phases: number, type and volume.
    - Viscosity.
    - Layers.
- **Physical Parameters**
    - Flash point.
    - Toxicity: Aromatic amines, expoxides, formaldehyde, phenols, isocynates, solvents.
- **Chemical Parameters**
    - Analysis of volatiles.
        - Percent volatiles by distillation.
        - Identify volatiles by GC, GC/MS or IR.
    - Analysis of nonvolatiles.
        - Identify by IR: epoxy, polysulfide, acrylic, etc.

Waste Paint: New, Used, or Paint Contaminated Rags:

- **Visual Parameters**
    - Color of material.
    - Phases: number, type and volume.

- **Physical Parameters**
    - Flash point.
    - Toxicity: Aromatic solvents, non-aromatic solvents or heavy metals.
- **Chemical Parameters**
    - Analysis of volatiles.
        - Percent of volatiles by distillation.
        - Identify volatiles by GC, GC/MS or IR.
    - Analysis of nonvolatile.
        - Percent extractable organics.
        - Identify extractable by GC, GC/MS or IR.
    - Analysis of no extractable material.
        - Identify material by IR.
        - Total Cd, Pb, Cr, Ba, Cu, Zn, Hg, etc.
    - Analysis of contaminated rags.
        - Volatiles by Headspace/GC or GC/MS.
        - Total Cd, Pb, Cr, Ba, Cu, etc. by ICP.

Paint Remover (Methylene Chloride Type):

- **Visual Parameters**
    - Color of material.
    - Phases: number, type and volume.
- **Physical Parameters**
    - pH.
    - Flash point.
    - Toxicity: solvents, heavy metals, amines, ketones or phenols.
- **Chemical Parameters**
    - Analysis of volatiles
        - Identify volatiles by GC, GC/MS or IR.
    - Analysis of nonvolatile.
        - Percent extractable organics.
        - Identify extractable by GC, GC/MS or IR.
    - Analysis of no extractable material.
        - Identify material by IR.
        - Total Pb, Cd, Cr, Cu, etc. by ICP.

Paint Stripper (Solvent Tank and Hot Strippers):

- **Visual Parameters**
    - Color of material.
    - Phases: number, type and volume.
- **Physical Parameters**
    - pH.
    - Flash point.
    - Toxicity: solvents, amines, ethers, heavy metals.
- **Chemical Parameters**

- Analysis of volatiles.
    - Percent volatiles distillation.
    - Identify volatiles by GC, GC/MS or IR.
- Analysis of nonvolatile.
    - Identify nonvolatile by IR.
    - Total Pb, Cd, Cr, Cu, etc. by ICP.

Degreaser Solvents:

- **Visual Parameters**
    - Color of solution.
    - Phases: number, type and volume.
- **Physical Parameters**
    - Toxicity: solvents (aromatic, halogenated, etc.), heavy metals in sludge.
- **Chemical Parameters**
    - Analysis of liquid phase.
        - Percent volatiles.
        - Identify volatiles by GC, GC/MS or IR.
    - Analysis of sludge.
        - Percent extractable organics.
        - Identify extractable by GC, GC/MS or IR.
        - Identify non-extractable by IR.

Degreasing Detergents:

- **Visual Parameters**
    - Color of solution.
    - Phases: number, type and volume.
    - Analysis of sludge.
        - Percent extractable organics.
        - Identify extractable by GC, GC/MS or IR.
        - Identify non-extractable by IR.
        - Total Ag, Cr, Cd, Cu, Ni, Zn, Pb, etc. by ICP.

Oils Not Commingled (Hydraulic, Aircraft):

- **Visual Parameters**
    - Color of materials.
    - Phases: number, type and volume.
- **Physical Parameters**
    - Flash point.
    - Toxicity: heavy metals, esters, solvents.
- **Chemical Parameters**
    - Analysis of oil phase.
        - Identify by GC, GC/MS or IR.
        - Percent volatiles by Headspace GC.
        - Identify volatiles by GC, GC/MS.
        - Metals Pb, Cr and Cd by ICP.

- Analysis of rags contaminated with oil.
    - Percent extractable organics.
    - Identify extractable by GC, GC/MS or IR.

Waste Fuels:

- **Visual Parameters**
    - Color of material.
    - Phases: number, type and volume.
- **Physical Parameters**
    - Flash point.
    - Toxicity: solvents, lead, hydrocarbon fuels.
- **Chemical Parameters**
    - Identify type of fuel by GC, GC/MS and IR.
    - Percent volatiles by distillation.
    - Identify volatiles by GC, GC/MS and IR.
    - Identify heavy hydrocarbons by GC, GC/MS and IR.

Industrial Waste Treatment Sludge:

- **Visual Parameters**
    - Color of materials.
    - Phases: number, type and volume.
- **Physical Parameters**
    - pH.
    - Toxicity: heavy metals, pesticides, herbicides, phenols.
- **Chemical Parameters**
    - Analysis of water.
        - Ag, As, Ba, Be, Cd, Co, Cr, Cu, Hg, Mo, Ni, Pb, Sb, Se, Tl, V and Zn by ICP.
    - Analysis of volatiles.
        - Identify volatiles by GC, GC/MS.
    - Analysis of nonvolatile.
        - Percent extractable organics.
        - Identify extractable by GC, GC/MS or IR.
    - Analysis of non-extractable material.
        - Identify material by IR.
        - Total Pb, Cd, Cr, Cu, etc. by ICP.

Appendix B – Emergency Contacts Tinker AFB

ORGANIZATION	ON-DUTY EXTENSION
a. Tinker Air Force Base	**(405) 732-7321**
(1) Fire Department	911
(2) Tinker Emergency Services	911
(3) Command Post	734-7313
(4) 76 AMXG Maintenance Operations Center (MOC)	736-2500
(5) Civil Engineer Service Desk	734-3117
(6) Environmental Compliance Section (72 ABW/CEIEC)	734-5199
(7) Occupational Safety Office	739-3263
(8) Security Forces **(EMERGENCY)**	734-3737
(9) Emergency Management	734-3515
(10) Bio-environmental Engineering	734-7844
(11) Liquid Fuels Maintenance	734-2753
(12) Staff Judge Advocate/(Environmental)	739-5811
(13) Public Affairs Office	739-2026
(14) HWMF (Barrel Yard)	734-3285
(15) DLA-DS	739-2204

b. Other Federal and State Agencies:

National Response Center	(800) 424-8802
Regional Response Center	(214) 767-2720
(If NRC is unavailable)	
Oklahoma Department of Environmental Quality	(405) 271-1400

c. Contingency Contacts

If, in the judgment of the Incident Commander (IC) additional off-base resources are required, the Installation Emergency Response Plan (IEMP) 10-2 will be implemented, and the following agencies and organizations can be contacted if deemed necessary:

Oklahoma City Police Department	297-1000
Oklahoma City Fire Department	297-3439
Midwest City Police Department	739-1300
Midwest City Fire Department	739-1340
Del City Police Department	677-2443
Del City Fire Department	671-2891
Veterans Affairs Medical Center	270-0501
Fort Sill EOD Unit	DSN 639-2313
	Commercial (580)442-2313
OK County Sheriff (Bomb Unit)	236-1717

If adequate spill response information is not available for a spill product, which can be identified by chemical, trade name, or manufacturer, the following organizations can be contacted by telephone to assist in providing specific information concerning the spill product:

Chemtrec	(800) 424-9300
Chem-Tel, Inc	(800) 255-3924
Military Shipments (Explosives/Ammunition)	(703) 697-0218
Military Shipments (Non-Explosive/Ammunition)	(800) 851-8061
ETIS	(904) 283-6167

Appendix C: Example Forms and Signage

The purpose of this section is to provide users of this HWPM with the locations of prescribed Tinker forms. All Tinker AFB CE Forms may be found through the eDASH website (https://cs2.eis.af.mil/sites/10625/Tinker/_layouts/15/start.aspx#/).

TANK INVENTORY LOG FOR ACCUMULATION SITES

MONTH/YEAR: TANK#: BLDG/ORG:
CURRENT ASD:

DAY	DESCRIPTION OF WASTE	GENERATION		ADDITION		REMOVAL			CURRENT TANK QUANTITY	DAYS LEFT BEFORE DRAINAGE
		PROCESS	RCC	**QTY	TOTAL	DRAIN (D) LEAK (L)	QTY	REMOVED TO***		
1.										
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										
10.										
11.										
12.										
13.										
14.										
15.										
16.										
17.										

ACCUMULATION START DATE (ASD) **ALL QUANTITIES IN GALLONS ***DRMO OR OFF-SITE FACILITY (OSF)

TINKERAFB FORM 132,19950810 (PerFORM PRO) Page 1 of 2

Figure 1: Tinker AFB Form 132, *Tank Inventory Log for Accumulation Sites*

ACCUMULATION SITE INSPECTION CHECKLIST (TANKS)				
MONTH	YEAR	ROUTING SYMBOL	LOCATION	WASTE/TYPE

PART I - DAILY INSPECTIONS *(Leaks, Corrosion, Containment Damage, Monitoring Devices, Labels, Security)*			
DAY	TIME	PROBLEMS AND ACTION TAKEN	INSPECTOR
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
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25			
26			
27			
28			
29			
30			
31			

TINKER AFB IMT 485, 20101227 PREVIOUS EDITIONS ARE OBSOLETE

Figure 2: Tinker AFB Form 485, *Accumulation Site Inspection Checklist (Tanks)*

ACCUMULATION SITE INSPECTION CHECKLIST (CONTAINERS)

MONTH	YEAR	ROUTING SYMBOL	LOCATION

PART I - WEEKLY INSPECTIONS

(INSTRUCTIONS: Inspect containers weekly with emphasis on evidence of leaks and corrosion. Complete all three columns and use Part III if necessary to describe problems or action taken.)

DATE / TIME	PROBLEM DESCRIPTION AND ACTION TAKEN	INSPECTOR

PART II - END-OF-MONTH INSPECTIONS

(INSTRUCTIONS: Inspect following items during last week of month. Indicate response to questions with check mark in appropriate column. Explain all "No" responses and actions taken in Part III.)

MARKINGS	YES	NO	NOT APPLICABLE
1. ARE ALL CONTAINERS CLEARLY MARKED WITH THE WORDS "HAZARDOUS WASTE" OR WITH CONTENTS DESCRIPTION IF DETERMINATION OF HAZARDOUS WASTE HAS NOT BEEN MADE?	☐	☐	☐
2. ARE ALL HAZARDOUS WASTE CONTAINERS MARKED WITH AN "ACCUMULATION START DATE?"	☐	☐	☐
3. ARE ALL "ACCUMULATION START DATES" LESS THAT 90 DAYS OLD?	☐	☐	☐
LABELS			
1. FOR CONTAINERS WITH CONTENTS THAT HAVE NOT BEEN DETERMINED TO BE HAZARDOUS WASTE, HAS THE OC-ALC FORM O-141 LABEL BEEN INSTALLED AND PROPERLY COMPLETED?	☐	☐	☐
2. ARE RECEIVING, SAMPLING, AND BUNG LABELS PROPERLY PLACED AND MARKED?	☐	☐	☐
3. FOR CONTAINERS WITH CONTENTS THAT ARE HAZARDOUS BY DOT RULES, HAVE PROPER DOT HAZARD CLASS AND WARNING LABELS BEEN PLACED ON THEIR OUTER SURFACE?	☐	☐	☐
CONTAINER MANAGEMENT			
1. ARE ALL DRUMS PLACED VERTICALLY ON PALLETS?	☐	☐	☐
2. DO ALL PALLETS CONTAIN FOUR OR LESS DRUMS?	☐	☐	☐
3. ARE PALLETS STACKED NOT MORE THAN TWO HIGH (ONE HIGH FOR FLAMMABLE LIQUIDS)?	☐	☐	☐
4. ARE ALL CONTAINERS TIGHTLY SEALED?	☐	☐	☐
LOCATION			
1. ARE IGNITABLE OR REACTIVE WASTES STORED AT LEAST 50 FEET FROM THE PROPERTY LINE?	☐	☐	☐
2. ARE WASTES SURROUNDED BY DIKES OR BERMS THAT ARE IN GOOD CONDITION?	☐	☐	☐
3. ARE INCOMPATIBLE WASTES SEPARATED BY DIKES, BERMS, OR WALLS?	☐	☐	☐

TINKER AFB IMT 486, 20101227 PREVIOUS EDITIONS ARE OBSOLETE

Figure 3: Tinker AFB Form 486, *Accumulation Site Inspection Checklist (Containers)*

INITIAL ACCUMULATION POINT MANAGEMENT AID

MONTH	YEAR	ROUTING SYMBOL	LOCATION *(Bldg/Post)*

WASTE DESCRIPTION *(Same as Container Label)*

PART I - WEEKLY INSPECTIONS

(INSTRUCTIONS: Inspect weekly noting evidence of leaks, corrosion, open containers, improper container markings and labels, and damage to secondary containment. Complete all three columns using Part III if necessary)

DATE AND TIME / CONTAINER SERIAL NUMBER	PROBLEM DESCRIPTION AND ACTION TAKEN	INSPECTOR

PART II - CONTAINER INVENTORY

(INSTRUCTIONS: Record indicated information when container is filled, removed, and replaced.)

FILLED DATE*	CONTAINER SERIAL NUMBER	QUANTITY (GALLONS)	REMOVAL DATE	REPLACEMENT SERIAL NUMBER	DATE PUT IN SERVICE	RECORDER NAME

*ENSURE FILLED DATE IS MARKED ON CONTAINER

PART III - COMMENTS

PART IV - MONTHLY ENDORSEMENT

TO THE BEST OF MY KNOWLEDGE THE ABOVE INFORMATION IS COMPLETE AND ACCURATE.

SUPERVISOR: _____ DATE: _____

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Figure 4: Tinker AFB Form 487, *Initial Accumulation Point Management Aid*

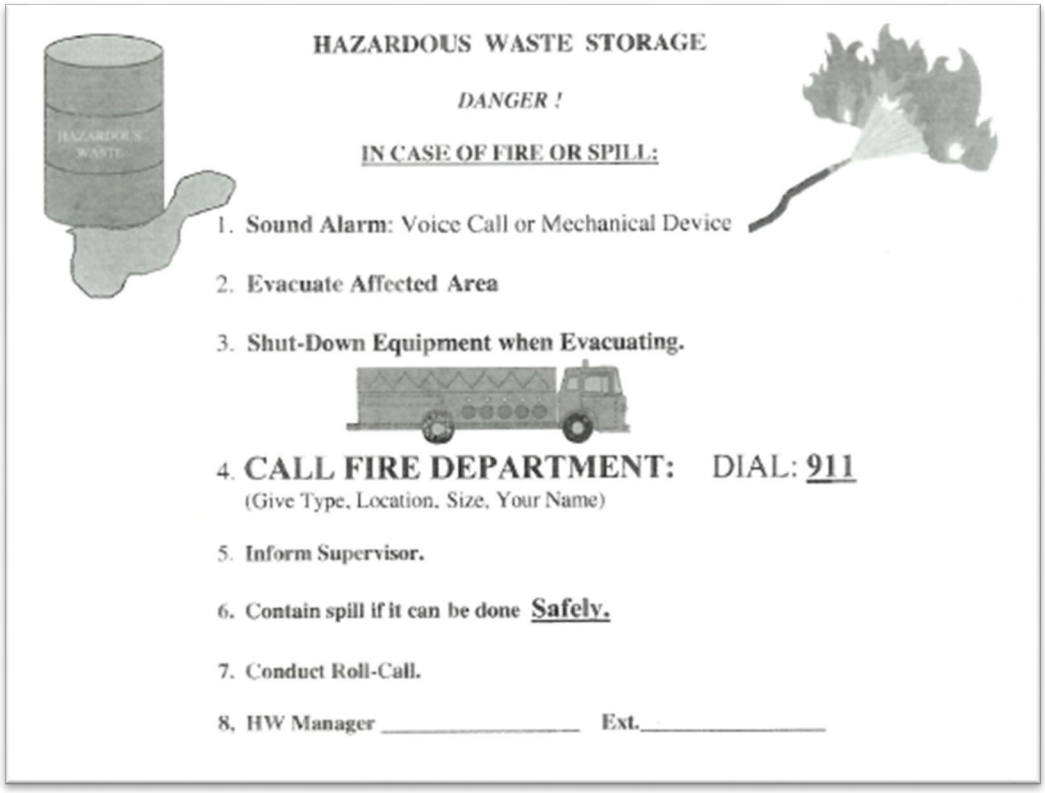
Universal Waste Lamp
Tracking Log

ORGANIZATION:	WLAS MANAGER:	SITE LOCATION (BLDG/POST):

INSTRUCTIONS: Post new Accumulation Start Date on Tracking Log and Container Label when first UW Lamp is placed into UW Waste Lamp Container. Containers must be kept closed unless adding waste to the container (boxes taped, tubes with lids on them). Containers at Waste Lamp Accumulations Site (WLAS) must be relocated to Waste Lamp Consolidation Site (B808 @ 734-3285) out within 6 months of accumulation start date written on Tracking Log and Container Label. Post the Clean-Out Date on day that the container is taken to WLCS.

ACCUMULATION START DATE (ASD)	CLEAN-OUT DATE	SIGNATURE

Figure 5: Example UW Tracking Log



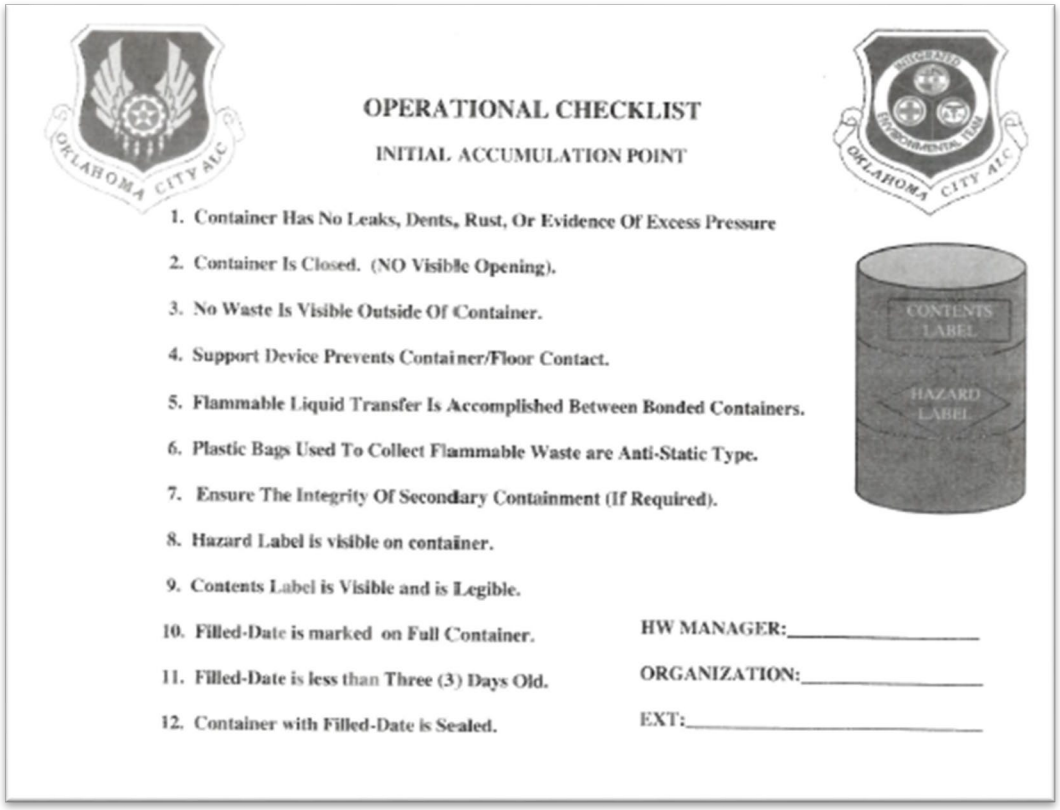
HAZARDOUS WASTE STORAGE

DANGER !

IN CASE OF FIRE OR SPILL:

1. **Sound Alarm**: Voice Call or Mechanical Device
2. **Evacuate Affected Area**
3. **Shut-Down Equipment when Evacuating.**
4. **CALL FIRE DEPARTMENT:** DIAL: **911**
   (Give Type, Location, Size, Your Name)
5. **Inform Supervisor.**
6. **Contain spill if it can be done Safely.**
7. **Conduct Roll-Call.**
8. **HW Manager** _____ **Ext.**_____

Figure 6: Example Emergency Response Plan



OPERATIONAL CHECKLIST

INITIAL ACCUMULATION POINT

1. Container Has No Leaks, Dents, Rust, Or Evidence Of Excess Pressure
2. Container Is Closed. (NO Visible Opening).
3. No Waste Is Visible Outside Of Container.
4. Support Device Prevents Container/Floor Contact.
5. Flammable Liquid Transfer Is Accomplished Between Bonded Containers.
6. Plastic Bags Used To Collect Flammable Waste are Anti-Static Type.
7. Ensure The Integrity Of Secondary Containment (If Required).
8. Hazard Label is visible on container.
9. Contents Label is Visible and is Legible.
10. Filled-Date is marked on Full Container.
11. Filled-Date is less than Three (3) Days Old.
12. Container with Filled-Date is Sealed.

HW MANAGER:_____

ORGANIZATION:_____

EXT:_____

Figure 7: Example Operational Checklist

OPERATIONAL CHECK LIST

ACCUMULATION SITE

1. No Leaks, Spills, or Evidence of Excess Pressure are Visible Around Containers or Tanks.
2. Containers and Tanks are Sealed Except when Sampling or Transferring Waste.
3. Hazardous Waste Containers and Tanks are Labeled "HAZARDOUS WASTE."
4. Containers are all Marked with "Received Date", Tanks with "Accumulation Start Date" (ASD).
5. Received Dates and ASDs are less than Ninety (90) Days old.
6. Incompatible Wastes are Separated.
7. Ensure the Integrity of Secondary Containment (if Required). HW MANAGER:_____
8. Aisle Space is Sufficient to Allow Passage of Emergency Equipment.
9. Site Specific Contingency Plan is Prominently Posted. ORGANIZATION:_____
10. Internal Communication or Alarm System is Operational.
11. Emergency Assistance Summoning Device is Operational. EXTENSION :_____
12. Fire Extinguishers are Operational.
13. "NO SMOKING WITHIN 50 FEET" Signs are Posted near Flammable Wastes.
14. Emergency Eye-Wash and Shower are Operational.
15. Spill Control Equipment is Readily Available.

Figure 8: Example HWAS Checklist

U. S. AIR FORCE INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Tinker Air Force Base

Plan No. 32-7064

(See INRMP signature pages and Annual INRMP Review and Update Requirements for plan approval date)

ABOUT THIS PLAN

This installation-specific Environmental Management Plan (EMP) is based on the U.S. Air Force's (AF) standardized Integrated Natural Resources Management Plan (INRMP) template. This INRMP has been developed in cooperation with applicable stakeholders, which may include Sikes Act cooperating agencies and/or local equivalents, to document how natural resources will be managed. Non-U.S. territories will comply with applicable Final Governing Standards (FGS). Where applicable, external resources, including Air Force Instructions (AFIs); AF Playbooks; federal, state, local, FGS, biological opinion and permit requirements, are referenced.

Certain sections of this INRMP begin with standardized, AF-wide "common text" language that address AF and Department of Defense (DoD) policy and federal requirements. This common text language is restricted from editing to ensure that it remains standard throughout all plans. Immediately following the AF-wide common text sections are installation sections. The installation sections contain installation-specific content to address local and/or installation-specific requirements. Installation sections are unrestricted and are maintained and updated by AF environmental Installation Support Teams (ISTs) and/or installation personnel.

NOTE: The terms 'Natural Resources Manager', 'NRM' and 'NRM/POC' are used throughout this document to refer to the installation person responsible for the natural resources program, regardless of whether this person meets the qualifications within the definition of a natural resources management professional in DODI 4715.03.

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DOCUMENT CONTROL

Record of Review – The INRMP is updated not less than annually, or as changes to natural resource management and conservation practices occur, including those driven by changes in applicable regulations. In accordance with (IAW) the Sikes Act and AFI 32-7064, *Natural Resources Management*, the INRMP is required to be reviewed for operation and effect not less than every five years. Annual reviews and updates are accomplished by the base Natural Resources Manager (NRM), and/or an Installation Support Team Natural Resources Media Manager. The installation shall establish and maintain regular communications with the appropriate federal and state agencies. At a minimum, the installation NRM (with assistance as appropriate from the NR Media Manager) conducts an annual review of the INRMP in coordination with internal stakeholders and local representatives of the United States Fish and Wildlife Service (USFWS), state fish and wildlife agency, and National Oceanic and Atmospheric Administration (NOAA) Fisheries, where applicable, and accomplishes pertinent updates. Installations will document the findings of the annual review in an Annual INRMP Review Summary. By signing the Annual INRMP Review Summary, the collaborating agency representative asserts concurrence with the findings. Any agreed updates are then made to the document, at a minimum updating the work plans.

INRMP APPROVAL/SIGNATURE PAGES

Coordination
(Oklahoma Department of Wildlife Conservation)

The signatory below indicates Oklahoma Department of Wildlife Conservation coordination for the Tinker Air Force Base Integrated Natural Resources Management Plan.

Having reviewed the Tinker Air Force Base Integrated Natural Resources Management Plan, I hereby agree with those aspects of the Plan that are within the jurisdictional authority of my agency concerning conservation, protection, and management of fish and wildlife resources.

J.D. STRONG
Director, Oklahoma Department of Wildlife Conservation

11·8·2018
Date

Coordination
(Tinker Air Force Base)

The signatory below indicates Tinker Air Force Base coordination/approval for the Tinker Air Force Base Integrated Natural Resources Management Plan.

3 JAN 19

KENYON K. BELL, Colonel, USAF
Commander, 72d Air Base Wing

Date

Coordination
(U.S. Fish and Wildlife Service)

The signatory below indicates U.S. Fish and Wildlife Service coordination for the Tinker Air Force Base Integrated Natural Resources Management Plan.

Having reviewed the Tinker Air Force Base Integrated Natural Resources Management Plan, I hereby agree with those aspects of the Plan that are within the jurisdictional authority of my agency concerning conservation, protection, and management of fish and wildlife resources.

Amy Lueders
Southwest Regional Director
U.S. Fish and Wildlife Service

March 15, 2015
Date

EXECUTIVE SUMMARY

Tinker Air Force Base (AFB), home of the Oklahoma City Air Logistics Complex (OC-ALC), is located in central Oklahoma five miles southeast of downtown Oklahoma City in the heart of the Sooner State, and is one of the largest and most important military installations in the United States. The largest single-site employer in the state of Oklahoma, Tinker AFB has an approximate workforce of 26,296 (16,307 civilian workers, 7,595 military personnel, and 2,394 contractor employees).

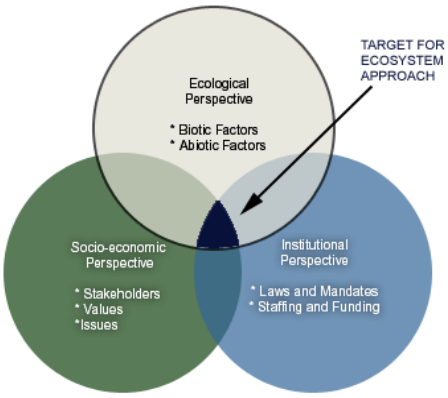
Tinker AFB is also home of the 552nd Air Control Wing, 507th Air Refueling Wing, 513th Air Control Group, the U.S. Navy's Strategic Communications Wing One, the Defense Logistics Agency's Defense Distribution Depot Oklahoma City, 38th Cyberspace Engineering Installation Group, and Defense Mega-center Oklahoma City.

Tinker AFB covers approximately 5,580 acres of land. Structures include a 10,000-foot runway, 11,200-foot runway, almost 700 family housing units, 48 miles of road, 717 buildings, and 57 aircraft assigned to associate units. The annual air traffic control traffic count (arrivals, departures, and practice approaches) is 34,000 to 36,000 and the annual ground traffic (aircraft and vehicle operations) is approximately 20,000.

The Tinker AFB Integrated Natural Resources Management Plan (INRMP) implements requirements of the Sikes Act; Department of Defense Instruction (DODI) 4715.03, Natural Resources Conservation Program; Air Force Policy Directive (AFPD) 32-70, Environmental Quality; and Air Force Instruction (AFI) 32-7064, Integrated Natural Resources Management in concert with the Tinker AFB Installation Development Plan (IDP).

The plan discusses the mission, vision, goals, and objectives for managing natural resources [i.e., flora (plants), fauna (fish/wildlife), soil, and water] in Tinker's urban ecosystem for the betterment of the warfighter, surrounding community, and environment. Included are discussions of the history, current condition, trend, and use of these resources and a detailed conservation strategy.

The plan strives to safely integrate all aspects of natural resources management with Tinker's flying mission. This is accomplished using an ecosystem management approach (i.e., integration of ecological, socio-economic, and institutional perspectives toward responsible and sustainable use of natural resources, Leslie et al., 1996) (see figure, "Ecosystem Management Approach").



Ecosystem Management Approach: Effective ecosystem management lies at the intersection of all three circles, taking into account ecological, socio-economic, and institutional (i.e., military mission) considerations.

This INRMP is intended to transform Tinker's natural environment to strengthen the military, their families, and the local community. It strives for positive change, using scientific fact to challenge old ways of doing environmental business. Many new policies have been established herein to facilitate and ensure going to the next level. The Plan is aimed at instilling pride and ownership in the surrounding natural environment by encouraging on- and off-base community involvement in the program. It promotes a balance between the needed facilities, roads, and runways and the natural environment. It brings competing interests together into a sensible approach to managing the heavily industrialized environment, leading to a greener, more vibrant, more livable community. This Plan aims to greatly improve Tinker's image and significantly contribute to the health, wellness, and quality of life of the workforce. It will move the health of installation's natural environment forward to better support and sustain military operational needs and expeditionary combat capability.

1.0 OVERVIEW AND SCOPE

This INRMP was developed to provide for effective management and protection of natural resources. It summarizes the natural resources present on the installation and outlines strategies to adequately manage those resources. Natural resources are valuable assets of the United States Air Force. They provide the natural infrastructure needed for testing weapons and technology, as well as for training military personnel for deployment. Sound management of natural resources increases the effectiveness of Air Force adaptability in all environments. The Air Force has stewardship responsibility over the physical lands on which installations are located to ensure all natural resources are properly conserved, protected, and used in sustainable ways. The primary objective of the Air Force natural resources program is to sustain, restore and modernize natural infrastructure to ensure operational capability and no net loss in the capability of AF lands to support the military mission of the installation. The plan outlines and assigns responsibilities for the management of natural resources, discusses related concerns, and provides program management elements that will help to maintain or improve the natural resources within the context of the installation's mission. The INRMP is intended for use by all installation personnel. The Sikes Act is the legal driver for the INRMP.

1.1 Purpose and Scope

The purpose of this plan is to establish an organized and systematic approach to improve the overall health of Tinker's urban ecosystem within the context of the military mission. The plan includes a prioritized and measurable strategy that will guide natural resources conservation and military activities to ensure integration and consistency with federal mandates for ecosystem stewardship. Monitoring and adaptive management will be employed to ensure positive progress toward program goals and objectives. This will ultimately provide optimal military operational sustainability while promoting societal, economical, and ecological benefits for Tinker AFB and its neighboring communities in concert with the desired development pattern of the Tinker AFB Installation Development Plan.

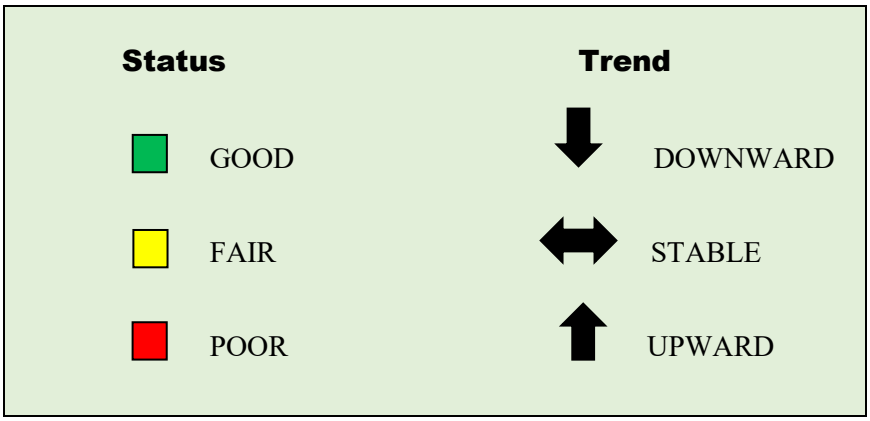
In 2003, natural resources program staff held a series of stakeholder meetings involving key personnel from Tinker AFB tenant organizations, local communities, private companies, and county, state, and federal governments. During the course of these meetings, two program deficiencies became evident: 1) inadequate planning in several resource areas, and 2) the natural resources program was moving forward without a clear understanding of its customers' needs and desires. Planning deficiencies included such things as the lack of environmental area master plans (such as urban greenways); area management plans (e.g., tree farm and urban forest); identification of targets or standards (e.g., pond water quality); inadequate overall reporting, tracking, and monitoring systems; and the need to ensure the INRMP is tied to plans of communities adjacent to Tinker AFB.

This plan is intended to correct these deficiencies through a more aggressive, proactive, holistic, and customer-focused conservation strategy. The planning aspects of the INRMP are more organized and detailed and include many new policy statements essential to sustainable natural resources improvements. The science-based strategy aims to ensure management actions are based in fact and not supposition. Furthermore, it aims to better measure actual progress and success in achieving natural resources goals, priorities, and mandates; stronger performance measures (metrics) have been integrated to evaluate program activities.

The INRMP applies to all lands managed by Tinker AFB including all leased areas (Glenwood, Landfill 6 Area, Military Family Housing) and other satellite areas to include, but not limited to, the Cyber Engineering Installation Group, Gator Site, and Fuel Control Facility. Efforts are underway, as applicable

and practicable, to work cooperatively with adjacent landowners to apply the INRMP scope beyond Tinker AFB boundaries.

Natural resources found within Tinker's urban ecosystem and addressed in this plan include flora (plants), fauna (fish and wildlife), soil, and water, and include a discussion of the vital connection between people and Tinker's natural resources, and lastly a brief discussion of important aspects of program management. Natural resources are described in their historical context, their present status (i.e., rated as POOR, FAIR, or GOOD), and trend (i.e., rated as DOWNWARD, STABLE, or UPWARD).



Natural Resources Current Status and Trend

1.2 Management Philosophy

For their roles and sacrifices in defending our nation, every airman and his or her family deserve the best standard of living—world-class facilities in a world-class environment. Moreover, as a federal agency, Tinker AFB should set the standard for managing land and associated natural resources within existing industrialized and urbanized landscapes. Therefore, it is our aim to be the model of a productive built environment. This is not possible without a balanced approach to military build-out and natural resources stewardship.

The INRMP establishes a comprehensive, interdisciplinary vision to achieve this balance and reach this standard. It sets forth goals and objectives framed by natural resources inventories, user surveys, science-based ecosystem management principles, and sustainability guidelines intertwined with our national defense needs to attain a healthy natural infrastructure that supports military mission goals.

1.3 Authority

The Sikes Act, 16 USC 670a, requires an INRMP be written and implemented for all DoD installations having significant natural resources. This plan has been developed cooperatively between the installation, the United States Fish and Wildlife Service (USFWS), and the Oklahoma Department of Wildlife Conservation (ODWC). The Air Force natural resources program ensures continued access to land, air, and water resources to conduct realistic military training and testing, as well as to sustain the long-term ecological integrity of the resource base.

This INRMP is developed under, and proposes actions in accordance with, applicable DoD and United States Air Force (USAF) policies, directives, and instructions including DoD Instruction 4715.03, *Natural*

Resources Conservation Program; AFPD 32-70, *Environmental Quality*; AFI 32-7064, *Integrated Natural Resources Management*; AFI 32-7065, *Cultural Resources Management*; legislation, executive orders (EO), and presidential memorandums. DoD Instruction 4715.03 provides direction for DoD installations to establish procedures for an integrated program for multiple-use management of natural resources. AFPD 32-70 discusses general environmental quality issues, including proper cleanup of polluted sites, compliance with applicable regulations, conservation of natural resources, and pollution prevention. AFIs 32-7064 and 32-7065 provide guidance on the preservation of natural and cultural resources, respectively, at USAF installations. The 'Annotated Summary of Key Legislation Related to Design and Implementation of the INRMP' table, included as an appendix to this plan, summarizes key legislation and guidance used to create and implement this INRMP. Refer to the complete listing of AFIs, the Federal Registry and the US Code to ensure that all applicable guidance documents, laws and regulations are reviewed. Installation-specific policies, including state and local laws and regulations are summarized in the table below.

Installation-Specific Policies (including State and/or Local Laws and Regulations)	
Green Infrastructure	**Policy 1:** Encourage sustainable development and military operational support by balancing gray infrastructure development with green infrastructure enhancement, restoration, and preservation. [Note: Designers of facilities in evaluation areas or near regulated areas shall consult Tinker natural resources staff early in the design process to evaluate and determine how the project may be designed consistent with principles outlined in this Plan. Within these evaluation areas, if impacts to green infrastructure cannot be avoided, they should be minimized. If minimization is not possible, the designer shall provide mitigation alternatives for consideration]. **Policy 2:** Tinker AFB shall observe a "no net loss of floodplain capacity" policy. Tinker will ensure no increase in the 500-year floodplain boundaries using the 2002 U.S. Army Corps of Engineers Tinker AFB Floodplain Study as the baseline. **Policy 3:** In developing future facility plans and as opportunities arise, all facilities located within the 500-year floodplain should be relocated to areas outside the 500-year floodplain. **Policy 4:** Employ conservation management principles when developing areas: • Practice compact development to the maximum extent practicable. • Focus on designing projects to "fit" the existing landscape or natural community as opposed to designing projects which require clearing and leveling the entire site and subsequently attempting to rebuild the landscape. **Policy 5:** Excluding the airfield, restore and maintain network gaps to create natural corridor connectivity wherever possible throughout the GI network. It is desired that these gaps be converted to native grasslands/woodlands a minimum of 300 feet wide (e.g., 150 feet on each side of a creek/trail) where practicable. In developed areas, any width of natural connectivity is encouraged. Where contiguous connectivity is not possible, the following guidelines shall apply: • Develop smaller natural areas (i.e., patches) which serve as stepping stones for wildlife movement. • Decrease distance between stepping stones wherever possible. • Emphasize larger patches over smaller ones. • Prioritize restoration by focusing first on higher order.

	streams versus lower order streams and gaps away from roads as opposed to close to roads.
Urban Forestry	**Tree Selection** **Policy 1:** In accordance with *Presidential Memorandum, Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds,"* April 26, 1994, all trees planted on Tinker shall be native and in accordance with the Tinker AFB Native Tree List. Variances may be granted by the natural resources office under certain circumstances. **Tree Planting/Removal** **Policy 1:** A tree planting/removal permit must be obtained from 72 ABW/CEIEC prior to the planting or removing of any tree on Tinker AFB. **Policy 2:** A digging permit must be obtained from Civil Engineering prior to planting any tree on Tinker AFB. **Policy 3:** For every live urban tree removed on base, two trees (each of which will grow to at least the mature size of the removed tree) shall be planted within the urban forest management unit of the removed tree to offset the loss. Trees may be planted in other management units as determined by the base urban forester. Replacement trees shall not exceed a 1.5 inch trunk caliper. Seedlings of an equivalent value may be substituted at the government's discretion. **Tree Maintenance** **Policy 1:** Trees on Tinker AFB shall not be pruned by any government or contractor personnel except those who have received annual training through the base natural resources office or other tree care training approved by 72 ABW/CEIEC. **Tree (General)** **Policy 1:** All trees planted on Tinker AFB shall be planted and maintained in accordance with Tinker's Urban Forestry Management Procedures. **Policy 2:** Notably significant trees (e.g., 100-year-old oaks) shall be protected to the maximum extent practicable.
Fish and Wildlife	**Oklahoma Administrative Code 800:25-7-8:** Oklahoma Department of Wildlife Conservation regulations make it unlawful to kill, capture, keep as pets, or sell Texas horned lizards (THL). **Oklahoma Administrative Code 800:20-1-2:** Aquatic nuisance species on Tinker AFB are governed by state regulations. **Oklahoma Administrative Codes 29 and 800:** Tinker hunting and fishing are governed by state regulations established by the Oklahoma Wildlife Conservation Commission.

Fish and Wildlife (continued)

FISHING PERMIT PROCLAMATION & GUIDE
(TINKER AIR FORCE BASE)

Fishing information and permits are available online at "tinker.isportsman.net"

Fishing Permit Sales Structure

		Expiration Date
Annual Family	$20.00	31 Dec of issued yr
Annual Individual	$15.00	31 Dec of issued yr
7-day Individual	$ 10.00	7 days from issue
Seasonal Individual Trout Stamp	$ 15.00	seasonal yr issued
Family Trout Stamp	$ 20.00	seasonal yr issued

Bluegill
Lepomis macrochirus

GETTING YOUR PERMIT

1) Go to "tinker.isportsman.net" - mobile device or PC
2) Click on register tab, complete info and hit "save"
3) Click "Acquire Permits" button and selected permit "Add to Cart"
4) Enter State Fishing License number and "Checkout"
5) Bookmark page or print out permit from "My Account" tab

LICENSE/PERMIT REQUIREMENTS:

1. *A valid **State of Oklahoma** fishing license is required to fish in the Base ponds unless exempt (must show proof of license or exemption upon purchase of base permits).*
2. *Individuals exempt from Base permits include:*
   - *anyone exempt for an Oklahoma fishing license*
   - *youth under 16*
   - *handicapped individ., volunteers and participants taking part in a Aquatic Education Event*
3. *No **State of Oklahoma** trout stamp is required to fish for trout on Base.*
4. *Youth under 16 are exempt from Base Seasonal Trout Stamps.*
5. ***Annual Permits** - are required for fishing on base in ponds and streams, valid for the calendar year in which they are purchased (i.e., expire on Dec 31st of the year they are purchased).*
6. ***Seasonal Trout Stamps** - are required in addition to base annual permits, for anglers fishing in Redbud and Beaver Ponds from Veterans Day through the end of the trout season (31st Mar) must possess a Trout Stamp. Only one Trout Stamp is required per family with the purchase of an Annual Family Permit. Trout Stamps are valid for the entire trout season (Veterans Day—March 31st of the subsequent year). Only one pole in water per angler for trout fishing.*
7. *Family permits are valid for immediate family members only (i.e., spouses and dependent children, grandparents and grandchildren).*
8. *Permits are non-transferable.*
9. *The **7-day Individual permit** is good for seven consecutive days from the date of purchase.*
10. *No licenses or permits will be required during "Free Fishing Days" (in June).*

Channel catfish
Ictalurus punctatus

For Questions Contact:
72 ABW/CEIEC
Natural Resources
(405) 739-7065

NATURAL RESOURCES
TINKER AIR FORCE BASE

Largemouth bass
Micropterus salmoides

1.4 Integration with Other Plans

INRMP revisions and concurrence with the final plan is coordinated through the installation chain of command and internal stakeholders to include, but not limited to:

- AFSC/LG
- OC-ALC
- 552 AWACS
- Navy
- 507th/513th
- 38 CEIG
- 72 ABW/JA
- 72 ABW/PA
- 72 ABW/SE
- 72 MSG
- 72 FSS
- 72 OSS
- 72 SFS
- 72 ABW/CE
- AFCEC/CZO

The NRM ensures that the INRMP and the following base plans/documents are mutually supportive and do not conflict:

- Installation Development Plan (IDP)
- Integrated Cultural Resources Management Plan (ICRMP)
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) cleanup plans
- Bird/Wildlife Aircraft Strike Hazard (BASH) Plan
- Integrated Pest Management Plan (IPMP)
- Green Infrastructure Plan (GI)
- Golf Course Environmental Management (GEM)
- Wildland Fire Management Plan (WFMP)
- Air Installation Compatible Use Zone (AICUZ) study
- Joint Land Use Study (JLUS)
- Grounds maintenance contract

2.0 INSTALLATION PROFILE

Office of Primary Responsibility	72 ABW/CEIEC has overall responsibility for implementing the Natural Resources Management program and is the lead organization for monitoring compliance with applicable federal, state, and local regulations.
Natural Resources Manager/POC	John Krupovage (405) 739-7074
State and/or local regulatory POCs	Sikes Act-cooperating agencies for Tinker AFB are: **U.S. Fish & Wildlife Service** Amy Lueders, Director US Fish and Wildlife Service, Region 2 Albuquerque, NM Larry Levesque Oklahoma Ecological Field Services Office US Fish and Wildlife Service Tulsa, OK **Oklahoma Department of Wildlife Conservation** JD Strong, Director Oklahoma Department of Wildlife Conservation Oklahoma City, OK Mark Howery, Biologist Oklahoma Department of Wildlife Conservation Oklahoma City, OK
Total acreage managed by installation	5,580 acres
Total acreage of wetlands	56.2 acres
Total acreage of forested land	234 acres
Does installation have any Biological Opinions? (If yes, list title and date, and identify where they are maintained)	No
NR Program Applicability (Place a checkmark next to each program that must be implemented at the installation. Document applicability and current management practices in Section 7.0)	☑ Invasive species ☑ Wetlands Protection Program ☑ Grounds Maintenance Contract/SOW ☐ Forest Management Program ☑ Urban Forestry Management Program ☑ Grassland/Woodland Management Program ☑ Wildland Fire Management Program ☑ Agricultural Outleasing Program ☑ Integrated Pest Management Program ☑ Bird/Wildlife Aircraft Strike Hazard (BASH) Program ☐ Coastal Zones/Marine Resources Management Program ☑ Cultural Resources Management Program

2.1 Installation Overview

2.1.1 Location and Area

Tinker Air Force Base (AFB), home of the Oklahoma City Air Logistics Complex (OC-ALC), is located in central Oklahoma five miles southeast of downtown Oklahoma City in the heart of the Sooner State. (See Figure "Tinker AFB Location [State]"). The largest single-site employer in the state of Oklahoma, Tinker AFB has an approximate workforce of 26,296 (16,307 civilian workers, 7,595 military personnel, and 2,394 contractor employees).

Tinker AFB is also home of the 552nd Air Control Wing, 507th Air Refueling Wing, 513th Air Control Group, the U.S. Navy's Strategic Communications Wing One, the Defense Logistics Agency's Defense Distribution Depot Oklahoma City, 38th Cyberspace Engineering Installation Group, and Defense Mega-center Oklahoma City.

Tinker AFB covers approximately 5,580 acres of land. Structures include a 10,000-foot runway, 11,200-foot runway, almost 700 family housing units, 48 miles of road, 717 buildings, and 57 aircraft assigned to associate units. The annual air traffic control traffic count (arrivals, departures, and practice approaches) is 34,000 to 36,000 and the annual ground traffic (aircraft and vehicle operations) is approximately 20,000.

Tinker AFB Location (State)

Installation/Geographically Separated Units (GSU) Location and Area Descriptions				
Base/GSU Name	**Main Use/Mission**	**Acreage**	**Addressed in INRMP?**	**Describe NR Implications**
Tinker AFB (main body of installation)	Providing worldwide technical logistics support to Air Force aerospace weapon systems, equipment, and commodity items.	5,580	All Tinker AFB land areas (i.e., main body and GSUs) are classified as Category II and are managed under the INRMP. In the INRMP, management of natural resources on GSUs is not addressed separately from the main body of the base.	Most management of fish and wildlife, agricultural land, urban forest, wetlands, floodplains, invasive species, etc., is focused on this portion of the base.
Cyber Engineering Installation Group	Strategic planning, operational engineering, and implementation of cyber infrastructure.	130		Some small-scale management of wildlife, agricultural land, urban forest, invasive species, etc., is done on this land area. Western side of site is Landfill 6.
Gator Site	Miscellaneous military exercises	16		No significant natural resources on site
Consolidated Fuels Facility	Supports the test and calibration of fuel system components for aircraft airframes and engines	13		Some urban forestry management on this site, otherwise, no significant natural resources on site.
Glenwood Training Annex	Airfield Clear Zone (CZ), Accident Potential Zone (APZ), miscellaneous military exercises	280		Site is located off end of runway and therefore is managed to reduce BASH. Wetlands have been removed from the site in support of BASH program. This site is home to the base's largest deer population.
Maintenance, Repair, and Overhaul Technology Center (MROTC)	Aircraft modification	37		A portion of the site is in the 100-year floodplain, otherwise no significant natural resources on site.
Twaddle Reserve Center	Air Force, Marine, and Navy administrative space	25		No significant natural resources on site

2.1.2 Installation History

In October 1940, as German troops invaded Europe and Japan expanded its empire, a dozen Oklahoma City businessmen formed the Industries Foundation to attract a bomber base, an aircraft plant, or an air repair depot to the area. Their efforts proved successful when the War Department announced, on April 8, 1941, Oklahoma City as the site of a new air materiel depot that would cover more than 1,500 acres and employ 3,500 people. Construction on the new Midwest Air Depot began on July 18, 1941. Since the airfield was not ready for occupancy until March 1, 1942, official depot operations began in a downtown office building on January 15, 1942. Just eight days later, Oklahoma citizens learned that the Army Air Forces had decided to build a huge Douglas Aircraft Assembly Plant next to the depot.

Maj. Gen. Clarence L. Tinker, an Oklahoma native and part Osage Indian, lost his life while leading a group of LB-30 bombers on a mission against the Japanese in the region of Wake Island on June 7, 1942. Accordingly, Gen. H.H. "Hap" Arnold ordered the installation named Tinker Field on Oct. 14, 1942. During World War II, more than 18,000 military and civilian employees repaired and modified B-17, B-24 and B-29 bombers as well as C-47 and C-54 cargo planes. They also overhauled thousands of aircraft engines and shipped supplies around the world. Meanwhile, the Douglas Plant, employing close to 24,000 people, produced more than 5,300 C-47 Skytrain aircraft and parts to build 400 C-54 Skymaster cargo planes and 900 A-26 Invader attack bombers.

At the end of the war, the Oklahoma City Air Depot acquired the adjacent Douglas Plant complex and moved new workloads into the facilities after the War Department declared Tinker Field a permanent air base. Renamed the Oklahoma City Air Materiel Area (OCAMA) on July 2, 1946, the depot continued work on bombers, engines and aircraft parts and played an important role in supporting the Berlin Airlift. Following the creation of the Department of the Air Force in 1947, the installation officially became Tinker Air Force Base on January 13, 1948.

In the 1950s, Tinker AFB modified and repaired the B-29 Superfortress, the B-47 Stratojet, and the C-97 Stratofreighter. In 1953, OCAMA's engine line became 100-percent jet propulsion. Throughout the decade, the depot performed maintenance on such power plants as the J47, J57, and J75. In the mid-1950s, Tinker AFB assumed management responsibility for the KC-135 Stratotanker and the B-52 Stratofortress, and in 1959, completed maintenance of its first B-52 and KC-135 aircraft. With the increased importance of OCAMA in the national defense network, it soon grew and expanded its western boundary from Air Depot Boulevard to Sooner Road. The area later housed a new chapel, hospital, dormitories, enlisted and officer clubs, and modern military family housing.

In the 1960s, Tinker AFB accelerated production due to the Cuban Missile Crisis and the continued Cold War. Soon, OCAMA shifted its focus to support the Vietnam War, and Tinker AFB became an inland aerial port for Southeast Asia activities. In January 1968, Tinker AFB employment reached an all-time high of 24,778 civilians and 4,404 military members assigned to OCAMA and its associate organizations.

Tinker AFB gained new work in the 1970s as skilled employees repaired F-4 and F-105 fighter jets as well as the A-7 attack aircraft and the new TF41 engine. OCAMA became the Oklahoma City Air Logistics Center on April 1, 1974. The next year, the OC-ALC assumed management responsibility for the E-3 Sentry aircraft, and the 552nd Airborne Warning and Control Wing activated its units at Tinker AFB on July 1, 1976.

In the 1980s, the OC-ALC added management responsibilities for the B-1 Lancer and B-2 Spirit bombers and completed maintenance work on its first B-1 in 1988. More depot work on the F101, F107, F108, and F110 engines started in the mid-1980s along with management responsibilities for a host of engines. Despite

a near disastrous fire in Building 3001 in November 1984, ALC workers continued their support of warfighters throughout the world.

In 1991, Tinker AFB supported the war efforts of Operations Desert Shield and Desert Storm. A year later, the Navy's Strategic Communications Wing ONE completed its move to Tinker AFB, the first time a Navy wing had relocated to an Air Force base. The decade ended with the 1999 announcement that Tinker AFB and the OC-ALC had won the largest-ever public-private competition for an engine workload. It would be transferred from the closing ALC at Kelly AFB, Texas.

On Sept. 11, 2001, after foreign terrorists hijacked civilian airliners and crashed them into the World Trade Center in New York City, the Pentagon in Washington D.C. and a field in Pennsylvania, Tinker workers responded by providing support to U.S. troops at home and abroad in Operations ENDURING FREEDOM (starting in 2001) and IRAQI FREEDOM (starting in 2003). As in all previous wars and conflicts, the spirit of Oklahoma and America's military resolve could be vividly seen at Tinker AFB.

After the events of Sept 11th, 2001, Tinker AFB had many responsibilities and played many roles in the Global War on Terror. On 9 October 2001, the North Atlantic Treaty Organization (NATO) made history when it deployed five Airborne Warning and Control System (AWACS) aircraft to the United States. The aircraft, crews, and support personnel came from Geilenkirchen, Germany to assist the 552nd Air Control Wing (ACW) at Tinker AFB in support of Operation NOBLE EAGLE, a homeland defense operation, which continued until May of 2002.

While the 552 ACW and its NATO counter parts watched the skies, the men and women of the OC-ALC provided the aircraft, weapons, and other materiel critical to the wartime operations during Operations ENDURING FREEDOM and IRAQI FREEDOM. In the years since Sept 11, many military members from the active duty, Air Force Reserve, and Air National Guard departed from Tinker AFB to the theaters in Afghanistan and Iraq to combat our foes.

To meet the demands of the growing war effort, the Air Force authorized the activation of three new wings under the OC-ALC—the 76th Maintenance Wing, the 327th Aircraft Sustainment Wing (later inactivated June 2010), and the 448th Combat Sustainment Wing (later redesignated the 448th Supply Chain Management Wing [448 SCMW] Apr 2008)—in February 2005.

In January 2007, the OC-ALC received a mission assignment gaining new depot management responsibility for the C-32, C-37, and C-40 aircraft and the CF6-80C2-L1F engine. To more efficiently execute operations, the base capitalized on vacant close-to-base industrial space to meet mission requirements. Through a bond issue by the voters of Oklahoma County and $10M contribution by the state, the county purchased the 398-acre property and shuttered automobile assembly plant from General Motors for $54M. Through a lease agreement, Tinker used the campus moving aerospace programed depot maintenance operations into a facility with nearly 4-million square-feet of prime heavy industrial space. The Oklahoma community handed the Air Force the keys to Tinker Aerospace Complex (TAC) 9001 in October 2008. Later lauded by the Environmental Protection Agency (EPA) as one of the nation's top environmental redevelopment projects, a June 6, 2012 Brownsfield ceremony recognized the collaborative transformation of the former automobile plant to an aerospace complex with the Phoenix Award, one of the more distinguished environmental redevelopment awards in the country.

In November 2011, Headquarters Air Force Materiel Command (HQ AFMC) announced a major restructuring effort that would reduce overhead by cutting the number of centers from twelve to five. For Tinker AFB, the five center construct meant the establishment of a new organization on base, the Air Force Sustainment Center (AFSC). On July 10, 2012, the AFSC was activated at Tinker

AFB as the center in charge of the three air logistic complexes and three airbases (Hill AFB, Robins AFB and Tinker AFB) and the two supply chain wings (448 Supply Chain Management Wing at Tinker AFB (TAFB) and 635th Supply Chain Operations Wings at Scott AFB, Illinois). With the establishment of AFSC came new management responsibilities and tools to effectively and efficiently command the large organization.

In 2015, Tinker Air Force Base officials announced the acquisition of 156 acres of land on the southwest side of the base to stand up a depot maintenance facility for the Air Force's next-generation aerial refueling aircraft, the KC-46A Pegasus. The land purchase was made possible through a joint effort of the U.S. Air Force ($8 million), the City of Oklahoma City ($23.5 million) and Oklahoma County ($12.5 million). The land was formerly owned by the Burlington Northern Santa Fe Railway Co., where it operated a rail yard that primarily served the former General Motors manufacturing facility. Current facility requirements for the KC-46A depot maintenance operations include approximately 840,000 square feet of facilities to include 14 aircraft bays, a 10-meter engine test cell (to be located on the TAC 9001 facility), a kitting facility, a software integration lab, warehouse space, support facilities such as central chiller plant and fire pump house, taxiways, aircraft parking positions, an engine run up ramp (to be located on the TAC grounds), and approximately 1,250 personal vehicle parking spots.

2.1.3 Military Missions

Today, Tinker's vital Air Force mission continues to be dedicated to providing worldwide technical logistics support to Air Force aerospace weapon systems, equipment, and commodity items, and encompasses a myriad of responsibilities. OC-ALC has the unique mission of managing and repairing the engines that power cruise missiles and a variety of Air Force and Navy aircraft. The center also accomplishes aircraft modifications and repairs, maintains, and overhauls bombers, refuelers, and reconnaissance aircraft including the B-1B, B-2, B-52, E-3, and the C/KC-135 series aircraft. It performs depot level maintenance (i.e., high level overhaul maintenance such as engine removal and rebuild, painting, etc. as opposed to routine maintenance) on more than 120 aircraft annually. It also organizes, directs, and controls total life-cycle management of over 1100 aircraft. The center also manages the SRAM, SRAM II, ACLM, and GLCM missile systems, as well as the Air Force's Harpoon missile. The ALC annually overhauls and maintains more than 3,000 major jet engine modules from 11 major commands as well as the Army, Navy, and numerous foreign countries. In addition to aircraft/missile maintenance, overhaul, and repair, Tinker AFB provides deployable communications, computer systems, navigational aids, and air traffic control services worldwide for Air Force, Department of Defense, and other U.S. commitments.

Listing of Tenants and NR Responsibility	
Tenant Organization	**NR Responsibility**
List tenant organizations	*Identify which host/tenant organization is responsible for managing tenant's impact to/by natural resources (i.e., Unit Environmental Coordinators, UECs)*
552nd Air Control Wing	Shannon Reimers-Wavada
507th Air Refueling Wing	Kayla Cuffie
513th Air Control Group	Lt Col Brian Hard
U.S. Navy's Strategic Communications Wing One	Curtis Murtchinson
38th Cyberspace Engineering Installation Group	Thanh Alcorn
Defense Megacenter Oklahoma City (DLA)	Ryan Henry

Grounds Maintenance Contractor (Trace)	Patricia Troxell
Force Support Squadron	Dale Rogers/Marvin Broughton
CE Operations (Alutiiq)	Noland Voss/Michael Heustis
AAFES	Raymond Becker
72 LRS	Joshua Morris/Guy Wilson/Ralph Farley
Motorpool	Randall Hixson
76 AMXG	Chris Ray/Marty Allen
76 PMXG	Michael McGill/Rachel McArthur
76 CMXG	Brandi Dittrich/Tommy Fagan
76 SWEG	Torrie Wale/Michael Kessler
76 MXSG	Torrie Wale/Michael Kessler
76 MXSG/MXDEU	Christopher Ray
72 MDSS	Kelly Guest
72 SFS	Travis Morris/Shawn McClelland
72 ABW/SC	Jake Langham/Mark Holder
72 ABW/CEF	Robin Lewallen/Nathan Schooling
72 ABW/CEIEC	Kyle Barton/Mary Downs

2.1.4 Surrounding Communities

Midwest City: Starting in 1941, Midwest City was developed simultaneously with the rise of Tinker AFB. According to the 2010 US Census, the current population is 54,371, with little growth in the last ten years. It is the eighth largest city in the state and is a part of the Oklahoma City metropolitan area. The community covers about 25 square miles on the north side of Tinker AFB. The racial makeup of the city is 64.6% white, 21.9% African American, 5.6% Hispanic/Latino, 3.7% Native American, 1.7% Asian, 0.1% Pacific Islander, and 6.5% from mixed races. The medium income for a household in the city was $42,117. Most of Midwest City is suburban, being slightly more rural in the eastern half of the city.

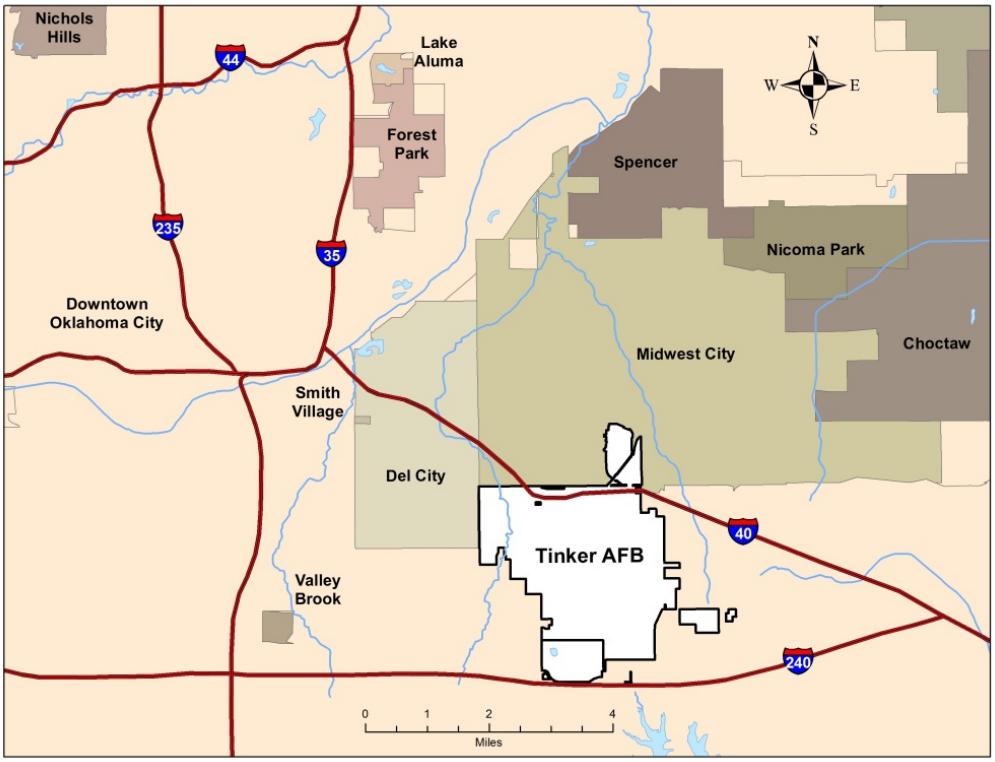
Del City: Bordering most of Tinker AFB's western boundary is Del City which covers 7.5 square miles. It is a part of the Oklahoma City metropolitan area. The current population is about 21,000, which is down by 3.6% since 2000 and down by 25.2% from its peak population of 28,523 in 1980. The racial composition is 66.4% white, 17.7% African American, 7.2% Hispanic/Latino, 4.3% Native American, 1.6% Asian, 0.2% Pacific Islander, and 7.6% of mixed race. The medium household income was $40,240. Del City is a mostly suburban community.

Oklahoma City: Tinker AFB is bordered on the southwest, south and east sides by portions of Oklahoma City, the largest city in the state with a population of 579,999. It is the 31st largest city in the United States and is the 8th largest city in the nation by land area at 606 square miles. From 2000 to 2010, the population increased by 14.6%. The racial composition is 62.7% white, 15.1% African American, 17.2% Hispanic/Latino, 3.5% Native American, 4.0% Asian, 0.1% Pacific Islander, and 7.2% of mixed race. The median household income is $43,798. Agriculture, oil, natural gas, petroleum products, and related industries are the largest sector of the regional economy.

Due to its relatively undeveloped state, the adjacent Oklahoma City land area has the greatest potential to positively or negatively impact Tinker AFB. For planning purposes, the Oklahoma City Planning Department has divided the city into six sectors. The portion of Oklahoma City that adjoins Tinker AFB is the Southeast Sector. It is considered one of the city's areas of highest suburban growth and acreage development. Although Oklahoma City as a whole is comprised of urban, suburban, and rural community

areas, the Southeast Sector is predominantly suburban and rural. The western one-third of the sector is suburban and the eastern two-thirds is mostly rural, including fairly large areas of undeveloped land.

Within the Southeast Sector Plan, land immediately east of Tinker has been designated as industrial for future Tinker AFB expansion. There are limited areas within the Southeast Sector near Tinker that could support new commercial, industrial, and higher density residential development. Land south of Tinker is being managed as a drinking water supply watershed and reservoir.



Tinker AFB Location (Surrounding Communities)

2.1.5 Local and Regional Natural Areas

Land south of Tinker—Lake Stanley Draper and adjoining West Elm Creek Reservoir preserve—has been designated as an Environmental Conservation Area. It is located about one mile from Tinker AFB and totals over 10,000 acres.

Lake Stanley Draper is 2,900 acres with a 34 mile shoreline and is located one mile south of the installation's primary runway. It serves as a water supply and recreation reservoir. Recreational activities include angling, camping, picnicking, jet-skiing, sailing, and boating. A multiuse recreational trail—Tinker-Draper Trail—loops around the lake and connects to Tinker's perimeter. Preliminary plans call for the Tinker-Draper Trail to extend from the North Canadian River at the Interstate 40/Interstate 35 junction and extend to the southeast through Del City to the north side of Lake Stanley Draper.

The West Elm Creek Reservoir preserve is comprised of land on the west side of Lake Stanley Draper and is set aside for potential use as a water supply reservoir in the future. If West Elm Creek Reservoir were built, it would be an encroachment issue for the base flying mission since the reservoir would be one mile

south-southeast of the end of the base's main runway and would be certain to increase large resident and migratory water bird activity.

Approximately one-half of the Environmental Conservation Area falls within the Central Oklahoma/Texas Plains ecoregion (upland and bottomland forest with scattered prairies), and the other half in the Central Great Plains ecoregion (prairie uplands with woodlands along streams). Most of Tinker AFB is in the latter ecoregion with some fringe areas in the former. In recent years, one endangered species has been identified near Lake Stanley Draper in the Central Oklahoma/Texas Plains ecoregion habitat type. This species has not been identified during surveys on Tinker AFB.

There are no federal wildlife refuges, state wildlife management areas, or other nature parks/greenways within five miles of Tinker AFB.

2.2 Physical Environment

2.2.1 Climate

TAFB's climate is officially classified by the United States Department of Agriculture (USDA) as warm subhumid with pronounced day-to-day changes and gradual seasonal changes, although the changes of seasonal weather conditions are very dramatic. Summer temperatures above 90 degrees Fahrenheit (F) are not uncommon, occurring on the average 71 days during the year. The maximum-recorded temperature is 109 degrees (F). Temperatures in the winter on the average are not frigid, but when combined with gusty winds can yield wind-chill temperatures in the below 0 degrees (F) range. The lowest recorded temperature at Tinker is –7 degrees (F). Temperatures below 30 degrees (F) occur on the average 86 days of each year. Temperatures in the spring and fall are generally mild with warm days and cool nights. The average amount of measurable precipitation per year is 33.3 inches which is almost entirely offset by evapotranspiration (see Tab 8). The average number of days per year with measurable precipitation is 75. Of the 75, an average of 47 are thunderstorms and 6 are snowfall. Winds on the average are from 12-14 mph (highest recorded – 87 mph) and predominant direction is from the south-southeast.

The following statistical summary has been compiled from weather observations taken at TAFB from January of 1943 through March of 1984 for averages, and January 1943 through June of 1990 for extremes (Source: Detachment 1, 17th Weather Squadron, Tinker Air Force Base, Oklahoma).

MONTH	MAX. TEMP. (F)	AVERAGE HIGH TEMP. (F)	AVERAGE LOW TEMP. (F)	MIN. TEMP. (F)	AVERAGE PRECIPIT-ATION (INCHES)	AVERAGE HUMIDITY (PRESENT)
JANUARY	80	46	27	-7	1.3	60
FEBRUARY	85	52	32	-1	1.3	62
MARCH	91	60	39	-1	2.3	59
APRIL	98	71	51	25	3.1	61
MAY	104	78	59	35	6.1	68
JUNE	106	87	68	51	4.1	67
JULY	109	92	72	53	3.3	60
AUGUST	107	92	71	56	2.3	61
SEPTEMBER	107	84	64	37	3.3	62
OCTOBER	98	74	53	26	2.9	58
NOVEMBER	84	60	40	11	1.9	62
DECEMBER	85	50	31	0	1.4	59

General descriptions of seasonal weather conditions are:

Spring (March-April-May-June): Spring yields the type of weather that Oklahoma is perhaps best known for; thunderstorms, sometimes severe, with locally heavy rainfall, gusty winds, hail, frequent lightning, and possibly tornadoes. Though severe thunderstorms can and have occurred during every month of the year, they are most frequent during the spring. Consequently, spring is the wettest season in Oklahoma receiving about 36% of the average annual precipitation.
Summer (June-July-August-September): Summer is best characterized as hot and humid. Temperatures above 100 degrees (F) in July and August are not uncommon. About 29% of the average annual precipitation occurs during the summer.

Fall (September-October-November-December): Fall is commonly known for warm days and cool nights. The average first frost at TAFB occurs in early November around the 7th. On the average, about 21% of Oklahoma's annual precipitation occurs in the fall. The spring, summer, and fall collectively constitute an average growing season of approximately 224 days.

Winter (December-January-February-March): The winter season is not only Oklahoma's coldest season but is also the driest. Roughly 14% of Oklahoma's average annual precipitation occurs during the winter. The average annual latest frost in Oklahoma occurs on about the 28th of March.

Climate projections for Tinker Air Force Base (See table, "Summary Climate Data") suggest minimum and maximum temperatures will increase over time under two emission scenarios – a moderate carbon emission scenario (Representative Concentration Pathway [RCP] 4.5) and a high emission scenario (RCP 8.5). The potential impact of these two climate change scenarios on the site's natural resources was analyzed using extracted climate data from 2026 to 2035 to represent the decadal average for 2030, and extracted data from 2046 to 2055 for the decadal average for 2050.

For the decade centered around 2030, both of the scenarios project a similar degree of increase in average annual temperature (TAVE) of between 2.6 °F (1.4 °C) and 3.9 °F (2.2° C) over historic average. The two emission scenario projections show higher warming by 2050, with RCP 4.5 expressing a warming of 3.6 °F (2.0 °C). RCP 8.5 expresses a slightly greater warming of 5.1°F (2.8 °C) for this period.

Average annual precipitation (PRECIP) varies between emission scenarios and over time due to larger interconnected ocean-atmosphere dynamics associated with the NCAR CCSM model. For 2030, RCP 4.5 scenario projects an increase in PRECIP of 11% while RCP 8.5 shows a more modest increase of 1%. For 2050 RCP 4.5 projects an increase in PRECIP of 14% while RCP 8.5 shows a smaller increase of 5%.

Summary Climate Data

Variable	Historical	RCP 4.5		RCP 8.5	
		2030	2050	2030	2050
PRECIP (inches)	39.4	43.6	44.9	39.9	41.5
TMIN (°F)	49.2	51.6	52.5	53.1	53.9
TMAX (°F)	72.0	74.7	76.0	75.9	77.5
TAVE (°F)	60.4	63.1	64.2	64.4	65.7
GDD (°F)	5367	5973	6148	6214	6490
HOTDAYS	64.1	91.0	102.0	100.7	113.4
WETDAYS	1.3	0.4	1.2	0.1	0.4

Notes: TAVE ºF = annual average temperature; TMAX ºF = annual average maximum temperature; TMIN ºF = annual average minimum temperatures; PRECIP (inches) = average annual precipitation; GDD ºF = Average annual accumulated growing degree days with a base temperature of 50 ºF; HOTDAYS (average # of days per year) = average number of hot days exceeding 90 ºF; WETDAYS (average # of days per year) = annual number of days with precipitation exceeding 2 inches in a day.

Understanding changes in daily intensity and total precipitation for multi-day precipitation events is helpful to evaluate precipitation patterns in addition to assessment of annual averages. Three-day storm events were generated from projected precipitation data based on RCP 4.5 and 8.5 emission scenarios for the 2030 and 2050 timeframes (see table, "Design Storm Precipitation"). Historical precipitation data were used to calculate a baseline storm event for the year 2000 for comparison. Estimated storms were used as design storm to model stream channel overflow in the hydrology assessment.

Design Storm Precipitation

Design Storm		Baseline	RCP 4.5		RCP 8.5	
		2000	2030	2050	2030	2050
Precipitation (inches)	Day 1	1.5	1.3	2.8	1.1	1.5
	Day 2	2.4	1.7	3.5	2.0	1.7
	Day 3	1.6	2.1	1.9	1.2	1.9
	Total	5.5	5.1	8.2	4.3	5.1
Percent change from baseline			-7%	49%	-22%	-7%

For more information on climate change impacts to Tinker Air Force Base, refer to Sections 2.2.4, 2.3.1, 2.3.2, 2.3.3, 2.3.5, 2.4.1, 7.1, 7.2, 7.7, 7.9, and Tab 8.

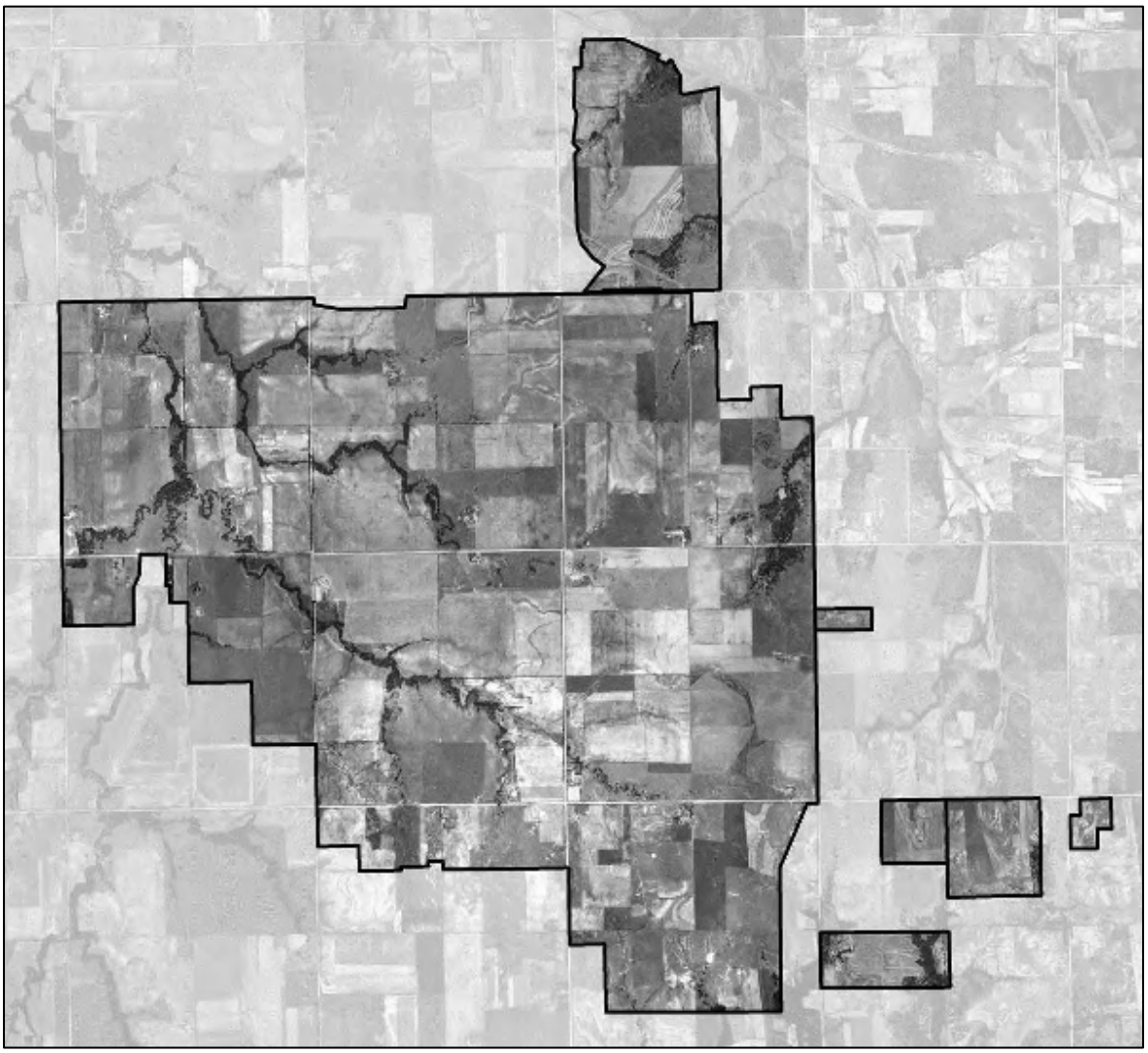
2.2.2 Landforms/Physiography

Tinker AFB is located in the Central Redbed Plains section of the Central Lowland Physiographic Province which is characterized by level to gently rolling hills, broad flat plains, and bottomlands bisected

by small- to medium-sized water courses. Oklahoma County elevations range from about 850 feet above mean sea level (MSL) in the southeastern part to 1300 feet MSL in the northwestern part. Tinker AFB elevations range from approximately 1200 feet MSL (Crutcho Creek - northwestern portion of Tinker AFB) to 1310 feet MSL (southeast portion of Tinker AFB). Airfield elevation is approximately 1291 feet MSL.

2.2.3 Geology and Soils

Early aerial photographs indicate the majority of land currently occupied by Tinker AFB was used for agricultural purposes (see figure, "Tinker AFB Agriculture"). Soil tillage and terracing are evident on historic aerial photographs, indicating much land was farmed before Tinker AFB was established.



Tinker AFB Agriculture: Historic aerial photograph of land now occupied by Tinker AFB illustrates substantial agricultural activity across the landscape.

Borrowing soil from various on-base locations to build up facility foundations and level the airfield was the primary soil impact during initial urbanization and industrialization of Tinker AFB. Later, soil was borrowed from select Tinker AFB locations and utilized for capping landfills. Some of these borrow sites,

up to 10 acres in size, had both the topsoil and subsoil permanently removed. No topsoil was replaced at these locations; consequently, revegetation was slow and led to further soil loss by erosion.

Physical properties of soils have been altered by military construction and activities. For example, vehicular traffic around construction sites and parking aircraft on grassed areas have compacted soils. However, placement of metal runway matting to facilitate aircraft movement on wet soils would have lessened the compaction (see figures, “Tinker Airfield”). Much soil was excavated and redistributed/compacted for projects such as large storm drainage systems across Tinker AFB.

Tinker Airfield: Hundreds of aircraft parked on grassed areas of Tinker's Airfield in the 1940’s.

Tinker Airfield: Metal runway matting placed on vegetated areas of the airfield in 1944.

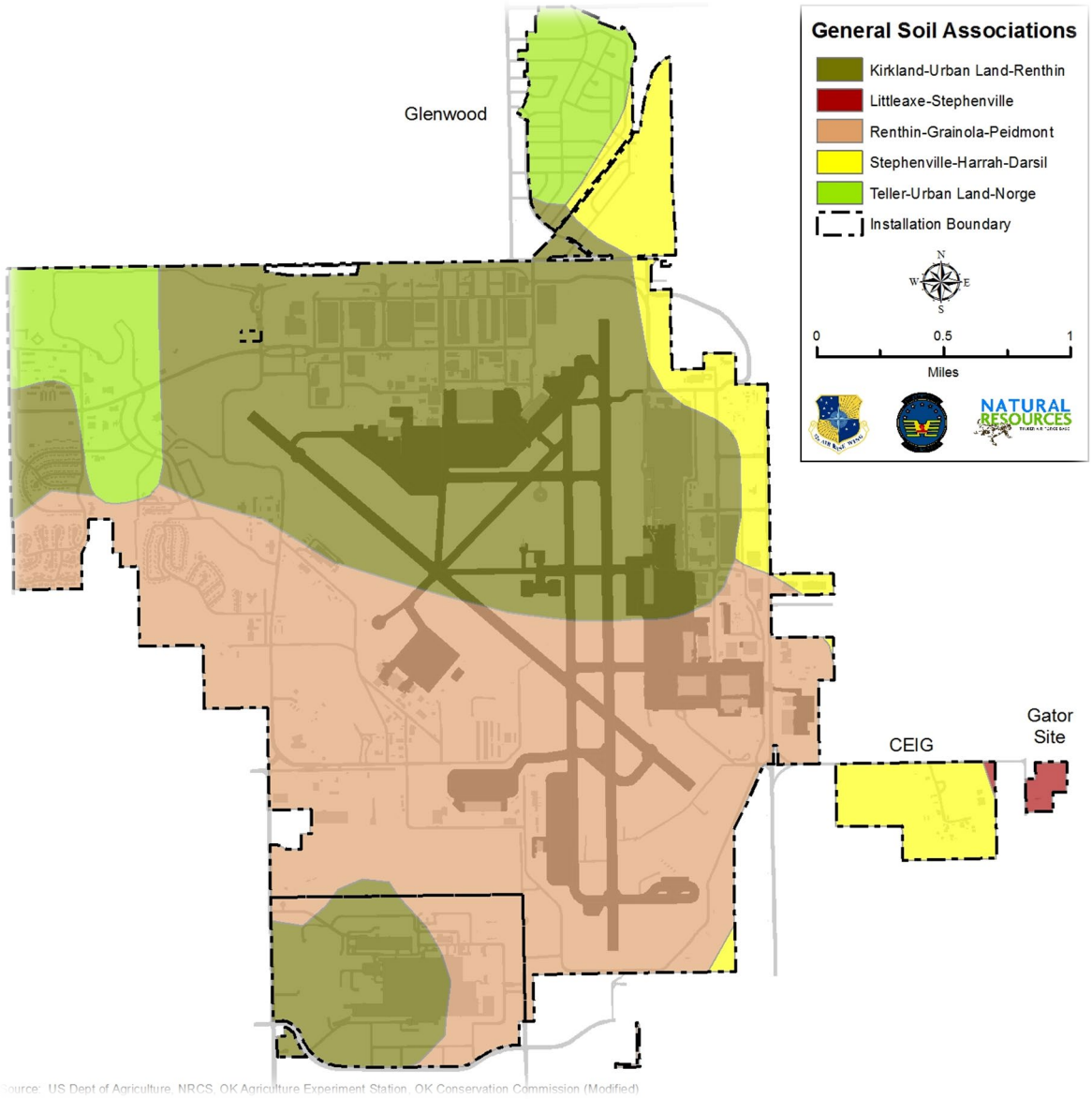
Accelerated soil loss has occurred because of unnatural creek bed erosion. Creek channelization and intensified runoff from developed areas has resulted in bed scour and deeply incised channels. Displaced soil is transported downstream and typically not replaced by aggradation because of the creek system's current morphology.

Highly fertile soils have been lost to other land uses and development. Many areas classified as prime farmland have been converted to other uses such as recreational land use (e.g., golf course).

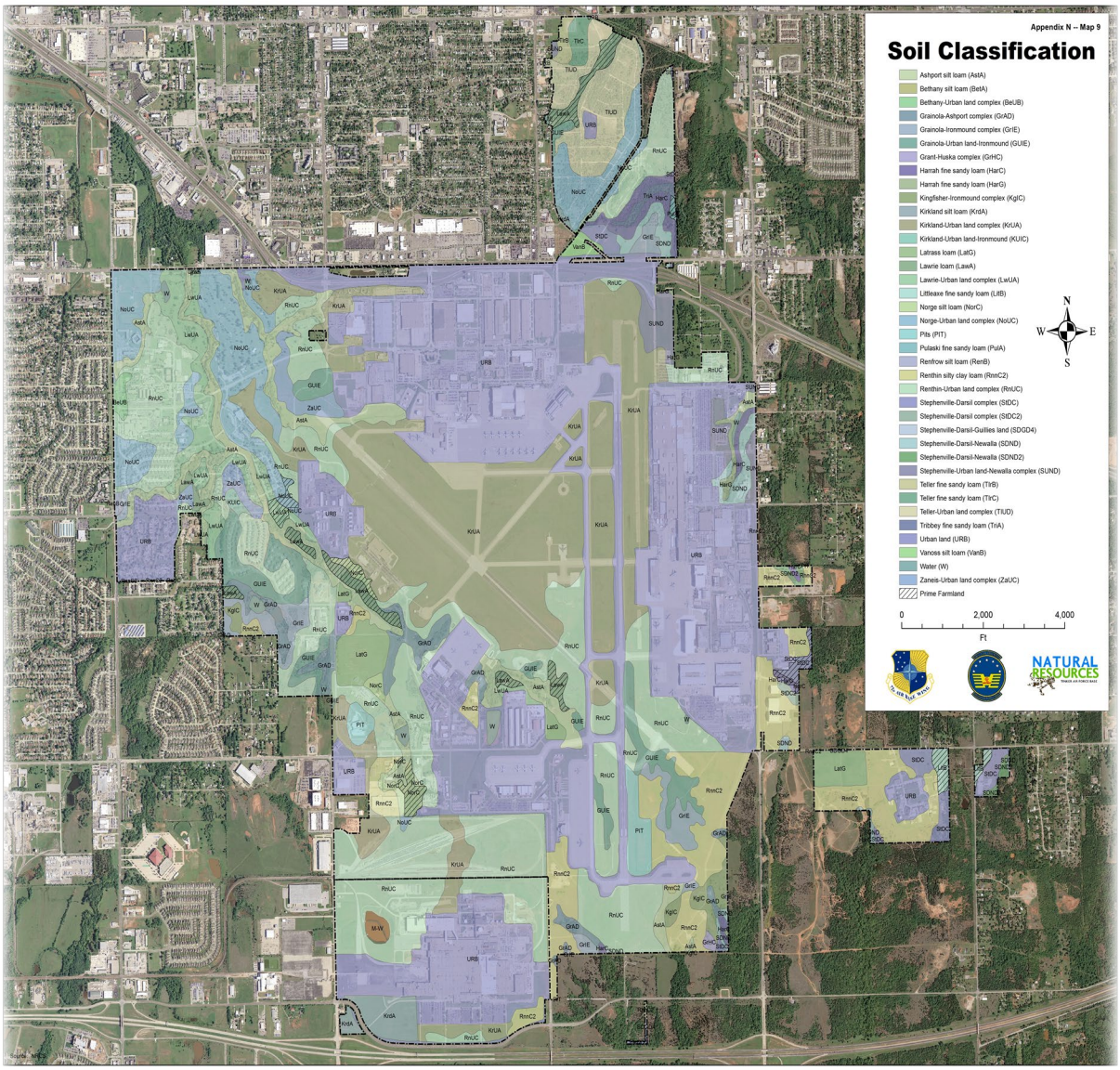
Geology (Surficial Soils)

Soil Associations: According to the United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS, 1996), Tinker's soil is comprised of five major associations (see figure, "Soil Associations"):

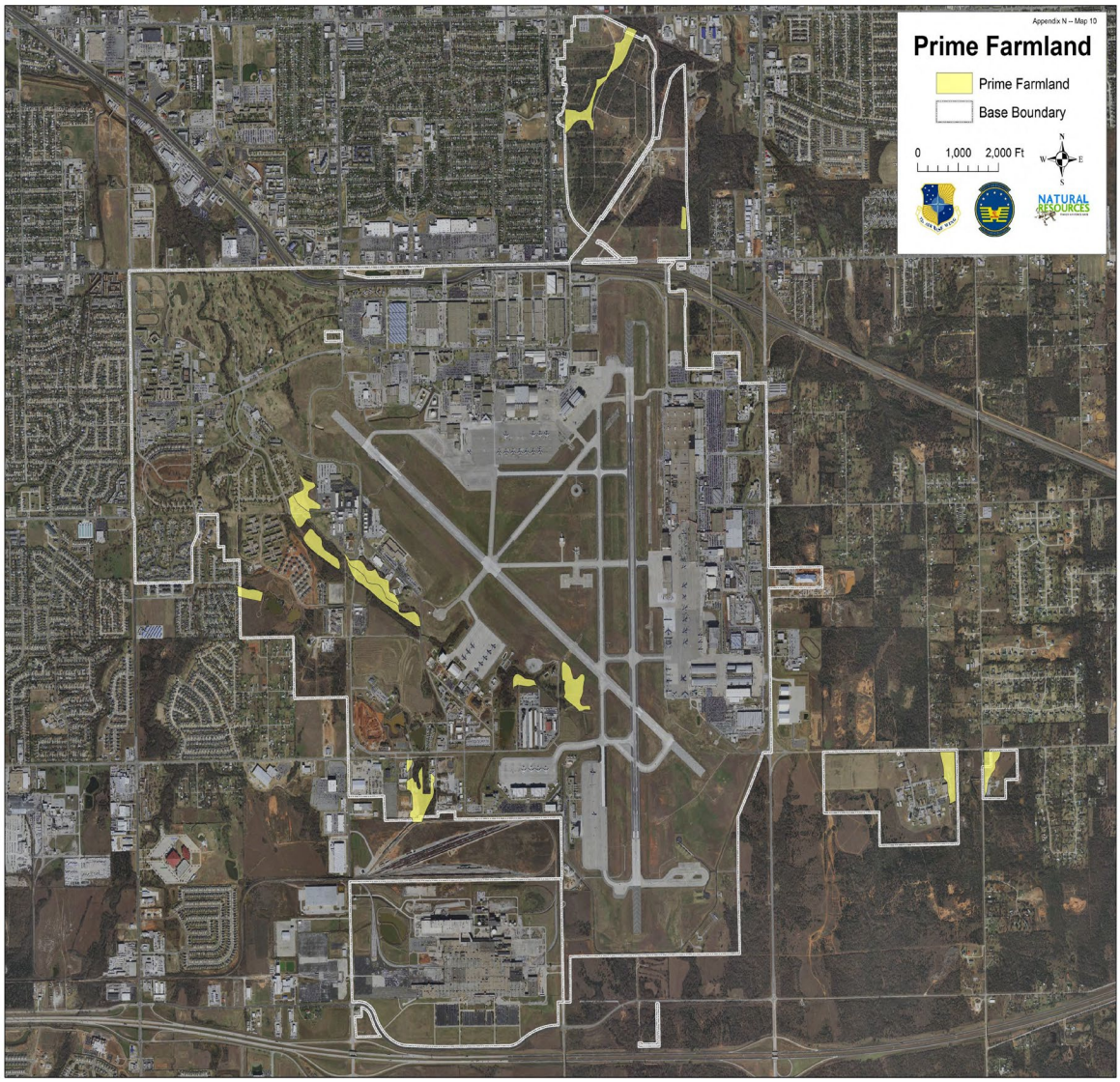
1. *Kirkland-Urban Land-Renthin*: Areas of very deep and deep well-drained, clayey soils in areas of Urban land; on prairie uplands;
2. *Littleaxe-Stephenville*: Deep and moderately deep, well-drained, loamy soils on forested uplands;
3. *Renthin-Grainola-Peidmont*: Deep and moderately deep, well-drained, clayey soils on prairie uplands;
4. *Stephenville-Harrah-Darsil*: Very deep, moderately deep, and shallow, well-drained and excessively drained, loamy and sandy soils on forested uplands;
5. *Teller-Urban Land-Norge*: Areas of very deep, well-drained, loamy soils and areas of urban land; on terraces.



Tinker AFB Soil Associations



Tinker AFB Soil Types



Undeveloped Tinker AFB Prime Farmland

Soil Types: Tinker's soil survey was initially completed by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) in 1983 and updated in 1996. Thirty-four soil types have been identified within Tinker AFB boundaries (Figure Tinker AFB Soil Types). Prior to development, approximately 300 acres of land currently occupied by Tinker AFB would have been classified as prime farmland. In 1983 and 1996, eighty-nine and seventy-eight acres, respectively, were classified as prime farmland on Tinker AFB. Further in-house refinement (i.e., accounting for roads, parking lots, playgrounds, etc.) brought the seventy- eight acres down to the present day sixty-three acres of undeveloped prime farmland on Tinker AFB (see figure, "Undeveloped Tinker AFB Prime Farmland").

Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is currently available for these uses (i.e., the present land use could be cropland, pasture land, rangeland, forest land, or other land, but not urban built-up land or water). Prime farmland has soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, according to acceptable farming methods. In general, prime farmland has adequate and dependable moisture supply from precipitation or irrigation, favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, few or no rocks, and is permeable to water and air. Furthermore, prime farmland is not excessively erodible or saturated with water for long periods of time, and either does not flood frequently or is protected from flooding.

Soil on Tinker AFB has been very suitable for construction purposes. In the mid-1980s and 1990s, Landfills 1, 3, and 6 were capped using clay excavated from the present day Redbud, Primrose/Wood Duck, and Prairie Ponds, respectively.

Geology (Lithology)

According to Bingham and Moore (1975), surficial geology was dominated by the Garber Sandstone stratum with relatively smaller stratigraphic units of the Hennessey Group, Terrace Deposits, and Alluvium. Wood and Burton (1968) reported Tinker AFB was almost exclusively underlain with the Hennessey Group (Kingman Siltstone and Fairmont Shale) with one small area underlain with Garber Sandstone/Wellington Formation, and one area with Alluvium stratigraphic unit. A 1988 U.S. Army Corps of Engineers report stated the Garber-Wellington Formation underlies the entire Tinker AFB with the Hennessey group overlapping the southern half of Tinker AFB.

Recent drilling and construction of cross-sections confirm the erosional edge of the Hennessey Group extends from the northwest corner of Tinker AFB southeastward to the Engineering Installation Group (EIG) area. Over ¾ of Tinker AFB surface geology is Hennessey. Most of the remaining surface geology is Garber Sandstone with some alluvium along streams.

Furthermore, recent work shows surface Hennessey is underlain by Garber Sandstone, which in- turn is underlain by Wellington Formation. Sandstone and mudstone comprise the majority of Tinker's surficial geology (Bingham and Moore, 1975; Wood and Burton, 1968). Sandstone is orange-red to reddish-brown, fine-grained, and poorly cemented with subangular to sub-rounded grains composed of quartz. Shale is reddish-brown and silty.

2.2.4 Hydrology

Based on topography and historical aerial photos, it appears that pre-settlement surface waters on land currently occupied by Tinker AFB consisted only of lotic waters (i.e., streams). There is no known evidence of the presence of lentic waters (e.g., ponds, lakes, wetlands) for that time period, although small beaver-created ponds and wetlands may have occurred along stream systems much as they do today. Streams

consisted of intermittent, ephemeral, and possibly perennial flows in wooded or non-wooded stream systems which bisected gently rolling hills of tall/mixed-grass prairie. These systems were typically shallow with broad, relatively flat floodplains (see figure, "Pre-settlement Stream Morphology"). Floodplain areas closest to the streams may have been heavily vegetated with riparian trees and shrubs; however, it is likely natural fire events would have kept most, if not all, woody vegetation suppressed such that land currently occupied by Tinker AFB was treeless (except for the upland eastern extremity of the base). Alternatively, it may have been just the more outlying floodplain fringes and the upper reaches of the first order stream segments that remained free of woody riparian vegetation.

Surface waters occurred in three main stream systems, one which drained to the north (current Crutcho Creek with Kuhlman and Soldier Creek tributaries) and two to the south (current East Elm Creek and West Hog Creek). The north-flowing stream system originated approximately two miles south of Tinker's current southern boundary with on-base portions of the system composed of twelve first order segments, two second order segments, and one third order segment. The south-flowing systems consisted of only first and second order tributaries with higher order tributaries located off-base. Stream flows were generated primarily by precipitation runoff and were probably relatively sluggish. Groundwater seepage and springs may have caused perennial flows in some of the higher order stream segments, particularly in tributaries on the eastern side of Tinker AFB.

Pre-settlement Stream Morphology: This stream in northwest Oklahoma has typical stream morphology and characteristics which would have been associated with Tinker AFB streams during pre-settlement times.

Flooding, which would have occurred naturally during pre-settlement times, likely would have been prevalent in second and higher order streams. However, the large expanses of densely vegetated native prairie would have slowed runoff and fostered greater water infiltration into the soil which would have lessened the degree of flooding. This would have in-turn increased groundwater recharge in subsurface aquifers. Pre-settlement groundwater was expansive and probably consisted of ephemeral and perennial aquifers which were under water table or confined conditions.

As would be expected in a highly urbanized setting, hydrological processes (e.g., water infiltration, runoff) on and around Tinker AFB have changed dramatically since pre-settlement times. Current processes are in a state of disequilibrium. Some of the more prominent reasons for this include past activities such as stream bed channelization, woody riparian vegetation removal, spill gate structure

installation, and stream system maintenance activities such as mowing, bank re-sloping, and rip-rap placement for erosion control. Additional negative influences include subsurface drainage network installation such as storm sewers; base-wide soil compaction; impermeable surface increase such as roads, runways, and buildings; construction of numerous retention and detention ponds; groundwater extraction for various uses/remediation activities; past water inputs from urban and industrial operation effluents; suppression of natural ecological processes such as fire and flooding; and alteration of dense, native, upland prairie groundcover.

The majority of on-base portions of watersheds have been developed into residential/industrial areas, airfield, and golf course with only some small areas remaining undeveloped. This, in combination with subsurface storm sewer systems and channelization, has resulted in very flashy, flood-prone stream systems during storm events. Tremendous volumes of water and sediment are transported within the systems in a very short time. This has significantly altered creek bed morphology, with most riparian areas having no resemblance to pre-settlement systems. Degradation is occurring in most Tinker AFB stream channels (i.e., eroding and incising with little sediment deposition). Aggradation, which normally occurs at spill gate dams and at major confluences, requires periodic removal. Much of the natural floodplain functions and values on Tinker AFB, such as floodwater storage, filtering, groundwater recharge, fish and wildlife habitat, and others, have been lost or greatly diminished.

Effects of Climate Change on Hydrology

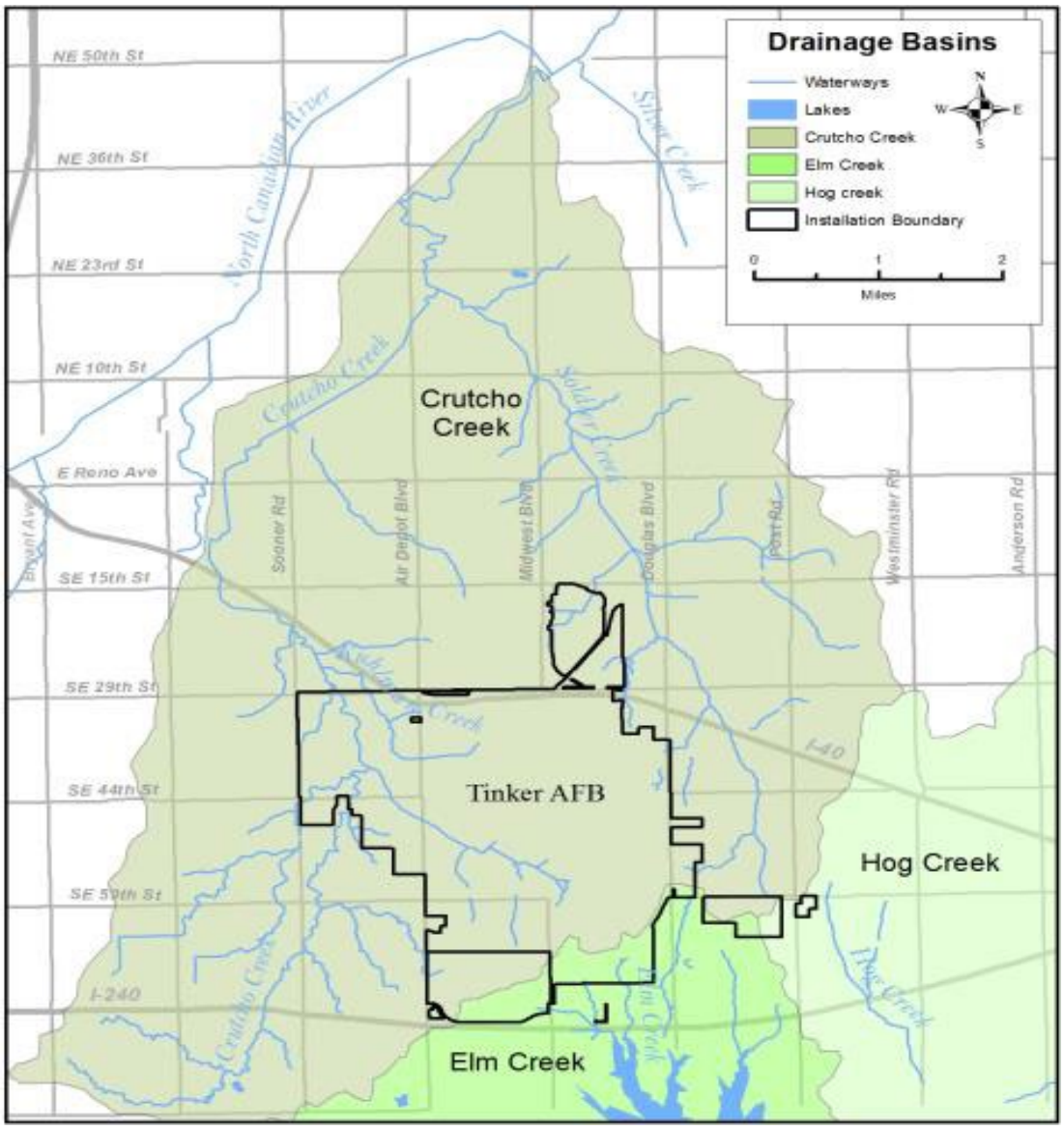
For information on projected climate change impacts on hydrology, refer to Section 2.3.5.

Surface Water (Streams and Ponds)

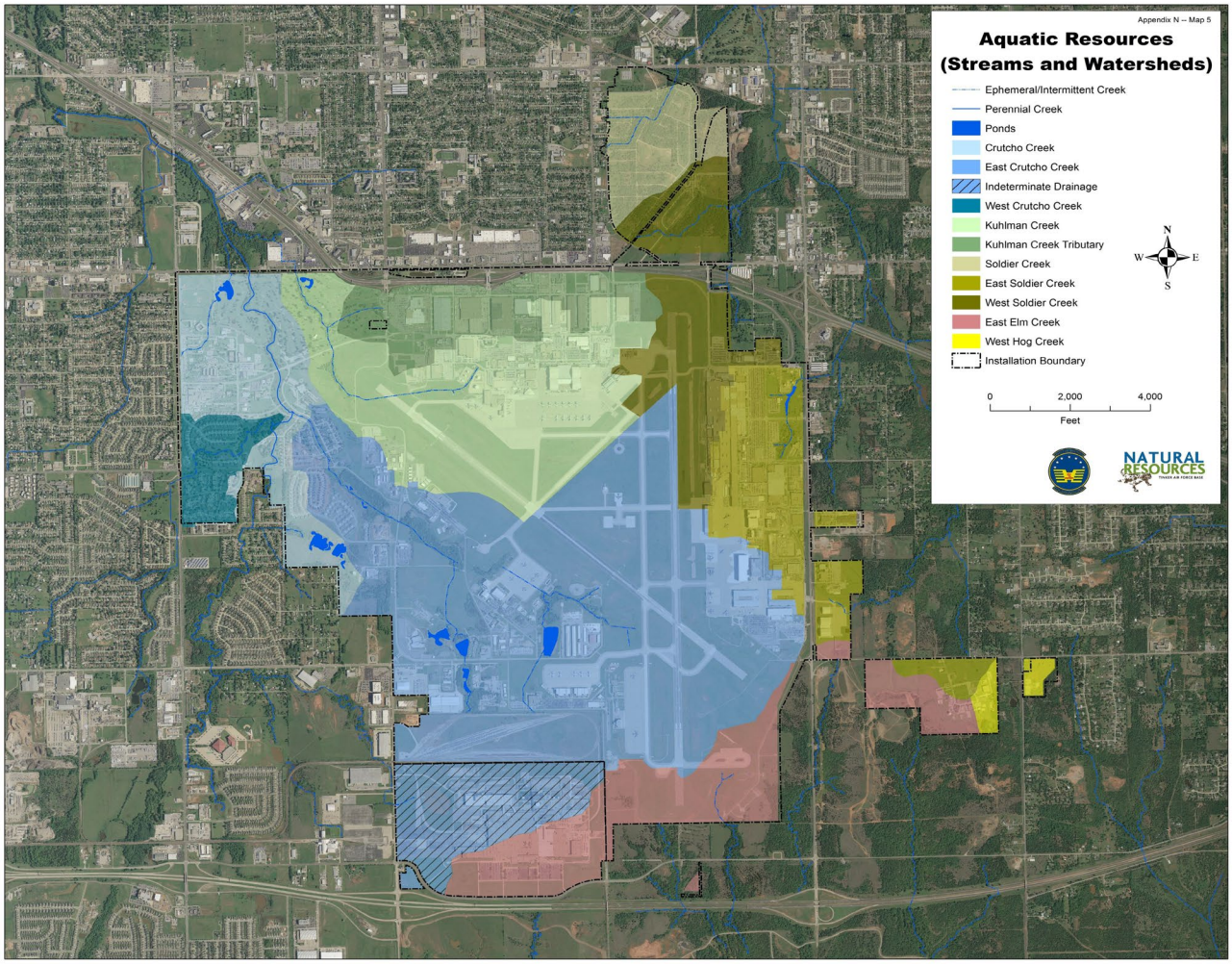
Today, Tinker's surface drainage occurs in three primary drainage basins: 1) Crutcho Creek Drainage Basin, 2) Elm Creek Drainage Basin, and 3) Hog Creek Drainage Basin (see figure, "Creeks and Drainage Basins [Local Area]"). The majority of Tinker's land is drained by Crutcho Creek Drainage Basin which flows north into the North Canadian River. Eventually the North Canadian River combines with the Arkansas River, Mississippi River, and finally discharges into the Gulf of Mexico. Elm Creek and Hog Creek Drainage Basins flow south of Tinker AFB into the Little River which forms confluences with the South Canadian River, Arkansas River, Mississippi River, and discharges into the Gulf of Mexico. The Elm Creek Drainage Basin is a sensitive watershed as it supplies Lake Stanley Draper, a drinking water supply reservoir for several local communities. The reservoir is located approximately ½ mile south of Tinker's southeast boundary.

Tinker AFB, lotic (i.e., flowing) waters (see figure, "Creeks and Watersheds [Tinker AFB]") comprise a total of about eight linear miles. The first and second order stream segments are typically ephemeral or intermittent while the third order segment is perennial. All Tinker AFB creek flows are the result of storm water runoff and groundwater seepage (i.e., groundwater enters the stream over a longer segment of the stream than a point source), with the exception of Soldier Creek which may be spring-fed (i.e., groundwater enters the stream at a point source) where the creek starts on the north side of the Cyber Engineering Installation Group at SE 59th Street. This spring-fed stream becomes a losing stream—feeding the groundwater—a short distance downstream).

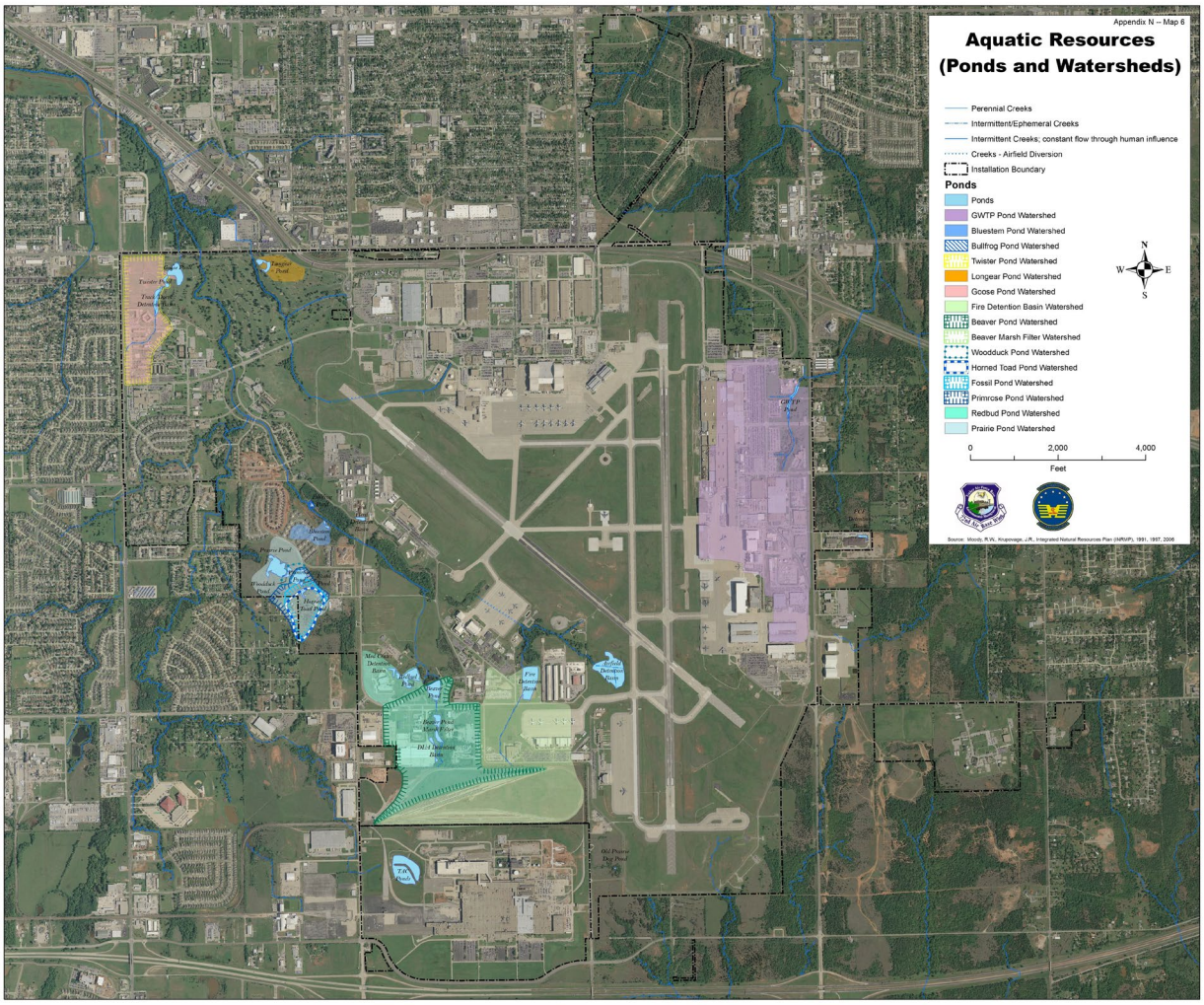
There are 15 small man-made retention ponds and seven detention basins located on Tinker AFB (see figure, "Tinker AFB Ponds and Associated Watersheds").



Creeks and Drainage Basins (Local Area): Tinker AFB and surrounding communities' creeks and associated drainage basins.



Creeks and Watersheds (Tinker AFB): There are ten sub-watersheds for creeks on Tinker AFB.



Tinker AFB Ponds and Associated Watersheds

Ground Water

Groundwater at Tinker AFB is found under either water table or confined conditions. The depth to groundwater varies from a few feet below ground surface to about 70 feet below ground surface depending on the local topography. Across Tinker AFB, water can sometimes be found in shallow, thin, discontinuous perched zones located above the aquifer.

Primary subsurface water zones identified at Tinker AFB include the Hennessey Water Bearing Zone, the Upper Saturated Zone (formerly the "Perched" Zone), the Lower Saturated Zone (formerly the "Top of Regional" and "Regional" aquifers), and the Producing Zone. Tinker AFB is located in a recharge area for these water-bearing zones; groundwater is derived primarily from precipitation and from infiltration of surface streams.

The Upper Saturated Zone, the Lower Saturated Zone, and the Producing Zone are colloquial terms to TAFB and are used to designate three identifiable saturated zones that comprise the upper portions of the

Central Oklahoma Aquifer under the base. The Central Oklahoma Aquifer underlies about 3,000 square miles of central Oklahoma. The shallowest two saturated zones occur in the Garber Sandstone whereas the Producing Zone spans the lower part of the Garber and extends into the Wellington Formation. The Producing Zone provides potable water and water for industrial use to the main portion of the base as well as two satellite areas to the east. Because of the increased yield from the Garber Sandstone and the Wellington Formation, this portion of the aquifer is often referred to as the Garber-Wellington Aquifer. The recently acquired TAC area (former GM plant) obtains water from the City of Oklahoma City. Surrounding communities originally tapped the Central Oklahoma Aquifer, but today obtain water primarily from surface sources. The Hennessey group contains some saturation known colloquially as the Hennessey Water-bearing Zone, which overlies the Upper Saturated Zone across the southwest portion of the base; this water-bearing zone is not part of the Central Oklahoma Aquifer.

Approximate direction of groundwater flow in the Garber-Wellington Aquifer is south and southwest across the southern one-half of Tinker AFB and west to northwest across the northern one-half. Shallow groundwater may discharge to surface streams (gaining stream) or be recharged by streams (losing stream). Both situations occur at Tinker AFB along Crutcho Creek and Soldier Creek. In contrast, water in the Hennessey Water Bearing Zone generally flows to the northeast toward Crutcho Creek from higher topographic areas along the south boundary of Tinker AFB.

Most water from the Garber-Wellington Aquifer is of sufficient quality to be used for most industrial, agricultural, and domestic purposes. However, some contaminated groundwater plumes do exist, typically at a depth of 175 feet or shallower. These plumes are primarily a result of aircraft maintenance and overhaul operations that occurred between the mid-1940s and mid-to-late-1970s. These operations required the use of solvents and involved activities such as chrome plating which by various means led to contaminants entering ground water. Leaking fuel tanks and inappropriate waste disposal practices also contributed to the plumes.

Groundwater plume contamination does not pose health concerns at this time since the producing zone (i.e., depth at which water from supply wells is obtained) is 200 feet or deeper. Also, there appears to be an aquitard at approximately 200 feet, which hydraulically separates the producing zone from shallower groundwater in the aquifer.

2.3 Ecosystems and the Biotic Environment

2.3.1 Ecosystem Classification

The United States Environmental Protection Agency (EPA), 2005, places most of Tinker AFB in the Central Great Plains ecoregion (mixed-grass prairie), with some eastern fringe areas in the Crosstimbers ecoregion

Bailey (2014) classifies the TAFB ecosystem within the Humid Temperate Domain, Prairie Division, Prairie Parkland (Subtropical) Province. Prairies are typically associated with continental, mid-latitude climates designated as subhumid.

2.3.2 Vegetation

2.3.2.1 Historic Vegetative Cover

The pre-settlement floral community on land currently occupied by Tinker AFB was considerably different from the existing community. Likely two primary vegetation types existed—rolling mixed-grass prairie and oak savanna (see figure, "Tinker AFB Pre-settlement Vegetation").

Tinker AFB Pre-settlement Vegetation: Rolling mixed-grass prairie bisected by wooded bottomlands as shown in this picture is believed to be similar to most of Tinker AFB property prior to settlement.

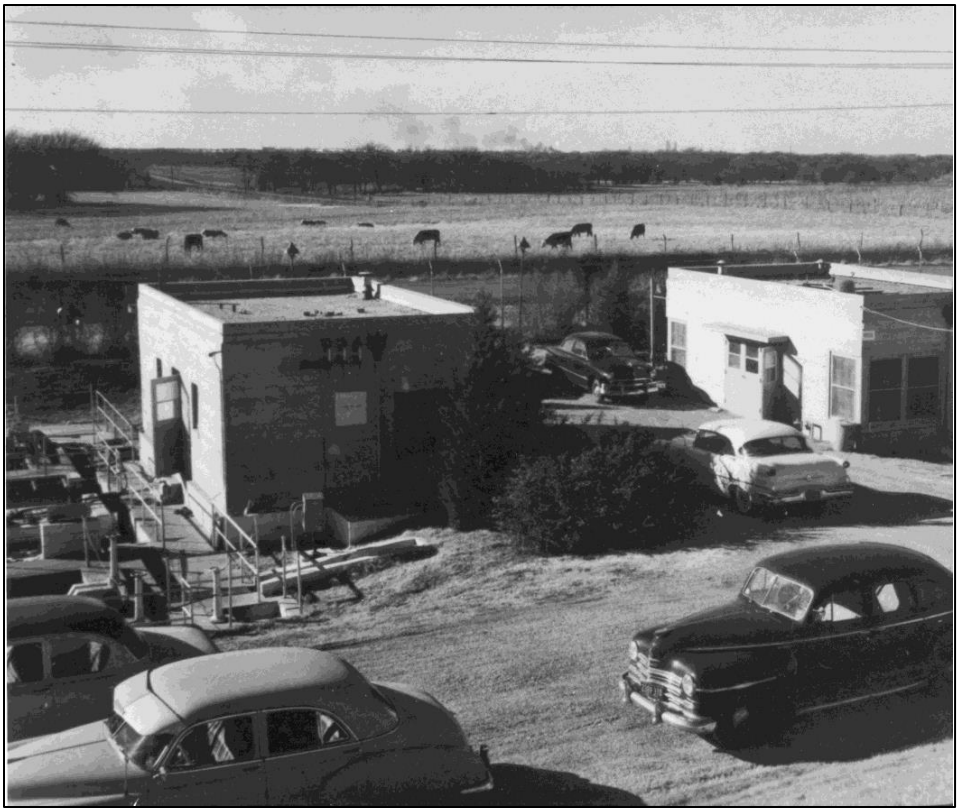
West of Building 3001, the majority of Tinker AFB appeared to be covered by mixed-grass prairie with trees and shrubs, if they existed, occurring almost exclusively in bottomland areas along watercourses. In the early 2000s, one of the oldest trees (bur oak) on Tinker AFB was aged at 100 to 110 years old. This indicated it began growing about the time of the Oklahoma land run. This could imply there were no trees in the water courses on land currently occupied by Tinker AFB prior to settlement—wildfires may have been of a frequency that trees could not become established. Then, when the land was settled, trees were more protected from wildfires creating conditions such that from that time forward they became established and survived to present day. Alternatively, settlers may have removed trees for building materials and firewood, but new trees began growing at that time and survived until today.

Additional implications can be drawn from recent tree growth in previously mowed bottom land areas. In 1990, mowing was discontinued in the floodplain area of Crutcho Creek between Air Depot Blvd and the Urban Greenway entrance. Native tree species that emerged from the floodplain seed bank included green ash, bur oak, slippery elm, soapberry, sugarberry, black walnut, Kentucky coffeetree, persimmon, cottonwood, black willow, Osage orange, redbud, boxelder, eastern red cedar, and American elm. Dominant trees were green ash and elm. Exotic trees that emerged were lacebark elm, Siberian elm, and callery pear. If trees did historically occur, or intermittently occur, along the Crutcho and Kuhlman watercourses, many of these trees (excluding the exotics) were likely present.

It appears most plausible that, for the most part, a treeless, rolling mixed-grass prairie is the true representation of the pre-settlement floral community for land areas west of Building 3001. It is believed oak savanna and/or denser crosstimber vegetation occurred in the upland areas east of Building 3001 and on the east side of Glenwood (where soil association transitions occur and post oak remnants are present). This is believed to be the dividing line between the aforementioned Central Great Plains and Crosstimbers ecoregions.

Tinker's vegetation represents an ecotone between the eastern deciduous forest and the western grasslands. Tallgrass species, such as big bluestem, indiangrass, and switchgrass were probably more dominant in draws and bottomland areas where soils were deeper and more fertile. Species such as little bluestem, gramas, and buffalo grass likely would have been more prevalent on the dryer slopes and crests of hills. In the bottomland areas, possible dominant woody tree species would have been elm, ash, sugarberry, hackberry, oak, walnut, cottonwood, and willow. Possible dominant woody shrubs would have included sumac, false indigo, corralberry, lead plant, green brier, roughleaf dogwood, and buttonbush. This grassland ecosystem was maintained by natural events and processes such as native mammal grazing, fire, flooding, and the climate of the local region. Bison and prairie dogs historically played significant roles in native grassland ecosystems.

Less than 2% of the pre-settlement prairie ecosystem currently remains on Tinker AFB. No pristine native prairie or bottomland areas are present on the installation. Very few, small, fragmented prairie remnants currently occur on Tinker AFB. These remnants total less than 100 acres and are in a degraded condition; restoration activities are currently ongoing on some of these areas. Much of the original prairie was farmed as evidenced by historical aerial photographs and remaining farmland terraces at numerous locations on Tinker AFB. Livestock grazing (see figure, "Tinker AFB Land Use") also appears to have been a significant past agricultural practice as seen by extant barbed wire fencing. Past grazing is also apparent by the absence of some plant species which would be expected to be present on existing prairie remnants had livestock grazing not occurred.



Tinker AFB Land Use: Cattle grazing in the 1950s on land formerly occupied by the 3rd Combat Communications Group (looking west, original Air Depot Boulevard can be seen between Sanitary Treatment Plant buildings and cattle).

Further native vegetation community change has occurred due to historical natural events, such as fire and herbivory, being removed from these prairie ecosystems. Thus, these islands of prairie habitat have been invaded by woody and non-native herbaceous plant species.

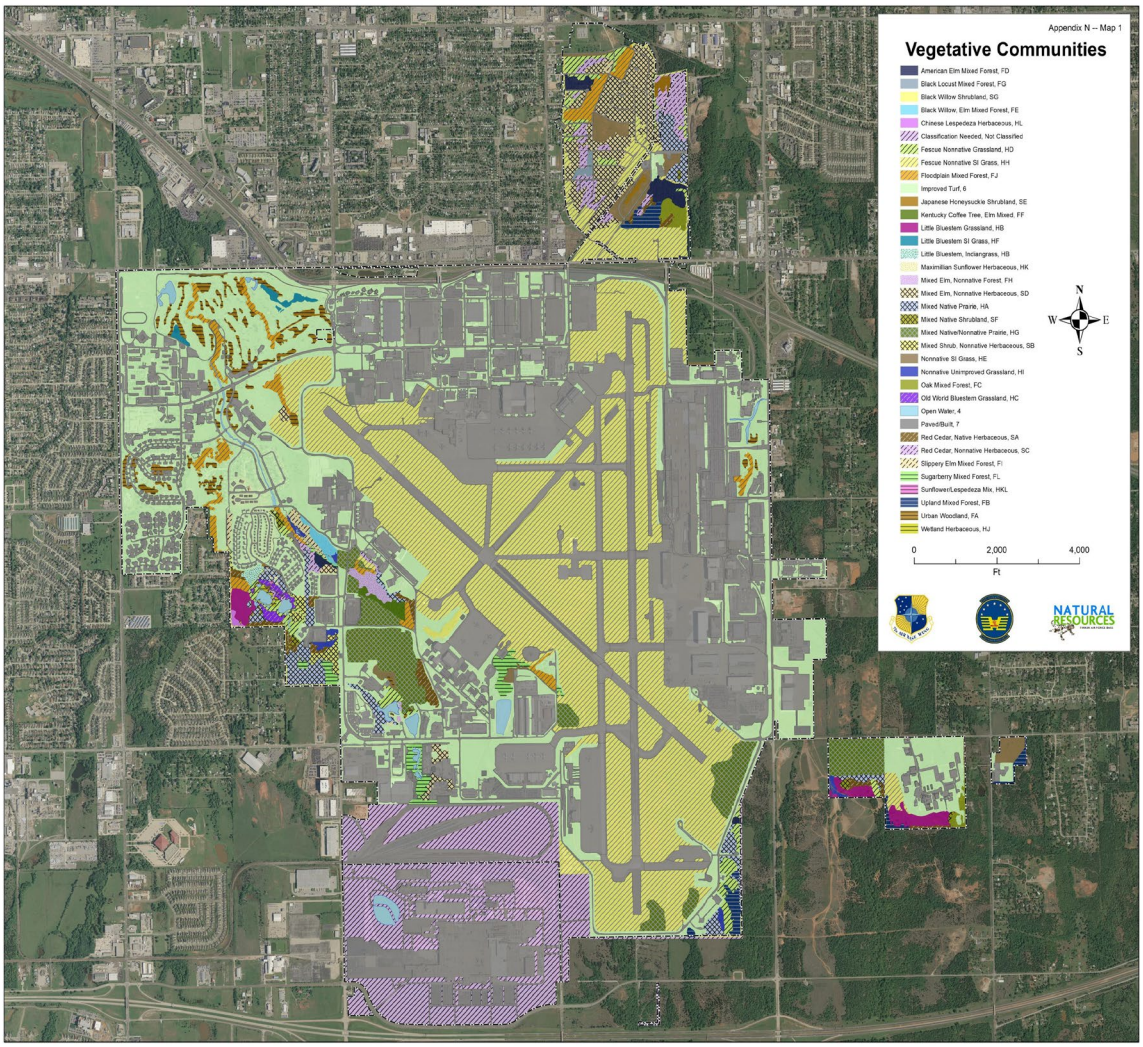
Bottomland areas have been substantially altered by activities such as channelization, native riparian vegetation removal, mowing, fire suppression, flood regime alteration, and exotic species invasion/introduction. Also, urban activities have caused soil properties to change substantially over the years, consequently modifying the original plant community. Common soil disturbances include topsoil being removed and not replaced; exotic plant species being used to revegetate disturbed areas; and soil compaction resulting from off- road training exercises, military construction projects, past aircraft parking on airfield, and related activities.

Within land areas which have been converted to urban and industrial use, the plant community is comprised primarily of turf grasses and ornamental trees and shrubs. The predominant turfgrass on Tinker AFB is exotic Bermuda grass. Native buffalograss is often found mixed with Bermuda grass. Other more rural areas are typically a mixture of exotic and native plants. Trees and shrubs are composed of native and exotic plants, and, contrary to pre-settlement plant distribution, many woody plants are found on upland as well as bottomland sites.

2.3.2.2 Current Vegetative Cover

Various vegetation surveys have been conducted at Tinker AFB since the early 1990s. A basewide flora inventory was completed in 1993 (Glenn et al., 1993). This survey catalogued Tinker's floristic community to include a herbarium collection maintained in the Natural Resources office (Flora List Appendix C). A native tallgrass prairie assessment was conducted in 1995 to determine the status and trend of native prairie areas on Tinker AFB (Johnson et al., 1995). This assessment determined that there was very little (less than 100 acres) native tall/mixed grass prairie remaining on Tinker AFB, and that which did remain was in degraded condition because of invasion of woody species, declining vigor of the native grasses, and the presence of a few exotic plant species. A base-wide vegetation classification and communities cover map was completed in 2005 (Dorr, et al. 2005; see figure "Tinker AFB Vegetation Communities Map" and table, "Vegetation Communities"). This provided current information regarding the composition of vegetation communities and their distribution within the boundaries of Tinker AFB.

An urban forest inventory was completed in 2007 (Dorr, et al. 2007) and is discussed further under the Urban Forestry section. From these surveys, approximately 388 plants have been identified on Tinker AFB.



Tinker AFB Vegetative Communities Map

Vegetative Communities: These communities have been identified and used for mapping vegetation at Tinker AFB.

Vegetation Community	Total Hectares
Urban Woodland (code FA)	18.5
Mixed Non-native Semi-improved Grass (code HE)	14.2
Little Bluestem (*Schizachyrium scoparium*) Semi-improved Grassland (code HF)	2.5
Mixed Native/Non-native SI Prairie (code HG)	49.6
Fescue (*Lolium* spp.) Non-native SI Grass (code HH)	422.7
Upland Mixed Forest (code FB)	8.1
Oak (*Quercus* spp.) Mixed Forest (code FC)	15.4
American Elm (*Ulmus americana*) Mixed Forest (code FD)	6.5
Black Willow (*Salix nigra*), Elm (*Ulmus* spp.) Mixed Forest (code FE)	2.2
Kentucky Coffee Tree (*Gymnocladus dioicus*), Elm (*Ulmus* spp.) Mixed Forest (code FF)	2.0
Black Locust (*Robinia pseudoacacia*) Mixed Forest (code FG)	1.1
Mixed Elm (*Ulmus* spp.), Non-native Forest (code FH)	3.1
Slippery Elm (*Ulmus rubra*) Mixed Forest (code FI)	3.1
Floodplain Mixed Forest (code FJ)	23.2
Sugarberry (*Celtis laevigata*) Mixed Forest (code FL)	8.0
Native Herbaceous, Redcedar (*Juniperus virginiana*) Shrubland (code SA)	14.9
Non-native Herbaceous, Mixed Shrubland (code SB)	3.8
Non-native Herbaceous, Redcedar (*Juniperus virginiana*) Shrubland (code SC)	14.5
Non-native Herbaceous, Mixed Elm (*Ulmus* spp.) Shrubland (code SD)	34.4
Japanese Honeysuckle (*Lonicera japonica*) Strangled, Mixed Shrubland (code SE)	1.7
Mixed Native Shrubland (code SF)	2.2
Black Willow (*Silax nigra*) Shrubland (code SG)	1.7
Mixed Native Prairie (code HA)	32.0
Little Bluestem (*Schizachyrium scoparium*) Grassland (code HB)	10.6
Old World Bluestem (*Bothriochloa ischaemum*) Non-native Grassland (code HC)	2.2
Fescue (*Lolium* spp.) Non-native Grassland (code HD)	16.0
Mixed Non-native Unimproved Grassland (code HI)	2.7
Wetland Herbaceous (code HJ)	0.5
Maximilian Sunflower (*Helianthus maximilianii*) Mixed Herbaceous (code HK)	0.3
Chinese Lespedeza (*Lespedeza cuneata*) Non-native Mixed Herbaceous (code HL)	0.5
Sunflower/Lespedeza Mix (code HKL) Needs To Be Classified	0.04 100.5
Total:	818.7*

*Total hectares do not include 1036 hectares that were identified as Paved/Built, Open Water, or Improved Turf

Effects of Climate Change on Vegetation

As relates to climate change, increased seasonal, annual, minimum, and maximum temperatures and changing precipitation patterns could impact Tinker vegetation. Slight changes in temperature and precipitation can substantially alter the composition, distribution, and abundance of species, and the products and services they provide. The extent of these changes will also depend on changes in the frequency and intensity of fire.

Increased drought frequency could also cause major changes in vegetation cover. Losses of vegetative cover coupled with increases in precipitation intensity and climate-induced reductions in soil aggregate stability could dramatically increase erosion rates.

In general, forests, which comprise a small portion of base land, are susceptible to climate change. Higher temperatures and severe droughts could lead to the direct or indirect loss of trees on Tinker.

2.3.2.3 Urban Forestry

For purposes on Tinker AFB, urban forest is defined as primarily street and park trees that are located on improved and semi-improved grounds (i.e., grounds that are routinely mowed) to include privatized military family housing. Trees located in unimproved grounds (e.g., Glenwood area, riparian areas) or that occur as groupings with natural understory vegetation are a part of the urban forest but are considered and managed as "tree stands," not as individual trees.

A base-wide urban forest inventory was completed in 2007 (most field work in summer 2006). The inventory identified and evaluated over 6,600 street trees across the installation. Data collected in the GIS-based survey included species, age class, hazard class, maintenance needs, and other information (Dorr, et al., 2007). As of 2017, the base has an estimated 5,091 street trees.

For Tinker AFB urban forest management policy and guidance, refer to Appendix G (Tinker AFB Urban Forestry Management Procedures) and Section 7.7, Grounds Maintenance.

2.3.3 Fish and Wildlife

History

Approximately 350 native vertebrate species and a much greater unknown number of invertebrates have historically occurred either in the Central Oklahoma/Texas Plains or Central Great Plains Ecoregions (Oklahoma Biodiversity Task Force, 1996). A smaller number occurred on land currently occupied by Tinker AFB. Some species which likely occurred on this land during pre-settlement times include prairie dogs, bear, bison, wolves, elk, and horses. Fossilized bison mandibles and horse teeth have been unearthed on Tinker AFB property confirming the historical presence of these species on Tinker AFB.

In general, although some urban-tolerant fish and wildlife populations have increased on Tinker AFB, overall species diversity has declined from pre-settlement times. Human activity and noise levels have increased, thereby deterring more sensitive species from occurring. Some species requiring large tracts of undisturbed land have been displaced because of habitat loss in the area. Intense urban development on Tinker AFB has attracted urban adapted wildlife such as non-native house sparrows, European starlings, and pigeons. These species have often out competed and displaced native species. Introduction of other non-native animals, such as feral cats, has to some degree negatively affected native wildlife.

Wildlife populations have been impacted further by intentional removal or relocation of certain wildlife. For example, egret and heron rookeries have occasionally colonized near Tinker AFB. These birds have often migrated daily across Tinker AFB causing aircraft flight safety concerns. Therefore, habitat at rookeries was modified during the non-breeding season to dissuade future nesting. This led to birds nesting at other locations away from Tinker AFB. Other species, such as the thirteen-lined ground squirrel, are believed to have been extirpated from Tinker AFB; human-wildlife conflicts such as burrowing on the golf course resulted in their removal over the years.

Fish and wildlife migration has also been negatively impacted by development. In-stream structures such as box culverts, check dams, and spill control structures impede the free movement of fish in Tinker AFB creek systems. However, recent stream studies have indicated that some of these in-stream features (i.e., check dams and spill control gates) have provided deeper pools and have enhanced fish populations (Marsh-Matthews, Matthews and Moody, 2010). Terrestrial wildlife movement patterns have been disrupted by fragmentation of historically contiguous habitat. Fencing around the entire installation, as well as interior fencing around the airfield and other restricted access areas, has further influenced the movements of larger wildlife.

Roadway wildlife kills are another negative urban impact on wildlife. Because of relatively low speed limits on Tinker AFB, roadway wildlife kills are believed to be less than off-base roadway systems. Although not believed to be a major problem on Tinker AFB, it is recognized that roadway kills must be taken into consideration, particularly when dealing with sensitive species. For example, road kills of the Texas horned lizard have been documented on Tinker AFB. This, along with other factors, could contribute to the decline of this species particularly in areas where prime habitat is adjacent to busy roadways.

Although there are no known early historical (pre-1980s) fish inventories for the Tinker AFB, numerous changes to the area stream systems and water quality issues have certainly had negative impacts on aquatic biota of the area (refer to Hydrology section for discussion of stream system impacts which would have affected aquatic biota).

Occurrence of over 330 native and exotic vertebrate species has been documented on Tinker AFB property (see Appendix D, "Fauna List"). This includes resident and migratory populations and is comprised of 40 mammals, 212 birds, 35 reptiles, 12 amphibians, and 33 fish (includes two hybridized fish). Tinker's species list has been compiled through inventory-related work such as recent class specific fish inventories: Investigating the Stream Fishes of Tinker Air Force Base (Lemons and Moody, 2005) and Fishes Assemblages of the Crutcho Creek Drainage Basin (Marsh-Matthews and Moody, 2010). Several other class specific wildlife inventories have been completed which include: Reptile, Amphibian, and Mammal Assemblages on an Urban Military Base in Oklahoma, (Bogosian, Hellgren and Moody, 2011); Bat Echolocation Surveys on Tinker AFB (Shaw and Moody, 2013-14 and CIRE et al., 2016); and Inventory of Avian Species on Tinker AFB, (Germain, 2010). Several invertebrate surveys have been conducted with 128 species being identified, including 36 aquatic macroinvertebrates identified and assessed by Virginia Tech University (2010) and 24 species of ants identified in conjunction with Texas horned lizard surveys. Furthermore, a volunteer hobbyist/entomologist has devoted many hours to surveying and identifying invertebrate species on Tinker AFB. Several of these surveys go beyond basic inventory and address important management issues for specific species such as the Texas Horned Lizard (research conducted by Southern Illinois University (SIU), see section on Sensitive Species). Other non-class specific surveys have included bird/wildlife aircraft strike hazard (BASH) surveys, sensitive species surveys, fish kill investigations, in-house deer spotlight surveys, and incidental observations by program biologists.

Much of Tinker's wildlife is found along riparian corridors and upland area habitat (see figure, "Habitat Favorable to Wildlife Movement and Habitation" in Section 7). Many of these areas are connected with off-base habitat and represent important animal refugia and movement corridors.

Mammals

Common mammal (class *Mammalia)* species on Tinker AFB include fox squirrel (*Sciurus niger*), eastern cottontail rabbit (*Sylvilagus floridanus*), opossum (Didelphis virginiana), raccoon (*Procyon lotor*), bobcat (*Felis rufus*), coyote (C*anis latran*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), white-tailed

deer (*Odocoileus virginianus*), various rodent species (*Peromyscus* sp., *Neotoma* sp., *Sigmodon* sp., etc.), and others.

One species-specific study on Tinker AFB was for the thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*) (CH2MHILL, 1998), conducted to determine its presence or absence. This study was done following verbal reports of historic occurrences on the golf course along with concerns of declining populations in the state. This survey consisted of identification of appropriate habitat (i.e., shortgrass prairie and managed areas with vegetation <14"), subsequent visual observations, and live trapping. Approximately 1,655 acres of potential habitat were identified and surveyed using baited Sherman live-traps. While no ground squirrels were captured, three other rodent species were: hispid cotton rat (*Sigmodon hispidus*), deer mouse (*Peromyscus maniculatus*), and short-tailed shrew (*Blarina brevicauda*).

Twenty-five of 36 different mammal species known to occur on Tinker AFB were identified in surveys conducted by SIU in 2007-08, the University of Science and Arts of Oklahoma (USAO) in 2013-14, and the Center for Integrated Research on the Environment (CIRE), et al., 2016. The remaining 11 mammals were identified by incidental observations by base biologists and the ground squirrel survey mentioned above.

In the SIU survey, the base was divided into 16 study areas based on either natural or man-made geographic features. Several indicator species (see table, "Species Survey" in Section 7.1) were selected based upon conservation need in the Oklahoma Crosstimbers and Mixed-grass ecoregions (Oklahoma Department of Wildlife Conservation, 2005). Using a variety of sampling techniques, 2,000 individual mammals were captured or observed. Species richness and diversity were predictably higher within green space portions of the base and notably lower near Tinker's airfield and industrial areas (see table, "Species Survey" in Section 7.1). These results are similar to surveys conducted on other military installations (Camp Mabry and Fort Wolters, Texas) in the region. Data are in agreement with published records of high diversity and presence of species of considerable conservation interest on military installations.

The USAO and CIRE surveys targeted bat species using echo-location monitors. Monitors were positioned at five different locations along riparian systems and at one location on top of Building 240. Calls were recorded for two week intervals throughout the summers of 2013, 2014, and 2016, resulting in the confirmation of nine bats on Tinker AFB (see Appendix D, "Fauna List").

Reptiles and Amphibians

Reptiles (class *Reptilia*) comprise families consisting of snakes, turtles, and lizards; amphibians (class *Amphibia*) include frogs, toads, and salamanders. See Appendix D, "Fauna List", for Tinker's reptile and amphibian inventory.

Forty-seven reptile species have been identified on Tinker AFB to include the three-toed box turtle (*Terrapene carolina*), red-eared slider (*Trachemys* [*Pseudemys*] *scripta*), prairie racerunner (C*nemidophorus sexlineatus*), northern prairie lizard (*Sceloporus undulates garmani*), western slender glass lizard (*Ophisaurus attenuates attenuatus*), plain-bellied water snake (*Nerodia erythrogaster*), and Texas horned lizard (*Phrynosoma cornutum*). Only one venomous reptile—copper head (*Agkistrodon contortrix*)—has been confirmed on Tinker AFB. There have been several copperhead sightings east of Douglas Blvd., to include the Cyber Installation Engineering Group (CEIG) campus. It is expected copperheads would occur in the extreme southeast corner of the installation near the Munitions area.

Twelve amphibians (8 frogs, 3 toads, and 1 salamander) have been identified on Tinker AFB to include the American bullfrog (*Rana catesbeiana*), gray tree frog (*Hyla versicolor*), Plains leopard frog (*Rana Blairi*), Woodhouse's toad (*Fufo woodhousei*), and smallmouth salamander (*Ambystoma texanum*).

Although most reptiles and amphibians on Tinker AFB are common, some species, such as the Western chorus frog (*Pseudacris triseriata*) and Texas horned lizard (*Phrynosoma cornutum*), are species of conservation concern.

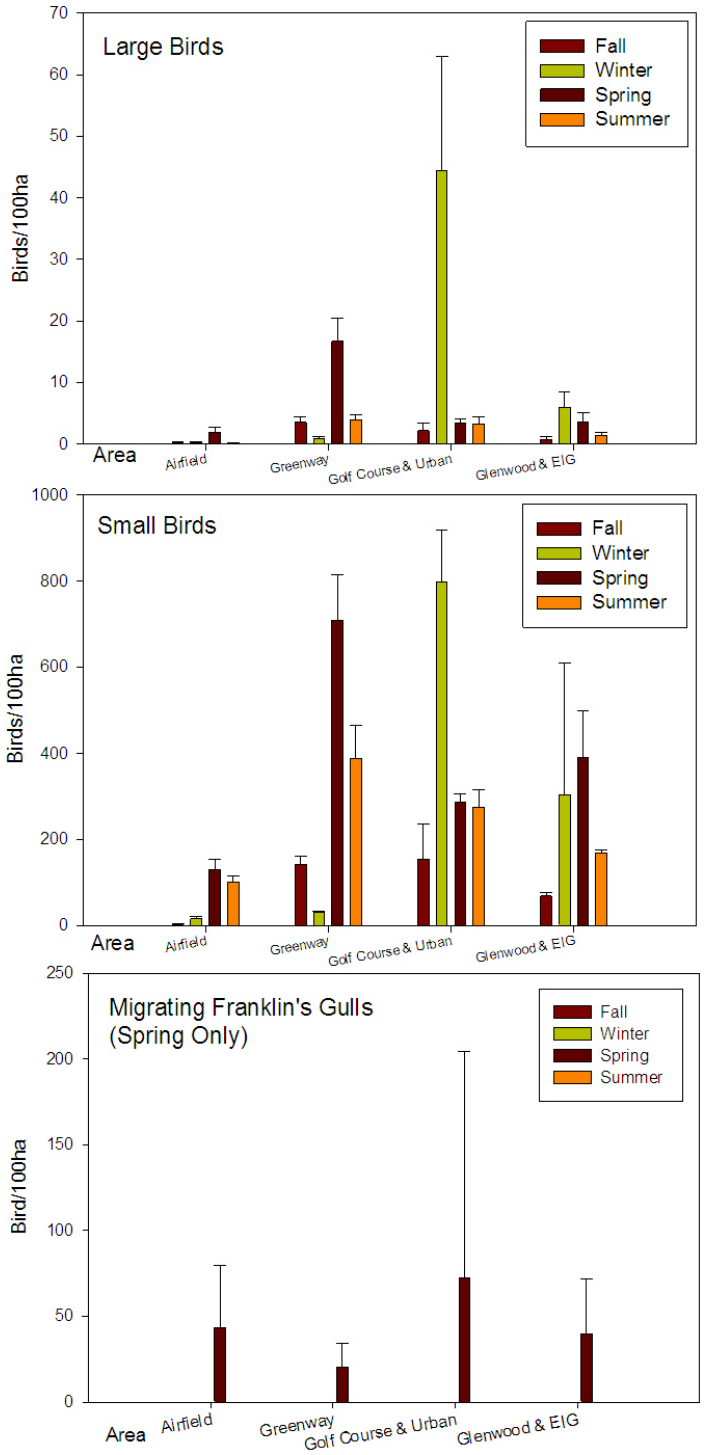
Twenty-six of the 36 different reptile species and 11 of the 12 different amphibians were identified in a class-specific survey conducted by SIU in 2007 and 2008 (Bogosian, Hellgren and Moody, 2011). Other sightings occurred during research being conducted on the Texas horned lizard. The horned lizard has been studied in detail on Tinker AFB under partnerships with the University of Oklahoma, Oklahoma State University (OSU) and SIU. Details of this research are in the Sensitive Species section.

Birds

Oklahoma is rich in diversity and abundance of bird (class *Aves)* life with over 400 species occurring in the state (Wood and Schnell, 1984). Many of these species are found on and around Tinker AFB. A significant source for the large diversity of bird life comes from Tinker's location on the central flyway where thousands of migratory birds traverse Oklahoma each year.

Biologists have documented 213 bird species on Tinker AFB through class and non-class specific surveys (Appendix D, "Fauna List"). The class specific survey, Inventory of Avian Species on Tinker Air Force Base (St. Germain, 2010), was conducted by Virginia Tech Conservation Management Institute. This study documented 137 of the 213 species. Other bird sightings have been incidental in nature, with most coming from individual sightings by Tinker AFB biologists, BASH surveys, or baseline surveys conducted for environmental assessments. Most of the birds identified are common such as species featured in George Miksch Sutton's work, Fifty Common Birds of Oklahoma and the Southern Great Plains (Sutton, 1977); however, many less common birds occur.

Results of the St. Germain study (St. Germain, 2010) showed spring had the highest diversity base-wide with 107 (species richness) followed by summer (68) and fall (56). The top six most abundant birds were eastern meadowlark 0.30 (relative abundance - ra), Franklin gull 0.179 (ra), European starling 0.108 (ra), mourning dove 0.042 (ra), northern cardinal 0.042 (ra), and barn swallow 0.041 (ra) (see figure, "Density Estimations"). Simpson's Diversity Index and species evenness (Krebs 1999) were calculated for each survey area by season. Diversity ranges from 0 (low diversity) to near 1 (high diversity).



Density Estimations: Based upon size classes for each region and season, migrating Franklin's gulls were calculated separately from all other species detected due to large flock sizes in winter.

Invertebrates

Oklahoma is rich in abundance and diversity of both aquatic and terrestrial invertebrates. Mollusks are among these, numbering over 201 species, and include 111 terrestrial snails and slugs, 31 aquatic snails, and 59 bivalves (clams and mussels). Terrestrial arthropods (insects, spiders and ticks) dominate by sheer numbers and diversity and are critical to ecosystem functioning. Scientists estimate there are over 200,000 insect species in North America, and Oklahoma is expected to have approximately 10,000 with its ecoregion diversity (Oklahoma Biodiversity Task Force, 1996). This task force identified the need for more sampling and taxonomic expertise throughout the state.

Invertebrate species serve many ecologically critical roles. Thus, to gain a better understanding of these animals, Tinker AFB biologists have embarked on several methods of identifying their presence on base. First, an Aquatic Benthic Macroinvertebrate Assessment was conducted for Tinker's ponds and streams by Virginia Tech (Jones and St. Germain, 2010). Secondly, Tinker AFB began preserving a voucher collection of invertebrate species. This has primarily been done through the volunteer efforts of a proven hobbyist entomologist (John E. Lee) who has provided species identification and preservation expertise. Staff biologists have also contributed to the collection documenting unique Tinker AFB species. Finally, in conducting research on Texas horned lizard diet preferences, many (24) Tinker AFB ant species have been identified. In total, 129 invertebrate species and members of various invertebrate families have been identified (see Appendix D, "Fauna List").

No invertebrate species at risk (SAR) have been identified on Tinker AFB; however, several vulnerable invertebrates listed by the Xerces Society and the International Union for Conservation of Nature (IUCN) are found in Oklahoma and potentially in central Oklahoma including Tinker AFB. According to the Xerces Society, these include the Arogos skipper (*Atrytone arogos*), Monarch Butterfly (*Danaus plexippus plexippus*), and Ottoe skipper (*Hesperia ottoe*). The skippers have not been identified on Tinker AFB; however, the Monarch, which is under review for listing as a federal threatened/endangered species, does migrate through the base. In one fall migration during the early 2000s, the number of Monarchs was so high the airfield bird watch condition was elevated to "Severe" due to safety concerns associated with the possible ingestion of butterflies into aircraft engines. Some Monarchs also have been observed completing their life cycle in base natural areas (Urban Greenway, Reserve 3). Species listed on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species that are known to occur on Tinker AFB are *Bombus fraternus* (endangered) and *Bombus pensylvanicus* (vulnerable).

The Oklahoma Natural Heritage Inventory (ONHI) does not list any invertebrate species of concern for Oklahoma County (ONHI, 2011).

Fish

Tinker AFB fishes (class *Osteichthyes*) within the Crutcho Creek Drainage Basin (CCDB) have been influenced by urbanization due to its metropolitan location and its headwaters being on a military installation. Urbanization is known to have negative effects on fish assemblage structure and species richness (Tabit and Johnson, 2002). However, native fish species that have evolved under harsh physical and chemical conditions may be more tolerant of urbanization than species that have evolved in more benign conditions (Matthews, 1987). Few studies have been published concerning effects of urbanization on prairie stream fishes or of the patterns of fish assemblages on Air Force bases (Marsh-Matthews and Matthews, 2010).

One peer-reviewed, published survey (Matthews and Gelwick, 1990) documented 17 fish species within non-Tinker AFB CCDB waters. Other more recent, unpublished, non-Tinker AFB fish data collected by

Lemmons and Vidacovich (2005) and Marsh-Matthews and Matthews (2010) shows 22 species inhabit the CCDB off-base (see figure, "Fish Survey Collection Sites"). Tinker AFB records indicate that 31 species of fish (see Appendix D, "Fauna List") have been identified in Tinker AFB ponds, streams, and wetlands. There are also several hybridized species and species strains that occur on Tinker AFB, such as the bluegill x redear sunfish (*Lepomis macrochirus* x *microlophus*) and rosy-red fathead minnow (*Pimephales promelas* 'Golden Strain'). In addition, several different species have been stocked as part of recreational sport fishing programs.

Fish Survey Collection Sites: Matthews, Marsh-Matthews, and Moody site sampling locations in 5 comparator streams along the North Canadian River for 2009 and 2010. TAFB is located in boxed portion of drainage basin.

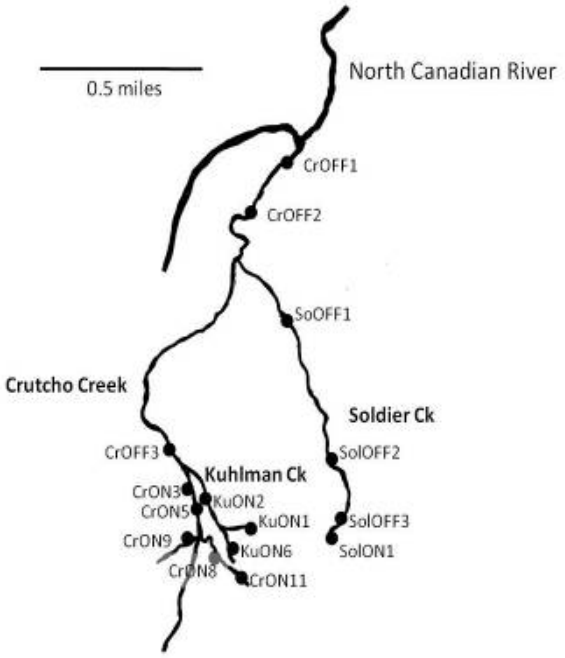
Historically, many Tinker AFB fish species were identified through sport fisheries management surveys, sporadic seining of streams, and fish kills. More recently however, class-specific surveys have been conducted for comparisons of fish in the entire CCDB, including Tinker AFB properties. The first of these surveys was started in 2005 by Lemmons and Moody. This comprehensive seasonal stream survey collected 4,732 individuals representing 20 species for the five sampling periods between August 2004 and June 2005.

At the end of the 2005 sampling period, researcher Lemons was unable to complete the survey. Thus, the survey was continued under cooperative agreement with the University of Oklahoma in 2009 by Marsh-Mathews, Mathews and Moody (2010).

Collection efforts and numbers of species collected increased from 2003 to 2011 within the CCDB (Lemmons and Moody, 2005 and Marsh-Mathews and Mathews, and Moody, 2010). Though earlier records of lower stream diversity, derived partly from significant total fish kill events in stream segments, are likely accurate and reflective of fish assemblages prior to 2003. Matthews and Gelwick (1990) survey of Crutcho Creek indicated lower species richness than what currently occurs in Crutcho Creek. In this early study, the two closest sampling locations (i.e., on Crutcho Creek just off Tinker AFB and at Soldier Creek at the convergence with Crutcho Creek where stream type and conditions were similar to on-base segments), had only 12 species present in collections. This is very similar to on-base historical records of 10 to 13 species being present in the early 1990s (e.g., Tinker AFB records). Matthews also indicated that game fish were rare, and piscivores, such as largemouth bass, were notably absent from their collections. Though suitable physical habitat for such piscivore species existed in the stream. Conversely, collections from Lemons and Moody (2005) had a species richness of 21 species, and all 12 of the species that were present in the 1990 study were found except for blue tilapia (*Tilapia aurea*). Numerous piscivorous species were also found during 2003-2005 including: largemouth bass (*Micropterus salmoides*), white crappie (*Pomoxis annularis*), channel catfish (*Ictalurus punctatus*), and spotted gar (*Lepisosteus oculatus*), all of which were not present in the 1990 study with the exception of channel catfish.

Particularly of note was the presence of spotted gar at two sites in the basin, on-base at Crutcho Creek and off-base in Soldier Creek (approximately 1 mile from convergence with Crutcho Creek). This represented a range extension for the spotted gar in the North Canadian River drainage basin (Miller and Robinson, 2004).

Most recently, the Marsh-Mathews, Mathews and Moody (2010) survey has collected 20 species from 4,732 individuals in nine different sites on Tinker AFB (see figure, "Fish Sampling Sites") and a total of 22,574 individuals of 25 species in the Crutcho Creek Drainage Basin. Additionally, 16 different off-base comparison streams were surveyed in order to assess Tinker AFB fish assemblage health. A total of 65,206 individuals were collected and 29 species were represented. The most abundant species found in the CCDB are very similar to those found in comparator streams (see table, "Most Common Fish Species"). In addition, the Lemmons and Moody survey (2005) found longear sunfish (*Lepomis megalotis*), red shiner (*Cyprinella lutrensis*), sand shiner (*Notropis stramenius*), fathead minnow (Pimephales promelas), and green sunfish (Lepomis cyanellus) dominated numerically. There were also numerous piscivorous species taken in these two studies such as the largemouth bass (*Micropterus salmoides*), white crappie (*Pomoxis annularis*), and spotted gar (*Lepisosteus oculatus*). These species were notably absent in the pre-1990 surveys. The most diverse (i.e., 14 species identified) sampling location on Tinker AFB within Crutcho Creek was CrON9, a segment just north of the historical Spaatz Dr. (i.e., road has been removed). This is likely the most natural creek segment and closest to pre-settlement conditions having a riparian canopy and little stream channel alteration. Diversity of fish species and richness in this segment is comparable to fish assemblages of similar Great Plains prairie streams (Matthews and Gelwick 1990).



Fish Sampling Sites: Eight Tinker AFB site sampling locations in the Crutcho Creek Drainage Basin and four off base. Site designations include the creek name abbreviations, number, and on/off base position.

Most Common Fish Species

Most Common Species Found in Crutcho Creek Drainage Basin and Comparator Streams			
Common Name	**Scientific Name**	**Proportion of Individuals Collected CCDB**	**Proportion of Individuals Collected Comparator Streams**
Red shiner	*Cyprinella lutrensis*	0.372	0.656
Sand shiner	*Notropis stramineus*	0.219	0.073
Golden shiner	*Notemigonus crysoleucas*	0.123	-
Longear sunfish	*Lepomis megalotis*	0.105	0.058
Bullhead minnow	*Pimephales vigilax*	0.061	0.066
Fathead minnow	*Pimephales promelas*	0.052	0.017
Bluegill sunfish	*Lepomis macrochirus*	-	0.032
Green sunfish	*Lepomis cyanellus*	0.029	-
Western mosquitofish	*Gambusia affinis*	0.018	0.058
Bluntnose minnow	*Pimephales notatus*	-	0.018

* Data 2009-2010 from Marsh-Matthews, Matthews and Moody (2010) study "Fishes of Crutcho Creek Drainage Basin"
- Indicates that proportion was below 1% but still found in collections

As part of these two studies (Lemmons and Moody, 2005 and Marsh-Mathews, Mathews and Moody, 2010), temporal patterns were statistically analyzed using Jaccard's index (JI) and percent similarity index (PSI) following methodology used by Matthews (1998). Analysis of species collected at all Crutcho Creek basin sampling sites showed qualitative similarity with JI ranging from an average 0.423 to 0.851 for all pair-wise comparisons between sampling dates. Mean JI of the averages was 0.621, indicating that overall the Tinker AFB Crutcho Creek system had a high degree of stability (Matthews 1998). Mean PSI averaged 0.754, which revealed that the permanent sampling sites had a high degree of similarity between sampling dates based on relative abundance of species. PSI was also calculated for the latest round of sampling (2009- 2010) for all CCDB sites and comparator sites and indicated a similar high score of 0.667. Matthews (1998) considers a PSI above 0.50 indicative of stable fish assemblage. Un-weighted pair-group using arithmetic means, cluster analysis, and detrended correspondence analysis was conducted on values confirming the results of PSI and JI analysis. Upon completion of these studies, results indicated fish assemblages in the Tinker AFB Crutcho Creek system are stable and similar to many other Mid-western fish assemblages (Lemmons and Moody, 2005 and Marsh-Mathews, Mathews and Moody, 2010).

Community ecology has been theorized and developed over many years and is necessary to the understanding and management of native communities both in prairies and streams. Leopold (1949-53) in his conservation classic, "Sand County Almanac", proclaimed that,"For the biotic community to survive, its internal process must balance, else its member-species would disappear." While this being foundational in ecology, the entire process and concepts have yet to play out. Over the early years, community ecology dynamics and concepts have developed from species-specific competition leading to stability (Gause, 1937 and Elton, 1946) to "resource partitioning" (Hardin, 1960) leading to balanced equilibrium to "fundamental niche" and "n-dimensional hypervolume" (Hutchinson, 1957) with many resource axes. Debate continued in more recent history over

"equilibrium vs. non-equilibrium" as it became better understood how stream communities fluctuate over time and in response to multiple variables and extreme events like floods and droughts (Grosman et.al., 1982 and Ross et.al., 1985). As a result of this progression and long-term fish studies, more modern fish community theory has taken on approaches of multivariate analysis such as stability and similarity indexes to describe fish communities as applied in Marsh-Matthews, Mathews and Moody (2010). While from these analyses Tinker's streams were determined to be "stable and similar", to other mid-western streams with new concepts in community ecology this description may fall short. Therefore, the base is continuing study efforts on Tinker streams in long-term studies with Marsh-Matthews and Matthews et.al., (2013, 2015 and 2016) to determine if Tinker's fish community falls within a proposed "Loose Equilibrium Concept" (LEC) as described in Matthew's book "Stream Fish Community Dynamics, a Critical Synthesis" (2017). These study efforts will provide a picture of fish community dynamics and natural variation in Tinker streams as a baseline for detecting fish community changes in the future, allowing recommendations for management and restoration of fish communities.

Effects of Climate Change on Fish and Wildlife

Fish and wildlife communities at TAFB are not expected to experience significant changes due to climate change. A substantial proportion of TAFB is developed, and most wildlife species on post are widespread generalists such as fox squirrels, eastern cottontails, opossums, raccoons, rodents, gray tree frogs, red-eared sliders, sunfish and minnows. Generalist wildlife species can tolerate a wide range of environmental conditions. Increasing temperatures at TAFB under all climate scenarios are not likely to impose direct threats to most of the wildlife species, but does raise concerns for indirect threats.

Migrating birds are an important and diverse component of wildlife communities found on the installation and may be especially vulnerable to indirect threats. Many birds time their migration routes to coincide with the springtime emergence of insects. Rising temperatures will prompt insects to emerge earlier, and birds migrating to or through TAFB could miss a major feeding opportunity that could result in decreased bird populations (Both et al., 2010). Long term changes in insect emergence could also change bird migration timing.

Changing climate also has the potential to alter vegetation communities, and these changes could have a negative impact on specialist fish and wildlife species that have historically depended on specific native plant communities for their survival (Dukes & Mooney, 1999).

Changing environmental conditions may also create open niches for non-native invasive species to expand onto TAFB. Newly arriving invasive species often have the ability to outcompete native species which are already experiencing reduced fitness due to environmental conditions shifting away from historic standards (Hellmann, Byers, Bierwagen, & Dukes, 2008). For example, if increased temperatures persist, red-imported fire ant populations could permanently surge northward across the state of Oklahoma causing catastrophic harm to native ant populations. This in-turn could negatively impact sensitive species on Tinker such as the Texas horned lizard, whose primary diet is native ants.

Rising temperatures could also result in the increased potential for foodborne diseases and incidences of infectious diseases of animals that are transmittable to humans, particularly those carried by foxes, rodents and arthropods such as rabies and West Nile virus (Parkinson & Butler, 2005).

Precipitation is projected to increase slightly but will possibly be offset by higher evapotranspiration rates due to increasing temperatures. Higher air temperatures can negatively impact water quality, particularly in lentic systems. As water temperatures rise in lentic systems, dissolved oxygen content decreases, impairing water quality particularly for larval amphibians and aquatic macroinvertebrates. Increasing water temperature can also increase the chances of algal blooms occurring, further depleting dissolved oxygen

content and degrading habitat quality (Paerl, Hall, & Calandrino, 2011). This could be of particular concern in areas on Tinker such as the golf course ponds which have historically experienced algal blooms.

While projections for annual precipitation forecast small increases in precipitation, summers are expected to become drier. Droughts will likely be more common, reducing water availability for fish and wildlife communities and increasing likelihood of wildland fires. Such shifts in environmental conditions could have particularly negative impacts on specialist or less common wildlife species such as bobcats, coyotes, beavers, muskrats and whitetail deer (Hellmann et al., 2008).

2.3.4 Threatened and Endangered Species and Species of Concern

Flora

No flora on Tinker AFB is classified as state or federal species of concern or proposed/listed as threatened or endangered. However, one rare species, the Oklahoma penstemon (*Penstemon oklahomensis*), does occur on Tinker AFB (see figure, "Oklahoma Penstemon in Full Bloom").

Oklahoma Penstemon in Full Bloom

Tinker AFB natural resources biologists use several web-based resources to assist in managing endangered, threatened, candidate, rare, and other sensitive flora species:

- Oklahoma Natural Heritage Inventory (ONHI) Plant Tracking List (2014)
  http://www.biosurvey.ou.edu/download/publications/NEWtrackinglist02212014.pdf
- Rare and Vulnerable Plant Species of Oklahoma (2011)
  http://www.oknaturalheritage.ou.edu/plants_rare_vulnerable.htm

The ONHI, a program administered by the state Oklahoma Biological Survey (a research unit of the University of Oklahoma), establishes and maintains lists of Oklahoma flora species based on their rarity. ONHI gives species and natural communities occurring in Oklahoma two ranks: a global (G) rank reflecting its rarity throughout the world, and a state (S) rank reflecting its rarity within Oklahoma. ONHI rarity rankings have no regulatory stature; however, this information has been included to aid Tinker AFB biologists in developing and prioritizing species and natural community management objectives. The following table (see table, "Oklahoma Natural Heritage Inventory (ONHI) Rare Flora") lists species that have been documented as occurring on Tinker AFB.

Oklahoma Natural Heritage Inventory (ONHI) Rare Flora

Common Name	Scientific Name	Global	State
Oklahoma penstemon	*Penstemon oklahomensis*	G3*	S3
Global Rank*			
G1	Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor of its biology making it especially vulnerable to extinction.		
G2	Imperiled globally because of its rarity (6 to 20 occurrences or few remaining individuals or acres) or because of other factors demonstrably making it vulnerable to extinction throughout its range.		
G3	Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range, or because of other factors making it vulnerable to extinction throughout its range; in the range of 21 – 100 occurrences.		
G4	Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.		
G5	Demonstrably secure globally though it may be quite rare in parts of its range, especially on the periphery.		
State Rank			
S1	Critically imperiled in Oklahoma because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor of its biology making it especially vulnerable to extinction.		
S2	Imperiled in Oklahoma because of extreme rarity (6 to 20 occurrences or few remaining individuals or acres) or because of other factors making it very vulnerable to extinction throughout its range.		
S3	Rare and local in Oklahoma (though it may be abundant at some of its locations); in the range of 21-100 occurrences.		
S4	Apparently secure in Oklahoma.		
S5	Demonstrably secure in Oklahoma.		

The Oklahoma penstemon is endemic to Oklahoma and north Texas and is found at several locations on Tinker AFB (see figures, "Historic Locations of Penstemon Colonies"). The penstemon is located in fragmented remnant native prairie communities, primarily in the southeast portion of Tinker AFB to include the airfield, Cyber Engineering Installation Group (CEIG, formerly EIG), leased land immediately adjacent to and south of Landfill 6. Another small population occurs in the northeastern portion of Glenwood.

The Oklahoma penstemon occurs only in Oklahoma and north Texas and is thus classified as rare globally. This species, also referred to as Oklahoma beardtongue, is a perennial cool-season forb that typically blooms in late April to early May. It is found in mixed native prairie and mixed native/non-native prairie areas on Tinker AFB. A large portion of the penstemon colonies on Tinker AFB are found on disturbed, non-native vegetation types.

Historical Locations of Penstemon Colonies (Glenwood)

Historical Locations of Penstemon Colonies (S.E. Portion of Tinker AFB)

Fauna

Tinker AFB natural resource biologists use several published resources to assist in managing endangered, threatened, candidate, rare, and other sensitive fauna species:

- U.S. Fish and Wildlife Service IPaC Trust Resource Report (2017)— Endangered and Threatened Species and Birds of Conservation Concern *https://ecos.fws.gov/ipac/*
- Oklahoma Natural Heritage Inventory Tracking List of Rare Oklahoma Vertebrates (2014-15) *http://www.oknaturalheritage.ou.edu/*
- NatureServe (2011) *http://www.natureserve.org/explorer/servlet/NatureServe?init=Species*

- Oklahoma Department of Wildlife Conservation (ODWC) Oklahoma Species List: Federally-listed, Proposed, Candidate, and Species Under Review (2017) *http://www.wildlifedepartment.com/wildlifemgmt/endangeredspecies.htm*

The following list is a compilation of documented and potential sensitive species on Tinker AFB. The table indicates their appropriate designations as threatened, endangered, or species of concern (S1, S2), or other designations. For sighting locations refer to "Species at Risk (SAR) Preferred Habitat Layer" in Section 7.4.

Species of Special Concern: Wildlife Species of Special Concern for Oklahoma County and Surrounding Tinker AFB Area.

Species of Concern in Oklahoma County (Wildlife)			
Common Name	**Scientific Name**	**Category**	**Observed on Tinker**
Federally Listed T & E Species			
Black-capped vireo	*Vireo atricapillus*	E	N
Least tern	*Sterna antillarum*	E	N
Townsend's big-eared bat (likely 'austrialis' Western sub species)	*Corynorhinus towsendii*	E	C?
Whooping crane	*Grus Americana*	E	N
Piping plover	*Charadrius melodus*	T	Y
Red knot	*Calidris canutus rufa*	T	N
Other Species of Concern			
Bald eagle	*Haliaeetus leucocephalus*	BGEPA	Y
Adler flycatcher	*Empidonax alnorum*	S2	Y
American avocet	*Recurvirostra Americana*	S2	Y
American bittern	*Botaurus lentiginosus*	S1S3	Y
American golden-plover	*Pluvialis dominica*	BCC	Y
Baltimore oriole	*Icterus galbula*	S2S4	Y
Bank swallow	*Riparia riparia*	S2	Y
Black-bellied plover	*Pluvialis squatarola*	S2	Y
Black vulture	*Coragyps atratus*	S2	Y
Bobolink	*Dolichonyx oryzivorus*	S2	Y
Burrowing owl	*Athene cunicularia*	S2	Y
Canada warbler	*Wilsonia canadensis*	S1	Y
Chestnut-sided warbler	*Denroica pensylvanica*	S2	Y
Chicken turtle	*Deirochelys reticularia*	S2	Y
Common poorwill	*Phalaenoptilus nuttallii*	S2	Y

Cooper's hawk	*Accipiter cooperii*	S2	Y
Dunlin	*Calidris alpina*	S2	Y
Green heron	*Butorides striatus*	S2	Y
Harris sparrow	*Zonotrichia querula*	BCC	Y
Hooded warbler	*Wilsonia citrina*	S2	Y
Horned grebe	*Podiceps auritus*	S2	Y
Lesser yellowlegs	*Tringa flavipes*	BCC	N
Little brown bat	*Myotis lucifugus*	S1	Y
Long-billed curlew	*Numenius americanus*	BCC	Y
Long-eared owl	*Asio otus*	S1	Y
Magnolia warbler	*Dendrocia magnolia*	S2	Y
Marbled godwit	*Limosa fedoa*	BCC	N
Migrant loggerhead shrike	*Lanius ludovicianus migrans*	S2,SG	Y**
Mountain bluebird	*Sialia currucoides*	S2	Y
Osprey	*Pandion haliaetus*	S2	Y
Ovenbird	*Seiurus aurocapillus*	S2	Y
Red-breasted nuthatch	*Sitta Canadensis*	S2	Y
Red-headed woodpecker	*Melanerpes erythrocephalus*	BCC	Y
Sandhill crane	*Grus canadensis*	S2	Y
Semipalmated sandpiper	*Calidris pusilla*	BCC	Y
Snowy plover	*Charadrius alexandrines*	GC	Y
Spotted sandpiper	*Actitis macularia*	S1S3	Y
Whip-poor-will	*Caprimulgus vociferus*	S2	Y
Silver-haired bat	*Lasionycteris noctivagans*	S2	Y
Smith's longspur	*Calcarius pictus*	BCC	N
Swamp sparrow	*Melospiza georgiana*	S2	Y
Texas horned lizard	*Phrynosoma cornutum*	CS, S2,SG	Y
Townsend's solitaire	*Myadestes townsendi*	S2	Y
Tree swallow	*Tachycineta bicolor*	S2	Y
Virginia rail	*Rallus limicola*	S1	Y
Whimbrel	*Numenius phaeopus*	S1	Y
Whip-poor-will	*Caprimulgus vociferus*	S2	Y
Willet	*Tringa semipalmata*	BCC	Y

Yellow-bellied flycatcher	*Empidonax flaviventris*	S2	Y

S2 or S1 - Species of Concern (state ranking). These species have been identified by technical experts as critically imperiled and possibly threatened of extirpation but for which additional information is needed (Oklahoma Natural Heritage Inventory).

SG – Species of Greatest Conservation Concern (Tier I) as identified in Oklahoma Comprehensive Wildlife Conservation Strategy (2016).

CS - Statewide closed season (state ranking). It is unlawful at any time to possess or to kill individuals of these species or to remove any individuals of these species from their natural habitats.

T - Threatened Species Federal listed. This species has been listed by technical experts as threatened of extirpation.

E - Endangered Species Federal listed. This species has been listed by technical experts as endangered of extirpation.

BCC – Birds of Conservation Concern listed by the USFWS IPaC Report 2018 for Tinker AFB Surrounding area

BGEPA – Bald and Golden Eagle Protection Act list by USFWS IPaC Report 2017

UC – Field identification unconfirmed with echolocation recordings

C? – *Corynorhinus townsendii* identified through echolocation recordings but Western vs. Ingens, endangered subspecies not confirmed

** Shrikes (*Lanius ludovicianus*) do occur on Tinker AFB, with the migrant race (i.e., *migrans*) potentially occurring.

Revised 29 March 2018

Based on the above sources, there are six federally listed threatened and endangered species that could potentially occur on base. Only one, the piping plover (*Charadrius melodus*), has been documented on base. This plover was found dead on Runway 36/18 on 11 May 2009, the result of a bird-aircraft strike. U.S. Fish and Wildlife Service (USFWS) and Oklahoma Department of Wildlife Conservation (ODWC) officials were contacted, and the plover was sent to verify identification. No other piping plovers have been observed loafing or foraging on Tinker AFB property before or after this strike. Three other threatened and endangered species—the least tern (*Sterna antillarum*), red knot (*Calidris canutus rufa*), and whooping crane (*Grus americana*) are listed by the USFWS IPaC Report as potentially occurring in the Tinker AFB area but have not been observed on or flying over Tinker AFB. Two additional listed species that may potentially occur on or near Tinker AFB are the Black-capped vireo (*Vireo atricapillus)* and the Townsend's big-eared bat (*Corynorhinus towsendii* 'ingens'). The bat was identified as potentially occurring through echolocation monitoring by the University of Montana. However, their recordings couldn't verify whether the calls were from the Western 'australis' or the Ozark 'ingens' subspecies which is listed. The "ingens" subspecies range is limited to eastern Oklahoma and western Arkansas and therefore outside its typical range (Piaggio and Perkins 2005). In addition the USFWS has indicated that the Western 'australis' species is likely the subspecies that was recorded and would be more likely to be found on Tinker AFB (letter from USFWS, May 2020). Habitat for the Black-capped vireo is absent on the base, so its presence is unlikely. It should also be noted that Bald Eagles protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668) frequent Draper Lake in the winter months and have been observed feeding and hunting on the lake.

The USFWS IPaC Report also lists 9 species of birds as "Birds of Conservation Concern" potentially occurring in the Tinker AFB area. Of these, 6 have been identified on Tinker AFB. Thirty-eight State Species of Special Concern have been identified on the base.

2.3.5 Wetlands and Floodplains

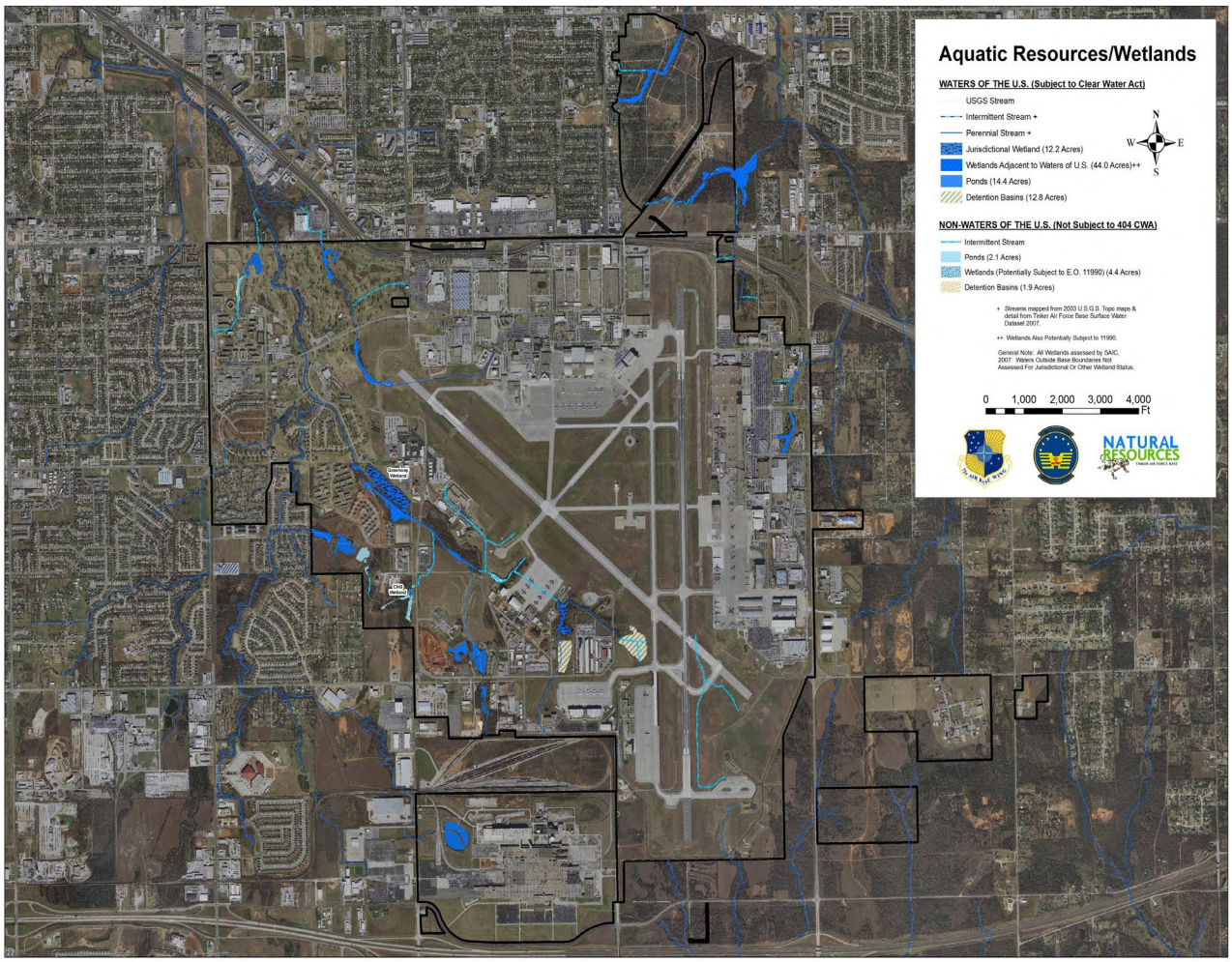
Wetlands

In 1995, approximately 65 wetland acres were identified on Tinker AFB by the U.S. Fish and Wildlife Service (USFWS) using National Wetland Inventory (NWI) criteria. This included creeks, ponds, drainage swales, and other wet areas.

Of the original 65 acres identified using NWI methodology, five wetland areas: 1) the Ground Water Treatment Plant (GWTP) Wetland (0.63 acres); 2) Fuel Control Facility Wetland (0.8 acres); 3) Greenway Wetland (8.64 acres); 4) Compressed Natural Gas (CNG) Wetland (0.34 acres); and 5) the Glenwood Wetland (1.5 acres, on-base portion only) were classified by the U.S. Army Corps of Engineers (USACE) as jurisdictional wetlands under the Clean Water Act. An additional contiguous off-base portion (8.5 acres) of the Glenwood wetland, which was located immediately east of Tinker AFB on county and private land, was also classified as jurisdictional.

During wetland monitoring in 2007, Science Applications International Corporation (SAIC) identified another jurisdictional wetland below and north of Fire Detention Pond (SAIC, 2008). This wetland likely developed from improper sizing of drainage pipes under the 507th ramp, which caused water to routinely back up into this wooded area. All jurisdictional wetlands on Tinker AFB were man-made with the exception of the Glenwood wetland, which was created by beaver.

Aquatic Resources (Wetlands) of Tinker AFB: Jurisdictional and non-jurisdictional wetlands on Tinker AFB (includes jurisdictional status of Tinker surface waters).



Floodplains

Tinker's 100- and 500-year floodplain boundaries were updated by the U.S. Army Corps of Engineers in 2002 (USACE, 2002) (see figure, "Tinker AFB Floodplains"). The 100- and 500-year floodplains combined comprise approximately 462 acres (100-year = 426.74 acres; 500-year = 35.55 additional acres). The majority of the floodplain, with the exception of Reserve 1 within the Urban Greenway is classified as improved grounds (i.e., facilities, roads, ramps, or highly maintained areas such as lawns, athletic fields, golf course, where personnel perform intensive maintenance). Much of the floodplain is therefore in an altered and impaired condition.

Effects of Climate Change on Flooding

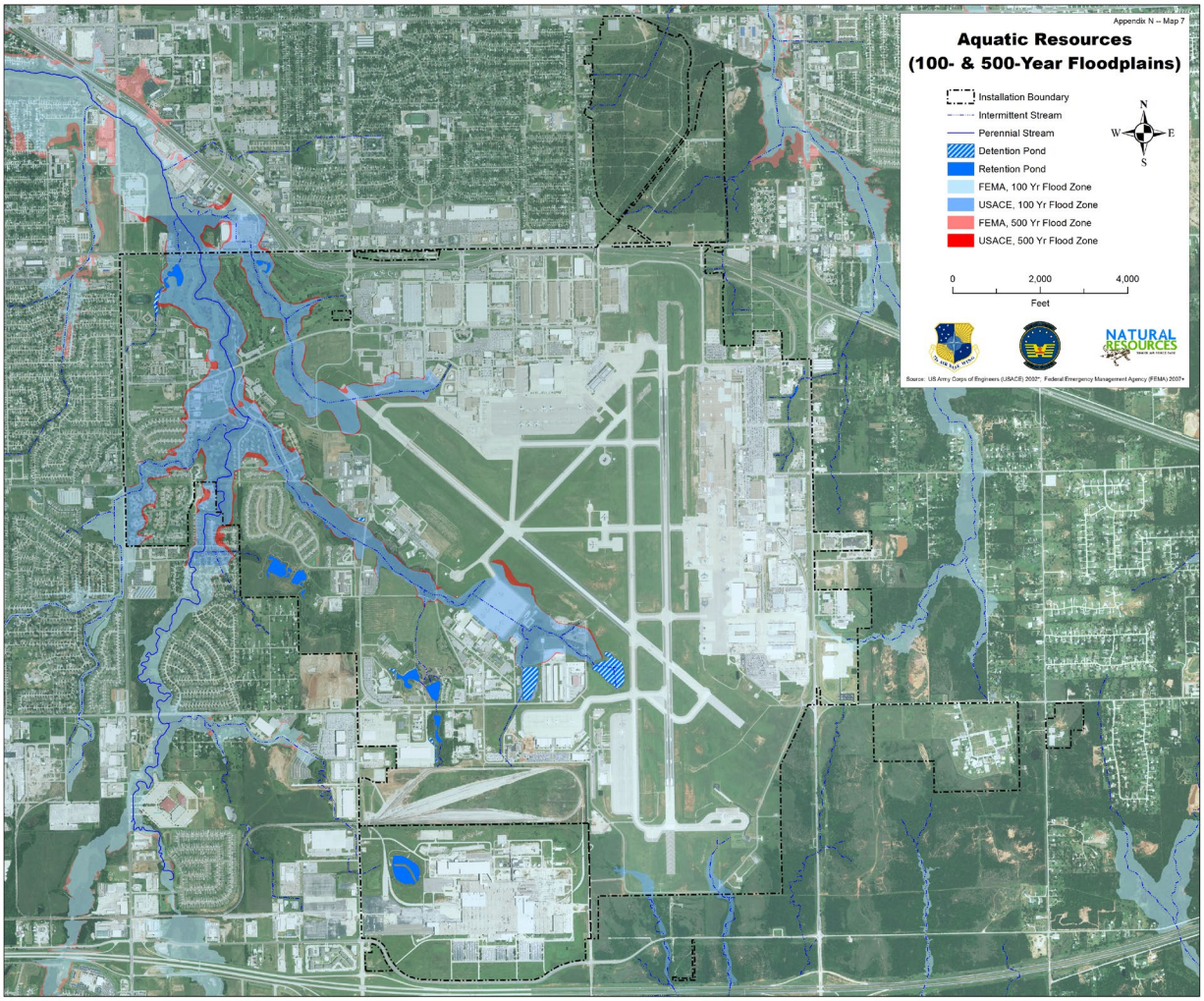
Associated with climate projections, modeling of stream channel overflow (or flood modeling) was conducted along Crutcho Creek in 2019 to examine the extent of flooding. Flood modeling was conducted using local watershed characteristics and the design storms generated from climate projection data. Floodplain modeling did not consider flooding of independent surface bodies, stormwater systems, or surface ponding. The projected design storms do not represent extreme weather events (e.g., hurricanes, extraordinary storm fronts). Inundation projections were influenced by four variable inputs: (1) variation in total precipitation between design storms, (2) variation between the daily distribution of precipitation over the three-day period, (3) land cover change over the watershed area used in hydrologic modeling, and (4) land cover change in the area within the installation used in hydraulic modeling.

Projected inundation associated with each climate scenario and the relative change from baseline conditions are summarized in table, "Projected Inundation from Stream Channel Overflow". In 2030, stream channel overflow is under the RCP 4.5 emission scenario is projected to not change from baseline conditions while under the RCP 8.5 emission scenario, inundation is projected to decrease by 15%. In 2050, inundation is projected to increase by 16% under the RCP 4.5 scenario but decrease by over 70% under the RCP 8.5 scenario. Land cover over the Crutcho Creek watershed is projected to be dominated by woodland/forest under the RCP 8.5, 2050 climate scenario, affecting runoff and inundation estimates.

The spatial extent of projected flooding is depicted in a series of maps included in Tab 8, Appendix C. In 2030, stream channel overflow is under the RCP 4.5 emission scenario is projected to not change from baseline conditions while under the RCP 8.5 emission scenario, inundation is projected to decrease by 15%. In 2050, inundation is projected to increase by 16% under the RCP 4.5 scenario but decrease by over 70% under the RCP 8.5 scenario. Land cover over the Crutcho Creek watershed is projected to be dominated by woodland/forest under the RCP 8.5, 2050 scenario, affecting runoff & inundation estimates.

Projected Inundation from Stream Channel Overflow

	Baseline	RCP 4.5		RCP 8.5	
	2000	2030	2050	2030	2050
Projected inundation (acres)	190.3	190.3	221.1	161.4	51.6
Change in inundation area from baseline (acres)		0	30.8	-28.9	-138.7
Percent change from baseline		0%	16%	-15%	-73%



Tinker AFB Floodplains: 100- and 500-year floodplain delineations and associated streams for Tinker AFB and adjacent communities (USACE, 2002)

2.3.6 Other Natural Resource Information

This section is reserved for other miscellaneous natural resources management information as needed.

2.4 Mission Impacts on Natural Resources

2.4.1 Natural Resource Constraints to Mission and Mission Planning

Currently, the primary potential natural resources constraint to future development and mission expansion on Tinker is flooding. As development continues on and off base, and if forecasted climate changes materialize, particularly the 2050 RCP 4.5 scenario, the quantity and intensity of flooding events on Tinker are anticipated to increase. This would negatively impact Tinker's mission, damaging much infrastructure. And, if Tinker expands into flood zones, unmitigated, it would exacerbate flooding impacts on downstream

off-base communities such as Midwest City. Therefore, proper floodplain management is essential. Execution of Tinker's Green Infrastructure Plan counters this threat and will ensure the military mission is resilient and not hampered by future flood events.

Other potential future climate-related impacts to the Tinker mission include:

- unsafe environmental conditions for the launch of current and planned weapons and equipment, resulting in increased maintenance requirements, need for new equipment, or decreased launch capacity due to increased temperatures and wind velocities (DoD, 2014);
- disruption in underground utility services due to pipe damage caused by expanding/contracting clay soils as the result of increased temperatures and droughts;
- increased dust generation effecting equipment and visibility due to high winds (DoD, 2014);
- damaged infrastructure due to increased wind velocities (Sydeman et al., 2014);
- potential degradation of realistic training sites due to loss of certain vegetation types;
- difficulty in cooling Information Transfer Node Systems (ITNS) due to high temperatures;
- reduced production due to tightened work-rest regimes caused by high temperatures;
- damage to infrastructure such as asphalt roadways due to high temperatures and droughts;
- disruption to field training due to invading fire ants caused by warmer temperatures
- disruption to military activities caused by the listing of species such as the Texas horned lizard as threatened or endangered (due to expansion of fire ant population which could negatively impact the lizard population regionwide).

In addition to these direct effects, climate change has the potential to disrupt the acquisition and transportation of materials required for the maintenance, construction, and storage of the equipment required for these systems (DoD, 2014).

Another potential natural resources-related impact that could restrict or complicate Tinker's future flying mission is the proposed development of West Elm Creek Reservoir immediately adjacent to the west of Lake Stanley Draper. If this reservoir were built, bird/wildlife aircraft strike hazards would be expected to rise.

2.4.2 Land Use

Tinker AFB is approximately 90% developed. Refer to Grounds Maintenance Land Use Classification map in Section 2.0 (Installation Profile) for general distribution of land uses.

2.4.3 Current Major Impacts

Prior to the construction of Tinker AFB, much of the land it presently occupies had been converted from native grassland to scattered farmsteads and agricultural land (e.g., farming and grazing). These new land uses significantly altered and degraded the area's natural resources and the functioning of natural systems. Subsequent military buildup and activities and surrounding off-base urbanization further impacted flora, fauna, soil, and water resources on and near the installation. In general, the most significant post-agricultural impact to natural resources on Tinker AFB has been the further displacement or degradation of native plant and animal communities as the result of facility/airfield development, noise, human activity, and other urban and industrial influences. Other impacts include the introduction of pollutants into the environment such as surface and groundwater, and disturbance of native soil conditions due to dense industrial and urban development.

Today, the majority of military operations and activities are conducted within facilities on the industrial portions of Tinker AFB as opposed to on the few remaining undeveloped land fragments. However, small

scale on-the-ground training is conducted in some undeveloped areas, primarily in the Glenwood Training Area. The Glenwood area is comprised of approximately 280 acres and is located off the end of the north-south runway. It was formerly a residential area, but because of aircraft safety concerns houses were removed in the 1970s. The roadways were left intact. Therefore, the native natural resources in Glenwood have been substantially disturbed. Only the southeast and northeast corners of the area have remained undeveloped. Current activities in the Glenwood area consist primarily of ground troop skills training and war exercises such as firefights and convoy training. These involve the use of foxholes and mock munitions such as smoke canisters and ground burst simulators. Other field training includes orienteering courses, major accident response exercises, search and rescue training, and local municipality police department pursuit training. Most of the vehicular training is conducted on established paved roadways. Impacts to natural resources by these activities are primarily related to wildlife which would be impacted by noise and the presence of troops and vehicles. However, considering the previous residential disturbance to the area prior to Tinker AFB occupation, training in this area is believed to have relatively little additional impact on natural resources.

Early Construction of Tinker AFB: Farmland is rapidly converted to industrial and airfield land uses in the 1940s.

Early Construction of Tinker AFB: Establishment of farmland and subsequent construction of Tinker's airfield in 1941 led to almost complete removal of the original native prairie community.

Early Construction of Tinker AFB: Workers sprigging airfield with exotic Bermuda grass in 1941.

2.4.4 Potential Future Impacts

Future development on and surrounding Tinker AFB would, if not properly planned, negatively impact native floral and faunal communities. Habitat loss and fragmentation would decrease biodiversity. The

Tinker AFB Green Infrastructure Plan recommends where to develop and where not to develop so as to limit negative impacts to natural resources as land is militarized. This plan encourages similar development practices on off-base land adjacent to the base. Also, a strong mitigation program would lessen the impacts of development on natural resources (see appendix, "Mitigation Action Tracker," for past and ongoing mitigation efforts on Tinker). The Oklahoma Southeast Sector Plan and Tinker Installation Development Plan contain further information on future development patterns on and surrounding Tinker AFB.

2.4.5 Natural Resources Needed to Support the Military Mission

Soil resources are in many ways foundational to sustained military operations on Tinker AFB. Soil is used to build up and level ground to permit infrastructure development across Tinker AFB. Quality soil is particularly valuable in controlling erosion on sloped terrain. Proper management and soil use can lead to tremendous cost savings for Tinker AFB projects. For example, in the mid-1990s, clay was excavated from two locations on Tinker AFB and used to cap three on-base landfills. This saved $500,000 by reducing soil and hauling costs.

Additionally, excavated sites were developed into ponds within Tinker's Urban Greenway which have enhanced warfighter quality of life. Soil provides the primary medium for vegetation growth, a critical ecological and aesthetic function. Fertile, properly managed soils will grow suitable vegetation for the airfield environment, golf course, and other areas. Improper management of soil could lead to erosion which in-turn could result in water quality notices of violation, thereby restricting military operations on Tinker AFB.

Vegetation is connected to the military mission in many ways. By protecting and increasing the distribution of the Oklahoma penstemon, Tinker AFB is doing its part to ensure state penstemon populations stay healthy and thrive. Currently, penstemon-related land use restrictions on Tinker AFB are minimal. However, if the state penstemon population were to go into decline and the plant became a federally listed threatened or endangered species, restrictions on land use could become much more stringent. It behooves the military to keep these populations healthy, thereby precluding listing and keeping land available for military use.

Vegetation also provides sites for realistic training exercises such as at Glenwood. Vegetation provides free ecological services (such as water filtration and soil stabilization) and enhanced aesthetics. The base Urban Greenway improves quality of life for the warfighter and his or her family. For example, many families use the Greenway's natural backdrop for family photos. Refer to "Green Infrastructure Benefits" in the Green Infrastructure Plan appendix for additional information on the importance of Tinker's vegetation resources to the military mission.

Fish and wildlife also support the military mission by supporting airmen, their families, and guests. Fish provide for inexpensive, close-to-home angling. Wildlife provide outdoor opportunities such as wildlife viewing and photography. Wildlife also support future military missions in less apparent ways. For the last nine years, Tinker AFB has partnered with various universities, organizations, and agencies to conduct research and provide considerable information on morphology, behavior, demographics, and ecology of Texas horned lizards in an urban environment. This fosters informed management of the species on Tinker AFB, in Oklahoma, and across the lizard's range. Improved management, in turn, promotes more robust populations and lessens the likelihood of federal or state listing as a threatened or endangered species. Preventing the listing of species reduces or eliminates potential land use restrictions on private and government lands, including installations within the geographic range of the lizard. Development of translocation methodology could also provide a means for mitigation when loss of horned lizard habitat on

base is unavoidable. Mitigation measures could prove an important factor for survival of the lizard if current development trends continue. These measures would also be valuable tools for private and public entities that have unavoidable land use changes or activities within areas of horned lizard habitat.

Active community-wide involvement in the natural resources program can contribute to a stronger military. When the people of Tinker AFB and surrounding communities take pride and ownership in their natural resources, the natural environment will become the best it can be. Ultimately, a healthier environment will make for a healthier people which in-turn translates into a healthier and stronger support of our national defense.

3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The AF environmental program adheres to the Environmental Management System (EMS) framework and its "Plan, Do, Check, Act" cycle for ensuring mission success. Executive Order (EO) 13693, *Planning for Federal Sustainability in the Next Decade*; U.S. Department of Defense Instruction (DoDI) 4715.17, *Environmental Management Systems*; AFI 32-7001, *Environmental Management;* and international standard, ISO 14001:2004, provide guidance on how environmental programs should be established, implemented, and maintained to operate under the EMS framework.

The natural resources program employs EMS-based processes to achieve compliance with all legal obligations and current policy drivers, effectively managing associated risks, and instilling a culture of continuous improvement. The INRMP serves as an administrative operational control that defines compliance-related activities and processes.

Environmental Compliance Assessment and Management Program (ECAMP) Inspection

The Tinker AFB natural resources program has been routinely evaluated via internal and external ECAMP inspections to identify and correct deficiencies. Through Air Force self-inspection, ECAMP essentially provides a "snap shot" of Tinker's compliance, or lack of compliance, with federal, state, and local natural resources laws and regulations, executive orders, DOD/Air Force policies and instructions, and other requirements.

As part of the INRMP annual review, natural resources staff will conduct a Stage 2 self-inspection using federal, Air Force, and state ECAMP inspection protocols and other internal checklists as applicable to ensure compliance is maintained with the aforementioned regulatory requirements. Findings will be documented on the following form: "Tinker AFB Finding and Corrective Action Worksheet." Completed forms will be submitted to the Tinker ECAMP program manager who will notify the noncompliant/compliant organization, track corrective actions, and brief at Environmental, Safety, and Occupational Health (ESOH) and EMS cross-functional team meetings. Also, for identification and tracking purposes, findings will be listed in this section of the INRMP. As appropriate, corrective action plans will be incorporated into INRMP work plans or submitted as job orders/work requests for corrective action.

Finding NR-1 (2018): Out-of-play areas *targeted* for future prairie/woodland restoration in the Golf Course Environmental Management (GEM) Plan have been allowed to grow without any maintenance (e.g., periodic mowing). This has resulted in the establishment and spread of invasive species such as Siberian and lacebark elm trees. This is not consistent with federal Executive Orders 13112, Invasive Species, and 13751, Safeguarding the Nation from the Impacts of Invasive Species. If trees are permitted

to continue to grow, future removal will require significant financial expenditures. (Responsible organization: 72 FSS/FSCG—golf course)

Corrective Action: 72 ABW/CEIEC received Air Force funding in FY2019 to remove all invasive trees and restore the out-of-play areas back to native prairie. Conservation and golf course staff have scheduled this work to be executed between Sep 2019 and Sep 2023. Invasive Plant Control, Inc. initiated Phase 1 (cutting, treating, and chipping invasive trees) in Sep 2019. **(Finding Status: CLOSED 9 Nov 2019)**

Finding NR-2 (2018): 50 CFR 21 states that no person may take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such bird without a permit. The Tinker natural resources function possesses migratory bird feathers, nest, and egg without the proper federal permit.

Corrective Action: All migratory bird feathers, nest, and egg were collected and delivered to the US Fish and Wildlife Service (USFWS) law enforcement office in Edmond, OK on 15 May 2018. These will be transferred to the USFWS Ecological Services Field Office in Tulsa or other conservation agency where they will be used for educational purposes. (Responsible organization: 72 ABW/CEIEC—natural resources function) **(Finding Status: CLOSED 15 May 2018)**

Finding NR-3 (2019): DoDI 4715.03 states, "…forest products shall not be given away, abandoned, carelessly destroyed, used to offset contract costs, or traded for services, supplies, or products, or otherwise improperly removed," and AFI 32-7064 states, "Do not give away, abandon, or destroy forest products with marketable value…Forest products may not be traded for goods or services nor used to offset contract costs associated with construction, land clearing, or other contracted activity."

Five known instances of improper reclamation of merchantable wood occurred on Tinker in 2019: 1) the Tinker grounds maintenance contractor (Trace) felled merchantable trees on the base and loaded them in roll-offs, where they were hauled off base and disposed at a landfill; 2) a contractor removed trees associated with new parking lot construction and did not transport them to the base Forest Product Staging area though required by Section 00720 specification; 3) Trace felled trees at B-9001 parking lot islands where the trees were partially pilfered by base employees; 4) storm-damaged trees are not being reclaimed and are being improperly stockpiled/staged for disposal at the Tinker golf course, and 5) processed firewood is being pilfered from the unsecured base forest product staging area west of Building 1156.

Corrective Action: TBD

4.0 GENERAL ROLES AND RESPONSIBILITIES

General roles and responsibilities that are necessary to implement and support the natural resources program are listed in the table below. Specific natural resources management roles and responsibilities are described in appropriate sections of this plan.

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
Installation Commander	• Approves the INRMP • Certifies the annual review of the INRMP as valid and current; or delegates the certification of the review to the appropriate designee

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
	• Provides appropriate funding and staffing to ensure implementation of the INRMP • Controls access to and use of installation natural resources • Signs Findings of No Practicable Alternative (FONPA) for actions within a wetland or 100-year floodplain • Signs cooperative agreements entered into pursuant to the Sikes Act, 16 USC § 670c-1
AFCEC Natural Resources Media Manager/Subject Matter Expert (SME)/ Subject Matter Specialist (SMS)	• AFCEC Natural Resources Media Manager (TAFB)—Christopher White (provides base-level support to ensure natural resources program execution in accordance with the Sikes Act and other regulatory requirements). • AF Subject Matter Expert—Kevin Porteck • AF Subject Matter Specialist—Paul Jurena
Installation Natural Resources Manager/POC	• Natural Resources Manager—John Krupovage (provides program oversight to ensure no net loss in capability of AF lands to support the military mission while sustaining the long-term ecological integrity of natural resources and the ecosystem services they provide) • Natural Resources Biologist—Raymond Moody (serves as lead biologist in support of natural resources management on Tinker AFB).
Installation Security Forces	• Enforces fish and wildlife laws and regulations and supports other conservation requirements
Installation Unit Environmental Coordinators (UECs)	• Serve as conduit between natural resources function and their unit • Ensure units comply with natural resources policies, regulations, laws, and other conservation requirements
Installation Wildland Fire Program Manager	• Dually managed by Tinker AFB Fire Chief & Natural Resources Manager
Pest Manager [Integrated Pest Management (IPM) Coordinator]	• Oversees all aspects of the installation Integrated Pest Management Plan to include as related to in-house, contracted, and out-leased natural resources operations
Range Operating Agency	• Not applicable
NEPA/Environmental Impact Analysis Process (EIAP) Manager	• Ensures proposed federal actions are analyzed to determine, document, and disclose impacts to the environment (to include natural resources)
National Oceanic and Atmospheric Administration (NOAA)/ National Marine Fisheries Service (NMFS)	• Not applicable
US Forest Service	• Not applicable
US Fish and Wildlife Service	• Enforces federal fish and wildlife laws • Supports federal fish and wildlife conservation efforts

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
	• Serves as the primary federal party of the Sike's Act-mandated tripartite core group for cooperative INRMP development, review, signature, and implementation to meet Sikes Act goals.
Oklahoma Department of Wildlife Conservation	• Enforces state fish and wildlife laws • Supports fish and wildlife conservation efforts • Serves as the primary state party of the Sike's Act-mandated tripartite core group for cooperative INRMP development, review, signature, and implementation to meet Sikes Act goals.
Base Civil Engineer	• Oversees execution, advocates for, and allocates resources in support of the base natural resources program • Ensures Civil Engineering natural resources function is appropriately staffed with trained natural resources personnel • Provides appropriate training/continuing education to ensure implementation of the INRMP
Civil Engineering Asset Management Natural Resources Function	• Serves as the lead and technical representative for the installation natural resources program to include but not limited to fish and wildlife, green infrastructure, urban forest, floodplains, wetlands, agricultural lands, and natural resources-related activities such as hunting and fishing • Develops and publishes INRMP to ensure compliance with local, state, and federal laws, federal executive orders, and Department of Defense and Air Force regulations • Identifies and programs resource (budget) requirements • Conducts annual INRMP review with collaborating state and federal agencies • Serves as the liaison with external stakeholders on installation natural resources issues that may also require coordination with Public Affairs and/or Judge Advocate • Serves as the primary Civil Engineering representative on the Bird/Wildlife Aircraft Strike Hazard Committee • Manages contracts, inter-agency agreements, and cooperative agreements for implementation of natural resources projects • Coordinates with installation contracting officer to ensure appropriate environmental requirements are included in contracts and communicate to contractors potential natural resources impacts
Environment, Safety, and Occupational Health Council	• Reviews INRMP major revisions • Ensures represented organizations are familiar and compliant with natural resources stewardship goals,

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
	objectives, policies, and other requirements as outlined in the INRMP
Tenant Unit Commanders	• Ensure unit environmental coordinator and unit personnel support and comply with natural resources stewardship goals, objectives, policies, and other requirements as outlined in the INRMP
Staff Judge Advocate	• Review proposed federal natural resources laws and regulations for potential impacts to Tinker AFB and communicate potential impacts • Keep Civil Engineering natural resources function apprised of new natural resources laws and regulatory requirements • Provide legal advice on natural resources issues
Public Affairs Office	• Supports the installation natural resources function as liaison between the installation and external communities • Supports the installation natural resources function though internal media publications and communications
Airmen	• Every Airmen (military, civilian, and contractor), including family members and visitors, is responsible for the stewardship of natural resources on and adjacent to Tinker AFB

5.0 TRAINING

AF installation NRMs/POCs and other natural resources support personnel require specific education, training and work experience to adequately perform their jobs. Section 107 of the Sikes Act requires that professionally trained personnel perform the tasks necessary to update and carry out certain actions required within this INRMP. Specific training and certification may be necessary to maintain a level of competence in relevant areas as installation needs change, or to fulfill a permitting requirement.

Installation Supplement – Training

Natural resources management training is provided to ensure that base personnel, contractors, and visitors are aware of their role in the program and the importance of their participation to its success. As appropriate, training records are maintained IAW the Recordkeeping and Reporting section of this plan. Below are key NR management-related training requirements and programs:

- Tinker AFB is a Category I installation which requires NRMs to take the course*, DoD Natural Resources Compliance,* endorsed by the DoD Interservice Environmental Education Review Board and offered for all DoD Components by the Naval School, Civil Engineer Corps Officers School (CECOS). The present Tinker NRM completed this course in August 1998.
- Natural resource management personnel at Tinker AFB routinely attend appropriate national, regional, state, and local conferences, seminars, and training courses. Some attended include:
    - Oklahoma's Biodiversity Conference
    - Bird/Wildlife-Aircraft Strike Hazard Workshop

  - Stream and River Corridor Management
  - Wetlands Regulation Conference
  - Watchable Wildlife Conference
  - DOD Legacy Workshop on Riparian Ecology, Restoration, and Management
  - Tree City USA National Conference
  - DOD/Interagency Workshop on Technologies to Address Soil Erosion on DOD Lands
  - Midwest Oak Savannah and Woodland Ecosystem Conference
  - Conference on Conservation and Ecology of Grassland Birds
  - An Approach to Ecosystem Conservation
  - Principles and Techniques of Electrofishing
  - Volunteer Recruitment and Management
  - Building Community Support
  - GIS Introduction for Conservation Professionals
  - The Excellence in Leadership Certificate Program
  - How to Become a Great Communicator/How to Make Presentations with Confidence and Power
  - Effective Facilitation
  - Strategic Conservation Planning Using a Green Infrastructure Approach
  - Air Force Landscape Architecture and Sustainability Training Workshop
  - DOD Pest Management Quality Assurance Evaluator Course
  - Wildland Fire Fighter training (S-190 Introduction to Fire Behavior)
  - Wildland Fire Fighter training (S-130 Introduction to Fire Fighting)
  - Wildland Fire Fighter training (S-131 Firefighter Type 1)
  - National Military Fish and Wildlife annual meetings/training workshops
- Natural Resources staff periodically host in-house training workshops for staff, volunteers, contract monitors, and others to ensure consistent, quality, and safe execution of natural resources activities such as tree care and chainsaw use. Field and classroom instruction is provided by professionals such as the Oklahoma state urban forester and the Oklahoma County Extension Agent.
- Natural Resources staff routinely tour/brief base personnel such as Employee Enhancement Program participants, Supervisor Development Program students, and others to communicate the base conservation mission and vision. It is a routine practice to conduct a field tour for all new Air Base Wing commanders and vice commanders upon their assumption of duties.
- Pest management personnel who capture and handle nuisance wildlife on TAFB must pass an ODWC Nuisance Wildlife Control Operator's course which qualifies them to possess the requisite state Nuisance Wildlife Control Operator's license.
- All individuals who will be enforcing fish, wildlife and natural resources laws on AF lands must receive specialized, professional training on the enforcement of fish, wildlife, and natural resources in compliance with the Sikes Act. This training may be obtained by successfully completing the Land Management Police Training course at the Federal Law Enforcement Training Center (http://www.fletc.gov/).
- USDA Wildlife Services and the Pest Management Shop support the BASH program. Both are flight line driver's-trained. USDA staff are degreed in wildlife biology which includes bird identification. USDA receives initial airport wildlife control training; advanced training in mitigating wildlife hazards at airports; Immobilization and Euthanasia training; and annual component training for firearms. Others, such as Base Operations, who are authorized to haze wildlife are periodically trained in pyrotechnic use.

6.0 RECORDKEEPING AND REPORTING

6.1 Recordkeeping

The installation maintains required records IAW Air Force Manual 33-363, *Management of Records*, and disposes of records IAW the Air Force Records Information Management System (AFRIMS) records disposition schedule (RDS). Numerous types of records must be maintained to support implementation of the natural resources program. Specific records are identified in applicable sections of this plan, in the Natural Resources Playbook and in referenced documents.

Installation Supplement – Recordkeeping

Natural resources records are maintained on the Electronic Records Management System (ERMS), on natural resources staff computers through the base network, and on some hard copy documents.

6.2 Reporting

The installation NRM is responsible for responding to natural resources-related data calls and reporting requirements. The NRM and supporting AFCEC Media Manager and Subject Matter Specialists should refer to the Environmental Reporting Playbook for guidance on execution of data gathering, quality control/quality assurance, and report development.

Installation Supplement –Reporting

Natural resources-related reporting consists of the following:

- Depredation at Airports Migratory Bird Permit Renewal & Permit Questions (annual—Natural Resources Function permit holder to USFWS)
- Depredation Permit Review WS Form 37 (annual—USDA Wildlife Services Biologist to Natural Resources Function)
- Depredation Annual Report Form 3-202-9 (annual—USDA Wildlife Services Biologist to Natural Resources Function)
- Scientific Collectors Permit Application and Collection Report (annual—Natural Resources Function license holder to ODWC)
- Nuisance wildlife trapping report (annual—Pest Management Shop to ODWC)
- Tree City USA recertification (annual—Natural Resources Function to Oklahoma Department of Agriculture, Forestry Services)
- Management Internal Control Toolset (MICT) reporting
- Natural Resources Program Annual Report (annual—Natural Resources Function to Sikes Act tripartite core group, i.e., Air Base Wing Commander, USFWS, and ODWC)

Natural resources data calls typically include:

- Deputy Assistant Secretary of Defense (DASD) Environmental Safety and Occupational Health (ESOH) Semi-Annual Environmental Quality (EQ) Data Call (semi-annual—Natural Resources Function to AFCEC)
- AF Forestry/Agriculture/Fish & Wildlife Reimbursable Natural Resources Program Operating Budget (annual—Natural Resources Function to AFCEC)

7.0 NATURAL RESOURCES PROGRAM MANAGEMENT

This section describes the current status of the installation's natural resources management program and program areas of interest. Current management practices, including common day-to-day management practices and ongoing special initiatives, are described for each applicable program area used to manage existing resources. Program elements in this outline that do not exist on the installation are identified as not applicable and include a justification, as necessary.

Installation Supplement –Natural Resources Program Management

No Installation Supplement

7.1 Fish and Wildlife Management

Applicability Statement

This section applies to all AF installations that maintain an INRMP. The installation is required to implement this element.

Program Overview/Current Management Practices

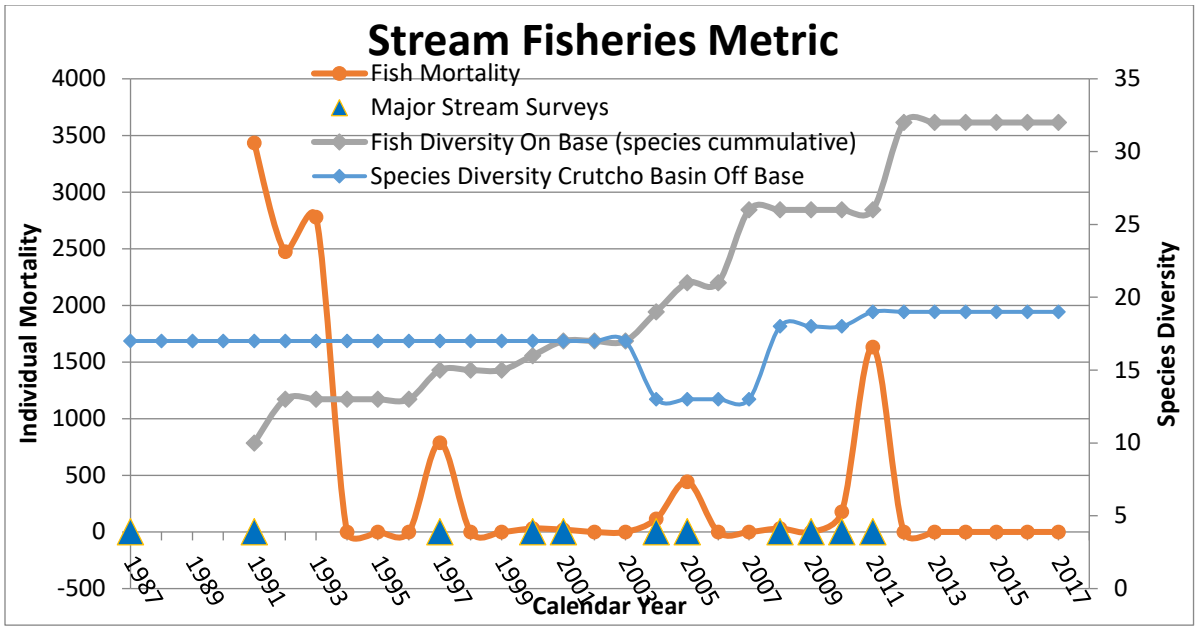
Tinker AFB is classified as a Category 1 installation (i.e., has suitable habitat for conserving and managing fish and wildlife) by AFI 32- 7064. Therefore, management of flora and fauna under specific management plans has been on-going since the first plan was published in the 1980's. Since that time, several iterations of this plan have been accomplished by in-house natural resources staff. In general, the habitat and management strategies have focused on increasing floral and faunal abundance and diversity, with the exception of the airdrome where the opposite strategy is employed. This strategy implements directives to conduct ecosystem management while, where appropriate, decreasing the potential for bird/wildlife aircraft strikes. Surveys have shown this strategy is working—species richness and diversity are indeed higher in green space areas and notably lower on and near the airfield and industrial areas (Bogosian, et al., 2012).

The overarching fish and wildlife management strategic aim is to provide a healthy native ecosystem which does not conflict with, but supports, the military mission. For example, fish and wildlife management provides base residents and employees with recreational fishing and other wildlife-related activities such as nature photography and viewing.

Sections below show current statuses and trends and how specific management activities have helped floral and faunal communities recover and, in some cases, thrive both on Tinker AFB and in surrounding communities.

Fisheries Management

Upon completion of the studies summarized in Section 2.3, Ecosystems and the Biotic Environment, results indicated fish assemblages in the Tinker AFB Crutcho Creek system are stable and similar to many other Mid-western fish assemblages (Marsh-Matthews, et.al. 2010) (see figure, "Fish Mortality vs Diversity").



Fish Mortality vs Diversity: Fish mortality resulting from fish kill events and species diversity from survey records on Tinker AFB (Source: Tinker AFB, Natural Resources Records 1990- 2017).

Fauna (Fish)

Status

Trend

Metric: Overall status of fish is stable with a high percent similarity index (PSI) score of 0.754 established from the latest stream surveys. Scores of over 0.50 are considered to be stable fish assemblages (Marsh-Matthews, et.al., 2010). As confirmed by current and past studies, species richness has increased over the years, with 33 total species identified on Tinker AFB. Fish kill frequency and severity are also down over the last twenty years, further contributing to stability and diversity of Tinker's fish assemblages. The trend is expected to be stable to upwards as water quality and stream habitat are improved.

Sport Fisheries Management

Tinker's sport fisheries provide for primary consumptive uses of fish and wildlife. Currently, Prairie, Primrose, Redbud, Beaver, and Beaver Marsh Filter Ponds (see figure, "Tinker AFB Sport Fisheries") are managed for a self-sustaining largemouth bass (*Micropterus salmoides*) and bluegill (*Lepomis macrochirus*) fishery. Channel catfish (*Ictalurus punctatus*) and rainbow trout (*Oncorhynchus mykiss)* are also supplementally stocked on a put-and-take basis (i.e., not a self-sustaining or reproducing population). Other sport fish found in Tinker's ponds include: red-ear sunfish (*Lepomis microlophus*), hybrid sunfish *(Lepomis macrochirus X microlophus and X cyanellus*), green sunfish (*Lepomis cyanellus*), longear sunfish (*Lepomis megalotis*), warmouth (Lepomis gulosus), and white crappie (Pomoxis annularis).

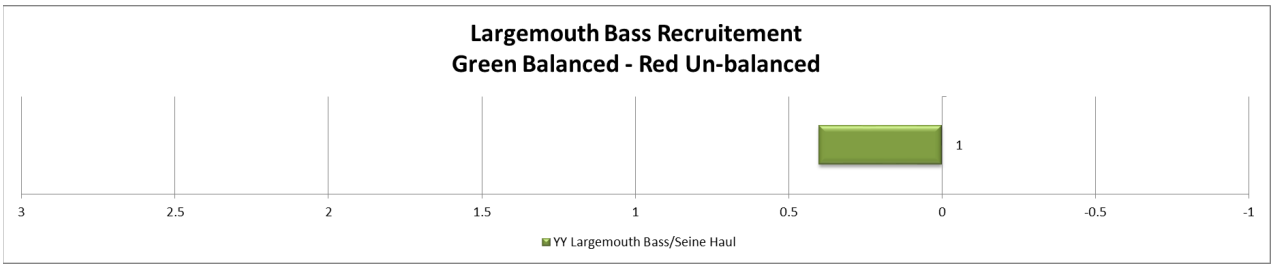
Tinker AFB Sport Fisheries: Recreational fishing ponds and connecting trails on Tinker AFB.

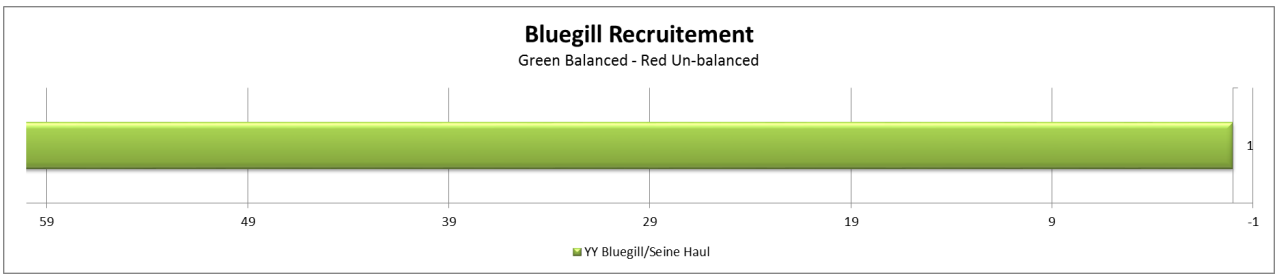
Tinker AFB streams also provide opportunities for sport fishing. Sport species present are Largemouth bass (*Micropterus salmoides*), Spotted bass (*Micropterus puctulatus*), sunfish (*Lepomis sp.*), White crappie (*Pomoxis annularis*) and Channel catfish (*Ictalurus punctatus*). Open waters for stream fishing include Crutcho Creek along Mitchell Ave. near the base housing area and north of Arnold Drive to the first low-water crossing.

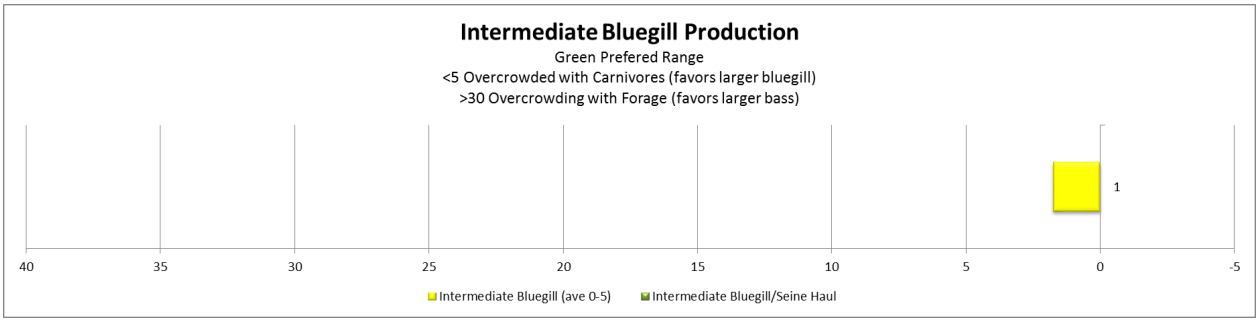
Tinker AFB biologists conduct annual fall seine surveys in Tinker AFB ponds to determine if recruitment of bass and bluegill is occurring and to determine the predator-prey balance of ponds. Field survey methodologies have been adapted from the early published work of H.S. Swingle and L.G. Hill from the University of Oklahoma. Results are presented here for interpretation using bar graph balances developed by Moody (Swingle 1956, Hill 1989, and Moody 2010). These results are used to develop stocking rates and

habitat improvement for base ponds. Examples, of these indicators for 2016 are shown below for Prairie Pond and Beaver Marsh Filter Pond (see figure, "2016 Fall Seine Results for Prairie Pond").

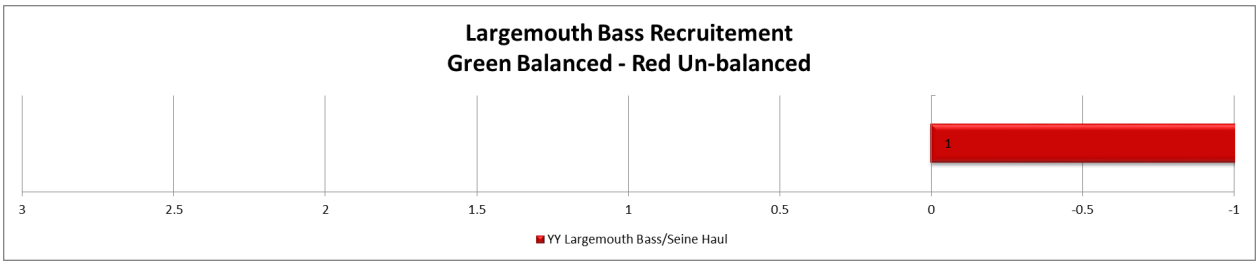
These indicators allow Tinker AFB biologist to make sound management recommendations. For example, a minor recommendation could be implemented, such as increasing cover for intermediate bluegill.

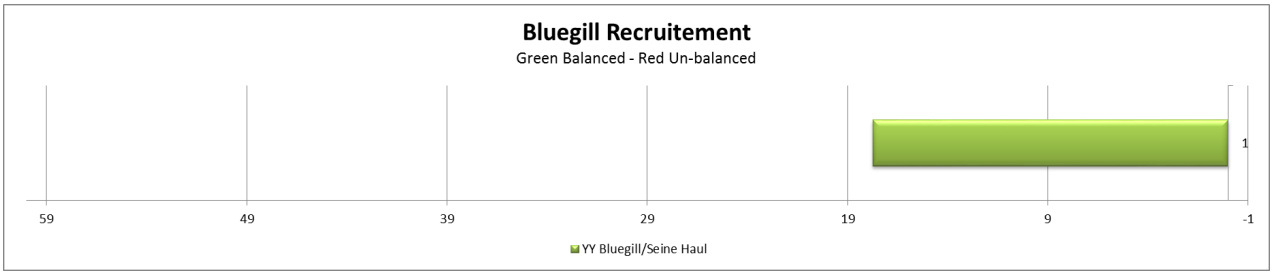


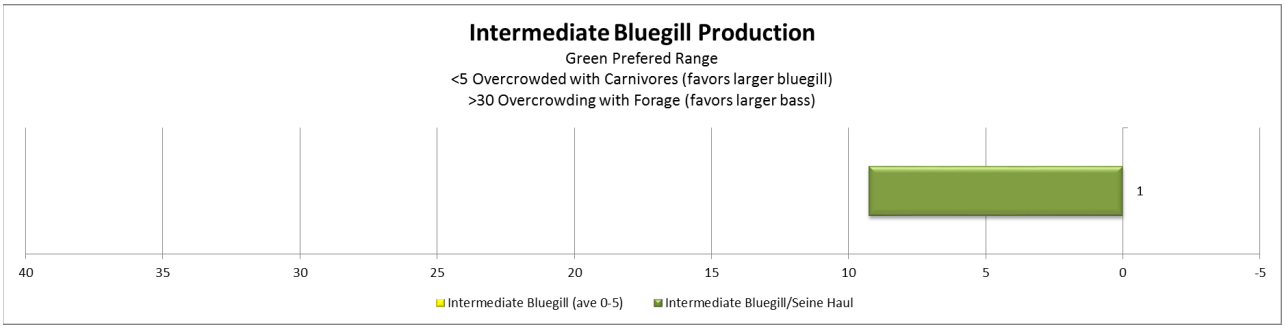




2016 Fall Seine Results for Prairie Pond: These results indicate a balanced predator-prey relationship for bass and bluegill populations. Intermediate forage or sunfish numbers indicate fairly high predation by adult bass or other predatory species and below preferred ranges - yellow bar).







2016 Fall Seine Results for Beaver Marsh Filter: These results indicate an unbalanced predator-prey relationship since bass did not reproduce (i.e., red bar); however, adult bass were present and bluegill had good reproduction. Intermediate bluegill numbers were also up and indicate predation by adult bass to be moderate but still in preferred ranges. Largemouth bass fingerlings have been stocked to supplement reproduction in this pond. Management recommendations from these surveys are implemented in the INRMP Annual Work Plan.

Sporting Fishing Regulations

Fishing regulations have been standardized across all Tinker AFB ponds and streams to simplify them and make them easily understood. Tinker AFB regulations are shown in Section 1, paragraph 1.3 “Authority” and are posted at each pond as shown in the figure, “Base Fishing Regulation Sign." All other regulations coincide with the Oklahoma “Fishing Guide” regulations available on the Oklahoma Department of Wildlife Conservation web site (www.wildlifedepartment.com).

Fishing Permit Sales Structure

Annual Family ……..……$20.00

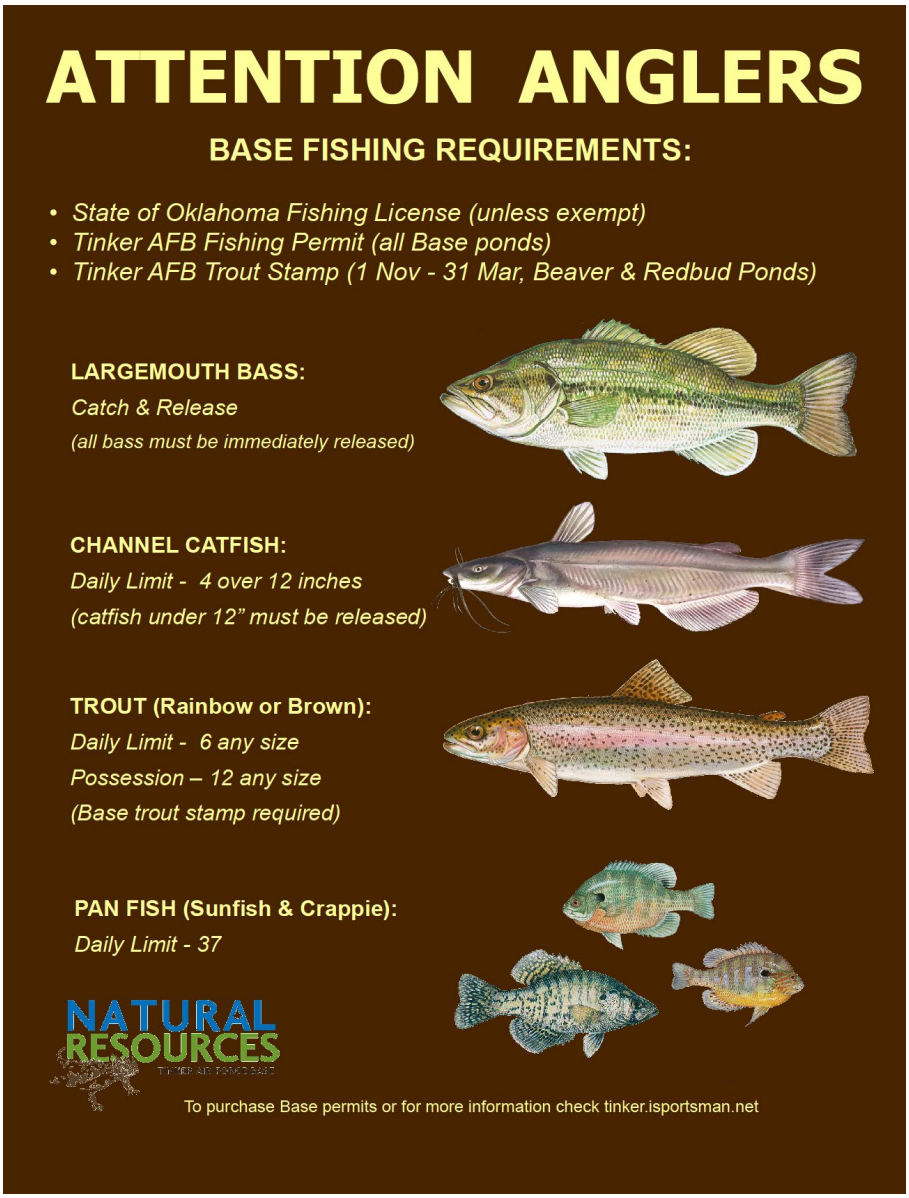
Annual Individual ...…….....$15.00

7-day Individual ……..…….....$10.00

Seasonal Individual Trout Stamp…...$15.00

Seasonal Family Trout Stamp……...$20.00

- *Fishing permits are purchased on-line at tinker.isportsman.net*
- *A valid State of Oklahoma fishing license is also required to fish in base ponds and streams.*



Base Fishing Regulation Sign: Signs are posted at each Tinker AFB fishing pond.

Only "Catch and Release" fishing is allowed for largemouth bass in Tinker AFB ponds and streams due to fishing pressure and to maximize trophy bass potential. Along with this management technique, ponds will continue to be supplementally stocked with bass. Limits for channel catfish have been set at four fish over 12 inches in all Tinker AFB ponds and streams. Beaver Pond has been designated as a "Kids" fishing pond, targeting large, easily harvested pan fish. To further this objective hybrid sunfish (*Lepomis cyanellus x machrochirus*) are being stocked regularly to provide a large easily catchable fish for kids. Limits for sunfish and other pan fish have been set at 37 (the current state limit) to encourage harvest and stimulate production. Crappie typically require larger (> 10 acres) bodies of water to produce sustainable populations. Crappie limits also have been set at 37 to reduce crappie over-crowding which could result in an imbalanced fishery.

A winter trout fishing program was started in 2004 with the first stocking of brook (only in initial year of stocking), rainbow, and brown trout in Redbud and Beaver Ponds. Its success has resulted in an ongoing

trout stocking program which typically starts on Veteran's Day and ends in by April or May when water temperatures rise to lethal levels for trout. Anglers are required to purchase a Tinker AFB fishing permit and a trout stamp to fish for trout. The base fishing program is managed by the natural resources function in the Civil Engineering Directorate. A permit/license system is administered through "iSportsman," an online licensing system approved by USAF. To purchase permits, anglers go on-line to "tinker.isportsman.net" and set up an account to purchase appropriate permits. Anglers needing assistance purchasing permits on-line can visit the natural resources office (Building 811) and be assisted in person. This site also has up-to-date fishing information for the base. All anglers 16 years of age and over must possess an Oklahoma State fishing license and a Tinker AFB fishing permit (unless otherwise exempt – see Oklahoma Fishing Guide). Permit prices have been established, and the structure is as follows: Annual Family ($20.00), Annual Individual ($15.00), 7-day Individual ($10.00), Seasonal Individual Trout Stamp ($15.00) and Seasonal Family Trout Stamp ($20.00). A free, natural resources staff-issued fishing permit is also available for special use and aquatic educational events such as fishing derbies and other approved events. Fishing receipts are earmarked for the Tinker AFB fishing program with trout stamp receipts going exclusively to trout stocking. There are no "user restrictions" or protocols other than those posted on "tinker.isportsman.net" and established under the Tinker AFB fishing proclamation, Oklahoma "Fishing Guide," and trail user rules posted on trailhead signage. Users of Tinker's recreational resources are comprised of Department of Defense prime contractor employees and active and retired Department of Defense military and civilian employees, their dependents, and guests (see Section 7.2 for more detailed breakdown of permitted users). Open public use of these resources is not possible because of limitations imposed by mission security requirements. Also, the limited size of recreational areas coupled with an increasing Tinker AFB population makes public use unfeasible. However, on a controlled basis, escorted individual guests, scouting groups, sporting clubs, and similar groups can be granted access and purchase permits to fish on Tinker AFB outdoor recreation areas.

Fishing Permit Sales: Tinker AFB fishing permit sales recorded from 1999-2019.

Tinker's natural resources function actively pursues goals of federal Executive Order 12962, Recreational Fisheries (2008). This aims to improve quantity, function, sustainability, and productivity of aquatic resources which result in an increase of recreational fishing opportunities. Some of the objectives being accomplished include: cooperative stocking efforts of channel catfish with ODWC (over 1,000 stocked annually), restoration of aquatic/fish habitat (in-house efforts), managing for sustainable fish stocks (bass-bluegill fisheries), hosting awareness and outreach events (fishing derbies/clinics), cooperative research of fish assemblages in Tinker AFB streams (University of Oklahoma Cooperative Agreement), and winter trout fishing (stocking of over 1,000 trout annually). Natural resources staff have also noted trends of increasing fishing permit sales when angler creel and permit checks were conducted. Therefore, Natural resources staff will continue these checks and monitor results of efforts to maximize permit sales. We have also worked through programs of the National Recreational Fisheries Coordination Council and Sport Fishing and Boating Partnership Council to secure fishing rods and reels for our youth fishing clinics and derbies. These derbies are held in cooperation with the Oklahoma Aquatic Resources Education Program of ODWC. These efforts are reflected in the upward trend of permit sales (see figure, "Fishing Permit Sales").

Fauna (Sport Fisheries)

Status

Trend

Metric: Tinker AFB fishing permit sales have shown a steady increase over the last decade with a few year-to-year fluctuations. Sales increased significantly in 2017-19 and are expected to continue to increase with continued permit surveillance and implementation of online permit sales (see figure, "Fishing Permit Sales".

Mammal Management

Mammal management on Tinker AFB is primarily related to wildlife aircraft strike hazards and focuses on sensitive areas such as on and surrounding the airfield (see section 7.12 and deer management section below). Some nuisance animal control is also implemented around facilities and housing areas and is accomplished by base contract in accordance with the Tinker Integrated Pest Management Plan (see sections 7.11, 15, and Tab 5). The metric for overall mammal management is linked to species diversity which is summarized in the Species Survey Table found in Section 7.1.

Fauna (Mammals)

Status

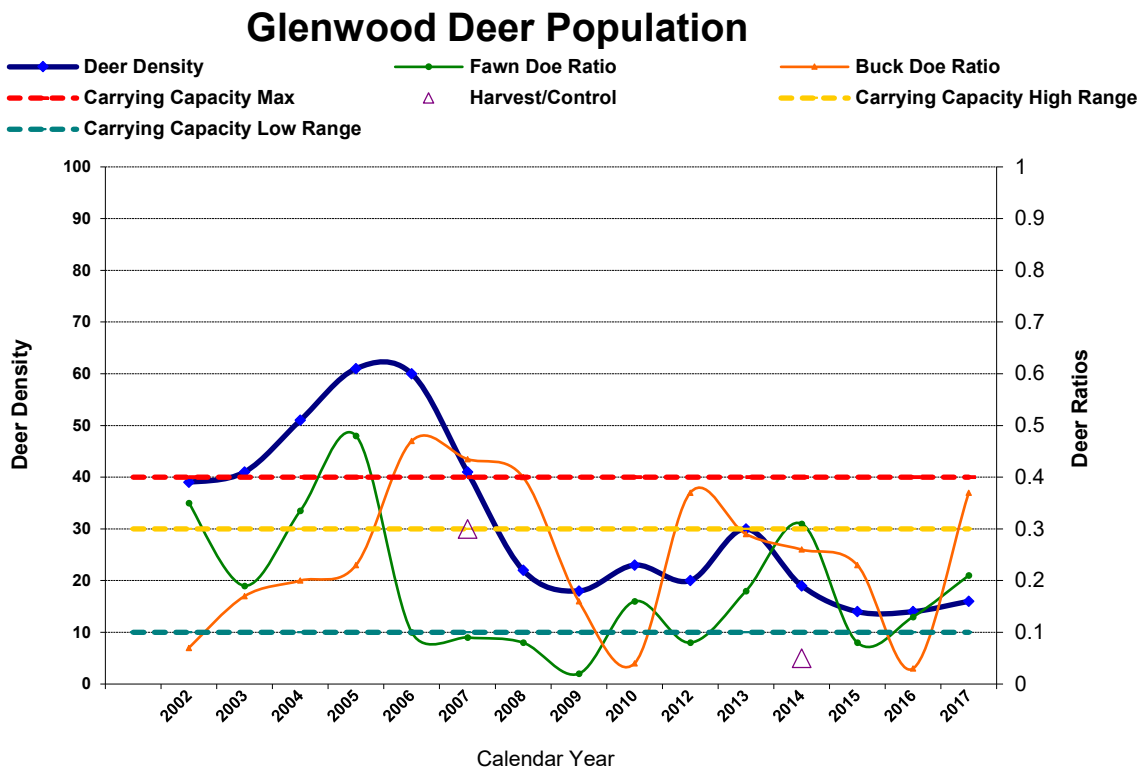
Trend

Metric: Mammal status is stable with a higher diversity (0.33 – 5.05) in green space areas than more urbanized areas. The trend is upward and is expected to continue this trajectory due to ongoing grassland, woodland, and aquatic system restoration.

Mammal Management (Deer)

White-tailed deer populations are increasing on and around Tinker AFB. On-base sightings, as well as sign (i.e., tracks and scat), have occurred at the Urban Greenway, munitions area (southeast corner of base off airfield), TAC, and Glenwood. Deer activity on the airfield is very infrequent with two individuals having been removed by USDA Wildlife Services personnel between 1989 and 2019. Numerous deer occurrences in Glenwood (see figure, "Glenwood Deer"), a satellite training area north of Tinker AFB, were first noted in the mid-1990's. This is a high-fenced area with approximately 280 acres in the airfield's clear and accident potential zones. Additionally, deer are known to frequent other satellite areas and are numerous around the Lake Stanley Draper area south of Tinker AFB. Spotlight deer surveys have been conducted annually in the Glenwood since 2002. Survey methodology follows guidelines found in the Samuel Roberts Noble Foundation, *Spotlight and Daylight Survey of Deer: Collecting and Interpreting Data* (Stevens R., 2001). Glenwood estimated deer densities are shown in figure, "Glenwood Deer Population Trends."

Glenwood Deer: A deer photographed by a wildlife motion sensor camera in the Glenwood area.



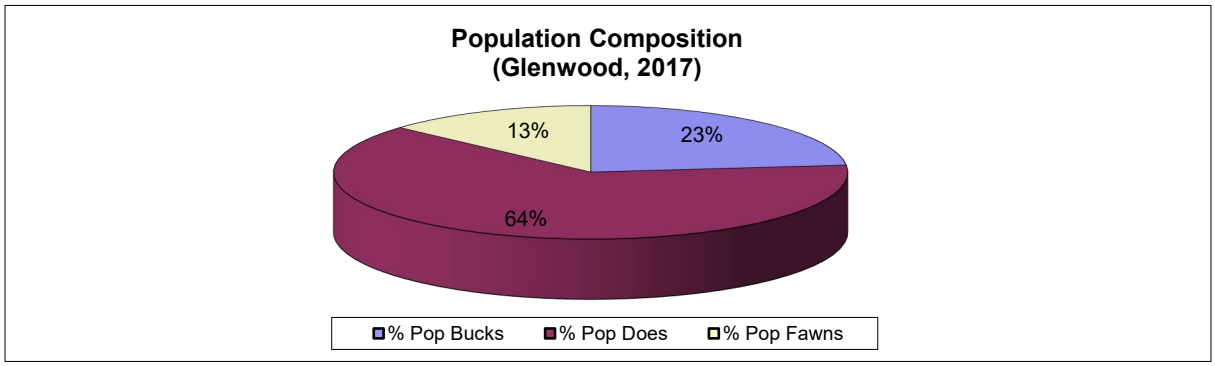
Glenwood Deer Population Trends: Density, ratios, and carrying capacity estimate for Glenwood deer population. The triangles along the x-axis represent controlled harvest of deer.

In 2007, following record deer numbers, control measures were taken in the Glenwood area after declining deer health and browse lines were observed. Thirty deer (26 females and 4 males) were harvested in conjunction with USDA Wildlife Services and under depredation permits issued by the Oklahoma Department of Wildlife Conservation (ODWC). Biologists from TAFB, USDA Wildlife Services, and ODWC conducted a health assessment on the first 10 deer harvested at Glenwood. Findings validated an overpopulated herd. Harvested carcass weights were well below typical deer weights for this region which ranged from 61 to 121 pounds (average 87.5) (Caire W. et. al., 1989). Several deer were emaciated. All deer collected had no fat reserves present, and biologists believed that muscle mass was being lost due to starvation. Considering deer condition, ODWC recommended harvesting 20 additional deer to bring population levels to the estimated carrying capacity of 40 deer for the area (see figure, "Glenwood Deer Population Trends"). In addition, they recommended providing supplemental feed (i.e., corn) for the remainder of the herd until the spring green-up when forage became available. Without these measures, ODWC believed a mass die-off could have occurred the following summer. Natural resources staff biologists concurred with this assessment and continued with an additional harvest of 20 deer and supplemental feeding until that spring. Samples were taken for Chronic Wasting Disease (CWD) and were negative. Final assessments determined declining deer health was the result of malnutrition due to overcrowding. Carcasses harvested were donated to the Little River Zoo and Hunter's Against Hunger, a non-profit program providing food for the underprivileged. Additional data collected from the annual surveys supported health assessment findings and suspected herd conditions. Fawn to doe ratios during this time were consistently under 0.50 which is the threshold for a deer population being at or over carrying

capacity (Miller and Marchinton, 1995). Glenwood deer herd population trend and composition are found in figures "Glenwood Deer Population Trends" and "Population Composition-Glenwood, 2016."

In Glenwood, deer densities may likely be supported over theoretical carrying capacities with deer aggregations occurring (Halls, 1984). Sufficient habitat migration linkages and ample forage and water are present within this unique urban setting. Deer densities have occurred over their theoretical carrying capacity in the past (2003-2007). Estimated Glenwood carrying capacity is at a maximum elevated level at 40 deer (see figure, "Glenwood Deer Population Trends"). This is primarily determined from observations of declining habitat conditions and corresponding elevated deer densities as well as health assessments over survey years. Biologists have concluded that the preferable carrying capacity for the herd is 30 deer and has targeted this level for maintenance of the population. This indicator is a useful tool in meeting deer herd management goals including improving deer health and minimizing negative deer-related issues. Spotlight survey data collected after the managed deer harvest in 2007 followed with an expected decreasing trend. Population density was immediately lowered below carrying capacity in 2008 and 2009. Additionally, field observations during these time periods concluded that browse lines had disappeared, and vegetation condition in Glenwood had recovered. In 2010, deer density levels began to increase as expected but remained steady at around 20 deer through 2012. However, for the 2013 survey herd levels showed an increase to 30 deer, a point at which harvest was determined to be necessary to maintain sound population levels. In March 2014, five does were harvested through depredation permits issued by ODWC. These deer were in generally good health with field-dressed weights ranging from 80-90 pounds. All five of the deer were donated to ODWC's Hunter's Against Hunger Program. The fall 2014-2017 deer surveys indicated population numbers back down to desirable ranges of 15-19 deer. While currently below carrying capacity, it is expected that intermittent control measures will be needed periodically.

In keeping with Executive Order 13443, *Facilitation of Hunting Heritage and Wildlife Conservation* (2007), strategies to develop hunting opportunities in the Glenwood area have been explored to help control deer populations. Many factors were considered such as Glenwood being a military training area, aircraft accident potential and clear zones, proximity of area to off base residential areas, and manpower required to manage a hunting program. These conditions and the low number of deer which could be harvested annually make it infeasible for a hunting program at this time. However, these issues will be monitored and reevaluated periodically to determine if a hunting program should be implemented. Other hunting programs, such as falconry, will be considered on a case-by-case basis by natural resources staff.



Glenwood Deer Population Composition

Fauna (Deer)

Status

Trend

Metric: The status of the Glenwood deer herd is good and well within the area's carrying capacity range of 10-30 deer. The trend is upward as the population has rebounded since five deer were harvested in 2014. (Deer density =16; Fawn:Doe ratio=0.21; Buck:Doe ratio=0.37). Fawn doe ratios are still well below 0.50 and slightly increasing indicating a stable but the potential for herd population growth.

Reptile and Amphibian Management

Reptile and amphibian species occurrences and are geo-referenced and recorded in Tinker's Arc Geographic Information System (GIS) animal database. In the Bogosian (2011) study herpetofauna were found to have higher diversity in green space areas (see table, "Species Survey" in Section 7.1). These results are likely due to natural area management and lack of suitable habitat in industrial and airfield environments. This study also commented that results were comparable to similar surveys conducted on other southwestern U.S. urban and semi-urban military installations (Bogosian, Hellgren and Moody, 2011). Also of note from this study was that approximately half of the species known to occur in Oklahoma County and adjacent counties were detected. Urban development often changes the composition of native plant and animal communities as well as ecosystem functioning. However, as compared to surrounding municipal development, military installations often serve as refugia for floral and faunal communities as attested by the above studies.

Several reptile and amphibian species are being used as indicators of ecosystem health and more detailed information are provided on those species under "Indicator Species." The Texas horned lizard is also addressed in Section 7.4 under "Texas Horned Lizard Management" where much detailed research and information can be found.

Fauna (Reptiles and Amphibians)

Status

Trend

Metric: The status of reptiles and amphibians is stable with high diversity (0.33 – 5.05) in greenspace areas. The current upward trend is expected to continue with ongoing grassland, woodland, and aquatic system restoration.

Bird Management

The majority of bird species found in Oklahoma and at Tinker AFB are considered migratory and are protected under the Migratory Bird Treaty Act (MBTA) of 1918 (50 CFR Part 21) and other important treaties and acts:

> *"The MBTA provides that it is unlawful to pursue, hunt, take, capture, kill, possess, sell, purchase, barter, import, export, or transport any migratory bird, or any part, nest, or egg or any such bird, unless authorized under a permit issued by the Secretary of the Interior. Some regulatory exceptions apply. Take is defined in regulations as: "pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect." The MBTA protects over 800 species of birds that occur in the U.S. (USFWS, Migratory Birds Page, 2011)"*

These laws protect our important avian fauna and provide mechanisms, such as permits (50 CFR Part 13), to ensure balanced use and conservation of this important natural resource. Since 2001, Tinker AFB has partnered and worked under cooperative agreement and permits with USDA Wildlife Service in conducting an integrated bird/wildlife damage management program. Tinker AFB (72 ABW/CEIEC) holds the bird depredation permit.

Tinker also complies with Federal Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds.* In partial fulfilment of the MBTA and this order, Tinker observes 1 Apr through 31 Jul as migratory bird breeding season. Special bird protection requirements and permitting are required by on-base personnel and contractors when working on sites with nesting migratory birds.

Tinker contracted with Virginia Tech to conduct a survey that was used in two ways in the management of avian species on Tinker AFB. The first was as a determination of bird richness and indication of species present and migratory trends. Secondly, it was used to help determine birds that were potential threats to aircraft operations and how to better manage Bird Air Strike Hazards (BASH).

One objective of the Virginia Tech (St. Germain, 2010) survey was to develop metrics to monitor avian populations within the airfield and green space areas. To accomplish these tasks, the study site was divided into 5 areas and 44 circular variable radius plots were established (see figure, Virginia Tech Bird Study Map). These plots were monitored seasonally in 2008-2009 for avian diversity and abundance. Aircraft bird strikes were also analyzed from both USAF and Tinker's BASH data sets to determine relative strike probabilities by species and are discussed in detail in the Bird/Wildlife Aircraft Strike Hazard (BASH) section.

Results of the study (St. Germain, 2010) showed spring had the highest diversity base-wide with 107 (species richness) followed by summer (68) and fall (56). The top six most abundant birds were eastern meadowlark 0.30 (relative abundance - ra), Franklin gull 0.179 (ra), European starling 0.108 (ra), mourning dove 0.042 (ra), northern cardinal 0.042 (ra) and barn swallow 0.041 (ra).

Simpson's Diversity Index and species evenness (Krebs 1999) were calculated for each survey area by season, diversity ranges from 0 (low diversity) to near 1 (high diversity). This diversity index will be used as a metric for Tinker AFB avian species and establishes a baseline for future comparison. Species diversity of all areas and seasons was high and ranged from 0.815 to 0.954. The overall species diversity and richness is fairly consistent between various regions on the installation with the exception of the airfield, which is much lower. Greatest species richness was during spring, followed by summer, then fall and winter. This observation would be expected given the geographic location of the installation in the central flyway. For each season the greenway region consistently contained the most species, followed by the golf course and urban areas. The golf course and urban areas are rich in water features with buffer zones consisting of native vegetation. The Glenwood and EIG region had similar richness during spring and summer, but was lower than golf course and urban areas during fall and winter. Of non-airfield regions, the Tinker Aerospace Complex (TAC) had the lowest species richness. This area is in a primarily urban setting with approximately 100 acres of essentially treeless mixed native/non-native grassland, two water detention basins with little

buffering vegetation present. However, this area did have the largest number of dickcissels on the installation.

Virginia Tech Bird Study: Forty-four circular radius plot/point counts with vegetative communities map as background.

Fauna (Birds)

Status ■

Trend ⬌

Metric: Based on Virginia Tech's bird inventory of TAFB, the Simpson Diversity Index indicates the status of birds is stable with high diversity (0.815 – 0.954). Diversity ranges from 0 (low diversity) to near 1 (high diversity). The trend is expected to move upwards as habitat improvements such as grassland and woodland habitat restoration continues. This initial inventory and index values establishes a baseline and a comparison for future years.

Invertebrate Management

Invertebrate management has been related mostly to habitat improvements. Removing invasive plants and increasing the diversity of native trees, shrubs, grasses, forbs, and other plants have been the primary focus to increase invertebrate richness and diversity. About 200 acres on base are being restored to healthy native prairie, woodland, and aquatic systems. Prescribed fire is being introduced to new areas to further enhance native system vigor and structure. Dozens of plants which once occupied the prairie on Tinker have been reintroduced through seeding and plugging. Natural Resources Staff will also be reviewing the Pollinator Partnership Action Plan (PPAP) provided by the Pollinator Health Task Force to determine ways to further pollinator conservation efforts.

Fauna (Invertebrates)

Status Unknown

Trend Unknown

Metric: Status and trend for invertebrates are unknown. Until more extensive surveys are conducted and existing work progresses, this information will be deficient. The current direction is to continue invertebrate inventories, with a focus on at-risk species, and to restore a diversity of natural habitats.

Indicator Species--Tracking Ecosystem Health

SIU (Bogosian, et al., 2011) conducted a survey titled, *Reptile, Amphibian, and Mammal Assemblages on an Urban Military Base in Oklahoma.* It assessed use of indicator species for ecosystem health on Tinker AFB. Indicator species were defined as species with known life histories whose presence indicate stable or biologically diverse grassland or forest habitat, or species of concern as listed by the Oklahoma Wildlife Action Plan (ODWC, 2005) specifically for Crosstimber and/or Mixed-grass Prairie Ecoregions.

The following reptilian indicator species were chosen: ornate box turtle (*Terrapene ornata*), spiny softshell turtle (*Apalone spinifera*), Eastern river cooter (*Pseudemys concinna*), slender glass lizard (*Ophisaurus*

attenuatus), prairie king snake (*Lampropeltis calligaster*), speckled king snake (*L.getula holbrooki*), and Texas horned lizard (*Phrynosoma cornutum*). Texas horned lizards, spiny softshell turtles, and eastern river cooters were chosen due to being listed as species of greatest conservation need in Crosstimbers and Mixed-grass Prairie Ecoregions according to Oklahoma Wildlife Action Plan (ODWC, 2005). The ornate box turtle and slender glass lizard were chosen due to their representation of stable grassland ecosystems. Prairie and speckled kingsnakes were selected as dietary specialists, and as representatives of stable reptilian populations.

The following amphibian indicator species were chosen: cricket frog (*Acris crepitans*), Great Plains narrowmouth toad (*Gastrophryne olivacea*), and Strecker's chorus frog (*Pseudacris streckeri*). These three frog species were selected because they are least tolerant of habitat disruption (M. R. Whiles, SIU Carbondale, personal communication).

Mammal indicator species chosen included the prairie vole (*Microtus ochrogaster*), fulvous harvest mouse (*Reithrodontomys fulvescens*), coyote (*Canis latrans*), and bobcat (*Lynx rufus*). The vole and harvest mouse were selected as characteristic species of grasslands (Leis et al. 2008). The coyote and bobcat were chosen because they are the system's top predators and require fairly large areas of contiguous habitat.

Study findings brought up questions on the use of some species as system health indicators. For example, the spiny softshell turtle (*Apalone spinifera*) is a species of conservation need in the Crosstimbers and Mixed-grass Prairie Ecoregions in Oklahoma (ODWC, 2006). However, this species was documented at four Tinker AFB areas, including the golf course and wastewater treatment plant. In consulting the ODWC, the spiny softshell was listed in need of conservation, not due to its current low population levels, but due to it being favored by commercial turtle harvesters, concerns of overharvesting in public waters, and because it doesn't disperse well into ponds. Additionally, studies of survival (Plummer et al. 2008) and occupancy (Conner et al. 2005, Rizkalla and Swihart 2006) of spiny softshell turtles in urban and intensively farmed areas found that populations can persist in altered landscapes. These results suggest that these species may not be a good ecosystem health indicator because of their resilience to extensive or periodic habitat disturbances, even in urban landscapes (Plummer et al. 2008).

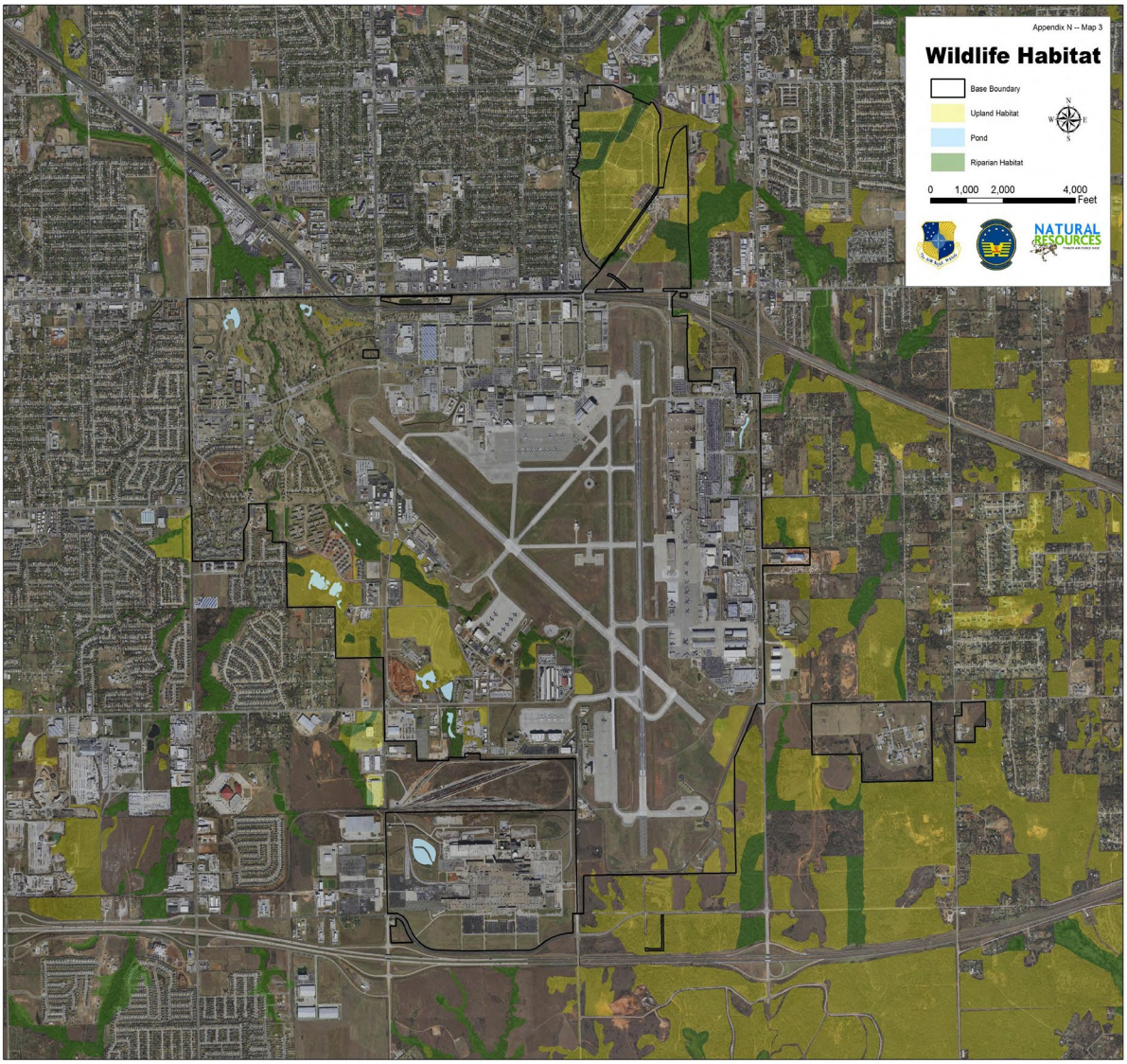
Alternatively, the ornate box turtle (*Terrapene ornata*), readily found on Tinker AFB, would serve as a suitable indicator species. Recent ornate box turtle studies indicate population demographics and genetic diversity are sensitive to habitat fragmentation (Bowen et al. 2004, Kuo and Jackson 2004, Converse et al. 2005). Other studies that have examined turtle population dynamics in disrupted or fragmented habitats have suggested opposite demographic responses of male and female turtles (Dodd and Dreslik 2008, Bennett et al. 2009). These responses are perhaps due to differential strategies employed in balancing trade-off between investment in reproductive resources and growth. In general, turtles may serve as suitable terrestrial indicators of biotic integrity due to importance of adult survival on population persistence (Congdon et al. 1993, Eskew et al. 2010).

Diversity was higher for all species and for indicator species alone in managed greenspace areas when compared to unmanaged, industrialized areas (see Table Species Survey). In addition, using the ad hoc method of adjustment, species diversity scaled by effort was also higher on greenspace areas.
Tinker AFB Urban Greenway Reserves 1 and 3 coupled with the Recycling Center area exhibit spatial connectivity (see figure, "Habitat Favorable to Wildlife Movement and Habitation") and represent focal points for wildlife diversity (see table, "Species Survey").

Species Survey: Shannon-Wiener diversity function for species captured by survey areas, Tinker AFB, 2007-2008 (Southwestern Naturalist, 2011, in-print).

Survey Area	Shannon-Wiener Diversity Index			
	Normal		By 1000 units of effort	
	All species	Indicator species^	All species	Indicator species^
Green Space Areas				
Crutcho Creek Riparian Zone	2.51	0.57	0.87	0.20
EIG/LTA Area	2.32	0.65	0.81	0.23
Fire Pond Area	0.94	0.25	5.05	1.33
Glenwood	2.36	0.63	0.84	0.23
Golf Course Area	2.28	0.51	0.65	0.15
Recycling Center Area	2.70	1.03	0.83	0.32
Urban Greenway (Reserve 1)	2.71	0.53	0.66	0.13
Urban Greenway (Reserve 2)	1.62	0.39	0.33	0.08
Urban Greenway (Reserve 3)	2.89	1.13	0.35	0.14
Unmanaged/Industrialized Areas				
Airfield	n/a	n/a	n/a	n/a
DRMO	1.91	0.67	2.11	0.74
Housing Area	1.61	0.15	1.20	0.11
Industrialized Areas	1.88	0.35	n/a	n/a
Landfill Area	1.10	0.00	0.98	0.00
Munitions Area	1.04	0.00	n/a	n/a
Wastewater Treatment Plant	1.88	0.62	3.93	1.29

Habitat Favorable to Wildlife Movement and Habitation: Areas not regularly mowed on and adjacent to Tinker AFB which is favorable for wildlife movement and habitation.



Fish and Wildlife Management Actions in Response to Climate Change

Fish and wildlife management on TAFB is not likely to change greatly with regard to climate change projections. Current fish and wildlife management issues are likely to persist in the future, such as the presence of invasive/pest species and bird/wildlife aircraft strike hazard (BASH) management. Rising temperatures and increased precipitation are not likely to deter invasive and pest species such as zebra mussels *(Dreissena polymorpha*), grass carp (*Ctenopharyngodon idella*), Asian basket clams (*Corbicula* spp.), domestic dogs, domestic cats, European starlings (*Sturnus vulgaris*), house sparrows (*Passer domesticus*), and rock doves (*Columba livia*). Rising temperatures would likely increase the northward expansion of fire ant populations in Oklahoma to include on Tinker AFB. This could be detrimental to the Texas horned lizard (*Phrynosoma cornutum*), as state-protected species.

Fish and wildlife surveys should be conducted on a regular basis to monitor native species and determine potential impacts. Monitoring of invasives will continue to be important, and management plans should be flexible enough to adapt to changing fish and wildlife concerns (Hellmann et al., 2008). Fire ant monitoring should be routinely accomplished particularly in Texas horned lizard habitat.

Increasing water temperatures will increase the chance of algal blooms occurring, further depleting dissolved oxygen content and habitat suitability (Paerl et al., 2011). Efforts to remove invasive aquatic plants and algae from ponds should be considered, and shade trees should be planted around water sources to prevent excessive heating of water (Poff, Brinson, & Day, 2002).

Climate projections suggest conditions at TAFB that will likely favor vectors for diseases such as mosquitoes and ticks (Süss, Klaus, Gerstengarbe, & Werner, 2008). Minimization of stagnant water in and around cantonment areas will help to reduce mosquito related infections. Tick populations in urban settings can be restricted by keeping lawns mowed and by preventing overabundances of hosts such as deer and rodents. Although annual precipitation is projected to increase slightly, this could be offset by increasing temperatures and drier summers. Open water sources should be allowed to occur at locations that do not present BASH concerns, as wildlife species will likely be drawn to them in times of drought.

Fauna (Indicator Species)*

Status ■

Trend ↑

Metric: Indicator species status is good with a diversity ranging from 0 to 1.33 basewide, with greenspace areas having a higher diversity than more urbanized areas. The trend is upward and should continue this trajectory due to ongoing grassland, woodland, and aquatic system restoration.

** Indicator species include ornate box turtle, spiny softshell turtle, eastern river cooter, Texas horned lizard, slender glass lizard, prairie kingsnake, speckled kingsnake, cricket frog, Great Plains narrowmouth toad, Strecker's chorus frog, prairie vole, fulvous harvest mouse, coyote, and bobcat.*

7.2 Outdoor Recreation and Public Access to Natural Resources

Applicability Statement

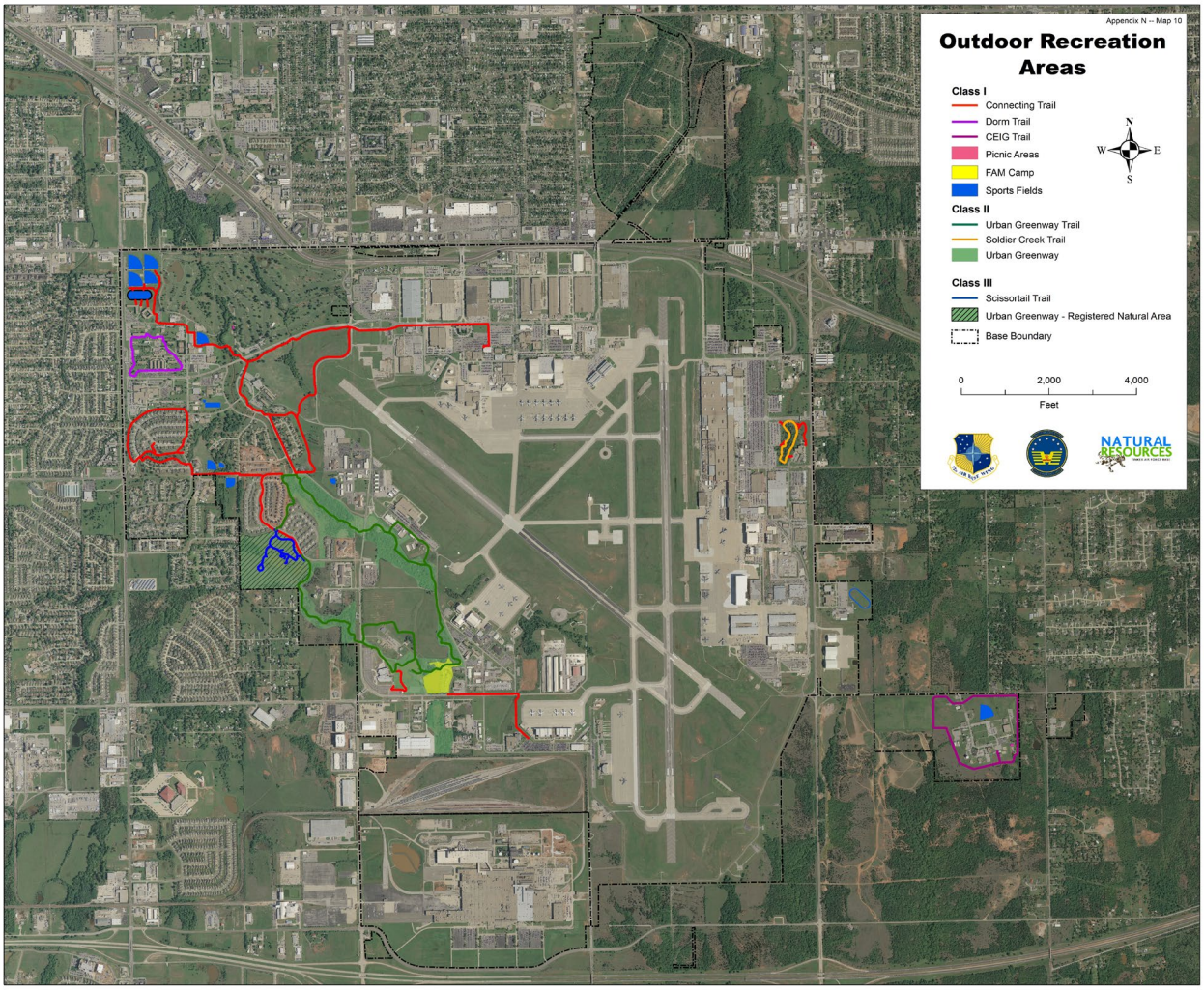
This section applies to all AF installations that maintain an INRMP. Tinker AFB **IS** required to implement this element.

Program Overview/Current Management Practices

Tinker AFB outdoor recreation areas are classified into three categories based on outdoor recreation potential and ecosystem sustainability (see figure, "Outdoor Recreation Areas"):

Class I areas: *developed recreation areas* which contain facilities designed to accommodate intensive recreational activities such as sports fields, campgrounds, picnic areas, paved walking/jogging/cycling trails, winter sports areas, marinas, developed swimming beaches, and other water sports areas.

Existing Tinker AFB Class I areas include: paved multi-use trails (Dorm, CEIG, Connecting Trails), running track, sports fields (soccer, football, and softball), and FAM Camp which provides for full hook-up recreational vehicles (RV), tent camping, and numerous picnic tables. Connecting trails refer to trails connecting facilities such as Gerrity Gym and Navy campus to the Greenway Trail. All Class I areas, except multi-use trails, are managed by the Force Support Squadron (FSS). Multi-use trails are managed by Civil Engineering. Class I rules of conduct may be obtained from FSS Outdoor Recreation personnel and Tinker AFB Fitness Coordinator.



Outdoor Recreation Areas: Existing and potential Class I, II, and III outdoor recreation areas on Tinker AFB

Class II areas: *dispersed recreation areas* which support less concentrated recreational activities such as hunting, fishing, primitive camping, bird watching, boating, hiking, and sightseeing.

Existing Tinker AFB Class II areas primarily consist of the Urban Greenway which includes natural reserve areas with multi-use trails and five fishing ponds. A discussion of the connection and compatibility of Class II recreation areas to the military mission can be found in the Green Infrastructure Plan (Tab 1). All Class II areas are managed by Civil Engineering Directorate (natural resources function) with assistance from Outdoor Recreation, Health and Wellness Center, and others. Rules of conduct for these areas are shown on trailside informational signage and include the following information:

- Stay on trails
- No motorized vehicles on trails (except as necessary for Greenway maintenance)
- No removal of plant materials
- Remove all trash
- Pets must be leashed
- Pet owners must clean up and properly dispose of pet waste

Angling rules of conduct are located in the Tinker AFB Fishing Proclamation available at Outdoor Recreation or Civil Engineering natural resources offices. Further discussion on the fishing program is located in Section 7.1.

Potential Class II areas include those areas identified as green infrastructure (except airfield, golf course, and extreme southeast portion of Tinker AFB) in the Green Infrastructure Plan (Tab 1). These areas could be developed for recreational activities such as jogging, biking, angling, and wildlife watching.

Class III areas: *special interest areas* which are defined as recreation areas that contain valuable archeological, botanical, ecological, geological, historic, zoological, scenic, or other features that warrant special protection and access control.

Tinker AFB has one Class III recreation area designated as a special natural area because of the presence of unique natural resources. A portion of Reserve 3 of the Urban Greenway has been designated as a Registered Natural Heritage Area through the Oklahoma Biological Survey. This area has been recognized for voluntary protection and preservation of the Texas horned lizard, a state-protected species. This area also has a 10-acre remnant native mixed-grass prairie.

This special natural area is managed by the Civil Engineering Directorate (natural resources function). Specific planned improvements and management activities for the area are identified in the Green Infrastructure Plan (Tab 1) and Section 8. Rules of conduct are the same as listed above for the Class II areas.

Also, although not classified as Class III recreational areas, several archeological sites have been identified on Tinker AFB involving wildlife fossils. Fossils unearthed on Tinker AFB property in recent years include: 1) immature bison humerus, 2) bison mandibles, and 3) horse molars (15th century or Ice Age). Bison mandibles are curated at the Museum of the Great Plains in Lawton, Oklahoma. The horse teeth are located in the Civil Engineering Directorate natural resources office. These archeological sites were small and isolated and therefore did not provide on-site recreational opportunities. For more information on these archeological sites, refer to the Tinker Air Force Base Integrated Cultural Resources Management Plan (Tab 6).

User access to recreational areas is limited to the following participant categories:

- Active duty military and members of the Guard and Reserves in active drilling status
- Military retirees
- Department of Defense civilians
- Department of Defense civilian retirees
- Employees of installation prime contractors (defined as a contractor with a five year or more term contract)
- Authorized dependents and family members in accordance with base guest/sponsorship requirements
- General public in accordance with base guest/sponsorship requirements

User access to the general public is restricted to the guest/sponsorship policy due to 1) base requirements necessary to ensure military safety and security and 2) intensive public use being inconsistent with natural resources use goals and objectives.

Off-road vehicle (including mountain bikes) use for recreational purposes is currently not permitted on Tinker AFB, but may be considered upon request. Off-road vehicle use for military training purposes is permitted but must be closely coordinated in advance and monitored by the Civil Engineering natural resources function. Permitted off-road vehicle use must comply with Executive Order No. 11989, *Off-road Vehicles on Public Lands*, May 24, 1977. Also, all motorized off-road vehicles must be licensed and insured as appropriate.

Outdoor Recreation Management Actions in Response to Climate Change

Little, if any, changes due to climate change are expected to occur regarding outdoor recreation and public access to natural resources on TAFB. Recreational activities such as use of the Urban Greenway, multi-use trails, golf course, sports fields, FAM Camp and picnic tables should continue without any effect. Hunting and fishing opportunities will need to be assessed on a regular basis. Opportunities will need to be based on assessment of health of fish and wildlife communities.

7.3 Conservation Law Enforcement

Applicability Statement

This section applies to all AF installations that maintain an INRMP. The installation is required to implement this element.

Program Overview/Current Management Practices

Fish and wildlife law enforcement needs have been limited in past years. However, as Tinker's natural resources have developed and the fishing program has grown, this need has become more apparent. The only procedure currently in place for enforcement of fish and wildlife laws on-base would be cooperation through the USFWS Law Enforcement Division located in Oklahoma City. This is due to specific training requirements for fish and wildlife law enforcement. The Installation Commander may designate fish and wildlife law enforcement authority to military or civilian personnel only if the person has either been certified in conservation law enforcement through training at the Federal Law Enforcement Training Center (FLETC) or by commission as a fish and wildlife conservation officer in the state where the installation is located (AFI 32-7064). In addition, cooperation with civilian law enforcement officials is addressed under DODI 5525. This requires prompt transfer of relevant information and allows cooperation with law enforcement agencies for certain assistance as outlined in Enclosure Four (DODI 5525 E4.1.1).

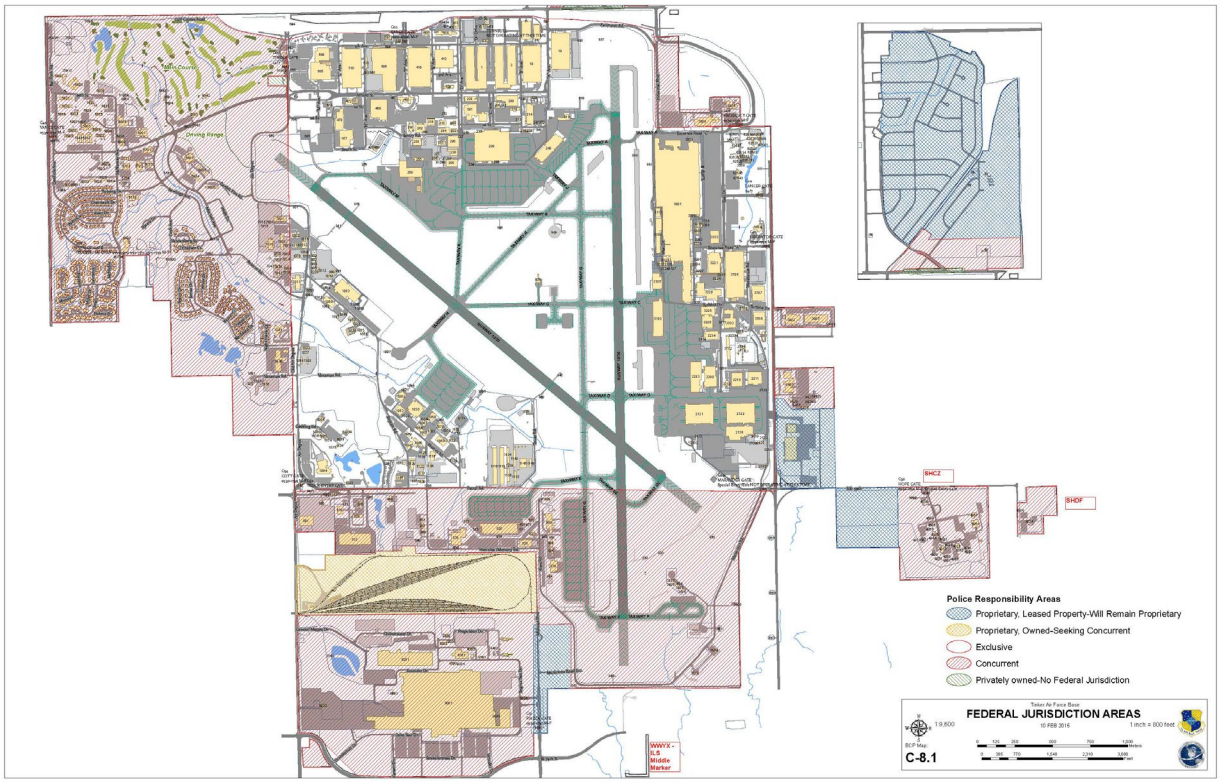
Angler survey and interviews of local anglers indicated a need for enforcement of creel limits that were at times being ignored by anglers. As a result, natural resources staff began permit and creel monitoring of anglers in 2009 (see table below). That year, twenty-nine of forty-four anglers were found to be compliant with Tinker AFB fishing permit requirements, and all anglers checked were found to be compliant with creel limits. The table indicates that as anglers were consistently checked compliance increased. It has also been noticed that when creel checks were conducted that permit sales increased. As a result, a courtesy permit check system has been implemented in the field. If anglers do not have their permits, they are instructed on how they can obtain them through "tinker.isportsman.net." On follow-up checks, if the angler is non-compliant, Security Forces is contacted and the angler may be escorted off base and/or reported to his immediate supervisor by Security Forces. Enlisted personnel can also be detained for non-compliance with base regulations or commander's orders (per Security Forces Instructions). It is evident that consistent monitoring has increased permit compliance.

Angler Permit Checks: Anglers were surveyed to determine whether they had appropriate licenses and permits to fish on the base.

Fiscal Year	Anglers Checked	Anglers Compliant	Percentage Compliant
2009	44	29	66%
2010	8	5	63%
2011	6	3	50%
2012-14	0	0	no checks
2015	17	21	81%
2016	95	74	77%
2017	44	32	72%
2018	69	57	82%
2019	42	39	92%

If wildlife law enforcement issues emerge such as deer poaching, illegal takes of migratory birds, or other violations, the appropriate agency (e.g., USFWS or ODWC) will be notified for enforcement. This would be dependent on the land jurisdiction where potential violations occurred per the map below. It might be noted that the only area that USFWS enforcement wouldn't have jurisdiction is on the Kuhlman cemetery located in the north central portion of the base.

If illegal plant substances such as *Cannabis* spp. were encountered on base, the Air Force Office of Special Investigations (AFOSI) would be notified immediately. If it were after hours, Security Forces would be notified who would patch through to the AFOSI on-call duty agent. AFOSI would respond to test the substance and dispose of properly.



Federal Jurisdiction Areas

7.4 Management of Threatened and Endangered Species, Species of Concern and Habitats

Applicability Statement

This section applies to AF installations that have threatened and endangered species on AF property. This section **is** applicable to Tinker AFB.

Program Overview/Current Management Practices

Fauna

For base management purposes, the term species-at-risk (SAR) denotes those species federally listed as threatened or endangered by the USFWS, state listed as threatened or endangered or species of concern or species of greatest conservation concern in Oklahoma County by ODWC (2011), and/or otherwise listed as a vulnerable (S3), imperiled (S2), or critically imperiled (S1) species by NatureServe (2011). NatureServe is a resource comprised of a network of natural heritage programs, including the Oklahoma Natural Heritage Inventory, and is a leading, comprehensive source for information regarding rare species and their habitats. NatureServe gives species and natural communities two ranks: a global (G) rank reflecting its rarity throughout the world and a sub-national/state (S) rank reflecting its rarity within specific states/regions. NatureServe rarity rankings have no regulatory stature but often times these rare species are found on federal and/or state listings, as candidate species for listing, or may have state laws protecting

them (for example, the Texas horned lizard). These rankings have been used to aid Tinker AFB biologists in developing and prioritizing species and natural community management objectives.

With six major taxonomic inventories of fauna accomplished to date, a total of 48 species at risk (SAR) have been documented on Tinker AFB (see Sensitive Species Table, Appendix I). The majority of these were birds; however, five mammals, one amphibian, one fish, and two reptiles are represented. Considering the number of species occurring and varying habitat requirements, a holistic ecosystem approach for management of these species has been developed. First, preferred habitat requirements for breeding, migratory, and resident Tinker AFB SARs were identified. Secondly, these requirements were cross-walked to Tinker's vegetative cover map creating a SAR Preferred Habitat Layer. Finally, SAR occurrences were mapped using GIS on the habitat layer to verify and truth the layer

Avian SARs listed as exclusively migratory within the central portion of Oklahoma were excluded from the analysis due to their relatively short and sporadic occurrences on Tinker AFB and their lack of reliance on Tinker AFB for resident or breeding habitat. As a management principle, exclusively migrant avian species and airfield-specific environments were eliminated from the layer as Tinker AFB does not desire to attract migratory birds to the airfield environment due to Bird Aircraft Strike Hazard (BASH) risks. Habitat located on and immediately adjacent to the airfield is managed to decrease wildlife diversity and abundance while areas further away from the airfield are managed to increase wildlife diversity and abundance. Attention is given to ensure wildlife in these latter areas do not pose increased BASH risks through daily migration patterns that may occur. A recent survey (St. Germain, 2010) of avian species on Tinker AFB concluded that the density, species richness, and species diversity are much lower on the airfield than within other areas located on Tinker AFB. This indicates that current management practices are successful in decreasing bird diversity and abundance on the airfield while increasing diversity and abundance on other areas on Tinker AFB (St. Germain, 2010).

The State of the Birds (North American Bird Conservation Initiative, 2011) report identified grasslands as the least protected and managed habitat type on public lands, with only 2% of grasslands in the United States being both publically owned and primarily managed for conservation. Grasslands and/or savanna (grasslands mixed with scattered trees) are a preferred habitat type for 21% of Tinker's SAR (see Appendix I). Several areas of dense invasive species monocultures (5.07 acres of lacebark and Siberian elm woodlands), which have little value to native and sensitive fauna, have been removed. These areas are being converted to native prairie/savanna habitat types. This will increase the value of these land parcels for all wildlife occurring on Tinker AFB, especially for the 21% of sensitive fauna which prefer grassland/savanna habitats. Twenty-nine Tinker AFB SAR prefer woodland, riparian woodland, open woodland, or woodland edge habitat. Currently 217 acres of this habitat type occurs on Tinker AFB. Efforts are underway to improve the quality of these woodland habitats through mechanical removal of invasive trees and shrubs, woodland thinning, and prescribed burning. Twenty-four Tinker AFB SAR require water or prefer habitat near aquatic resources. Tinker AFB contains numerous ponds and two major creek systems within its boundaries, thus creating 239 acres of suitable habitat for these species. Tinker AFB adheres to strict storm water and water quality guidelines which help ensure the health of these resources. SAR preferred habitat identified in the GIS layer will take precedence during planning of habitat management activities, and special considerations will be made during construction and community planning activities. This will allow Tinker AFB to properly balance the natural and built environment with its mission and allocate resources to appropriate areas thereby optimizing habitat improvement according to SAR habitat needs.

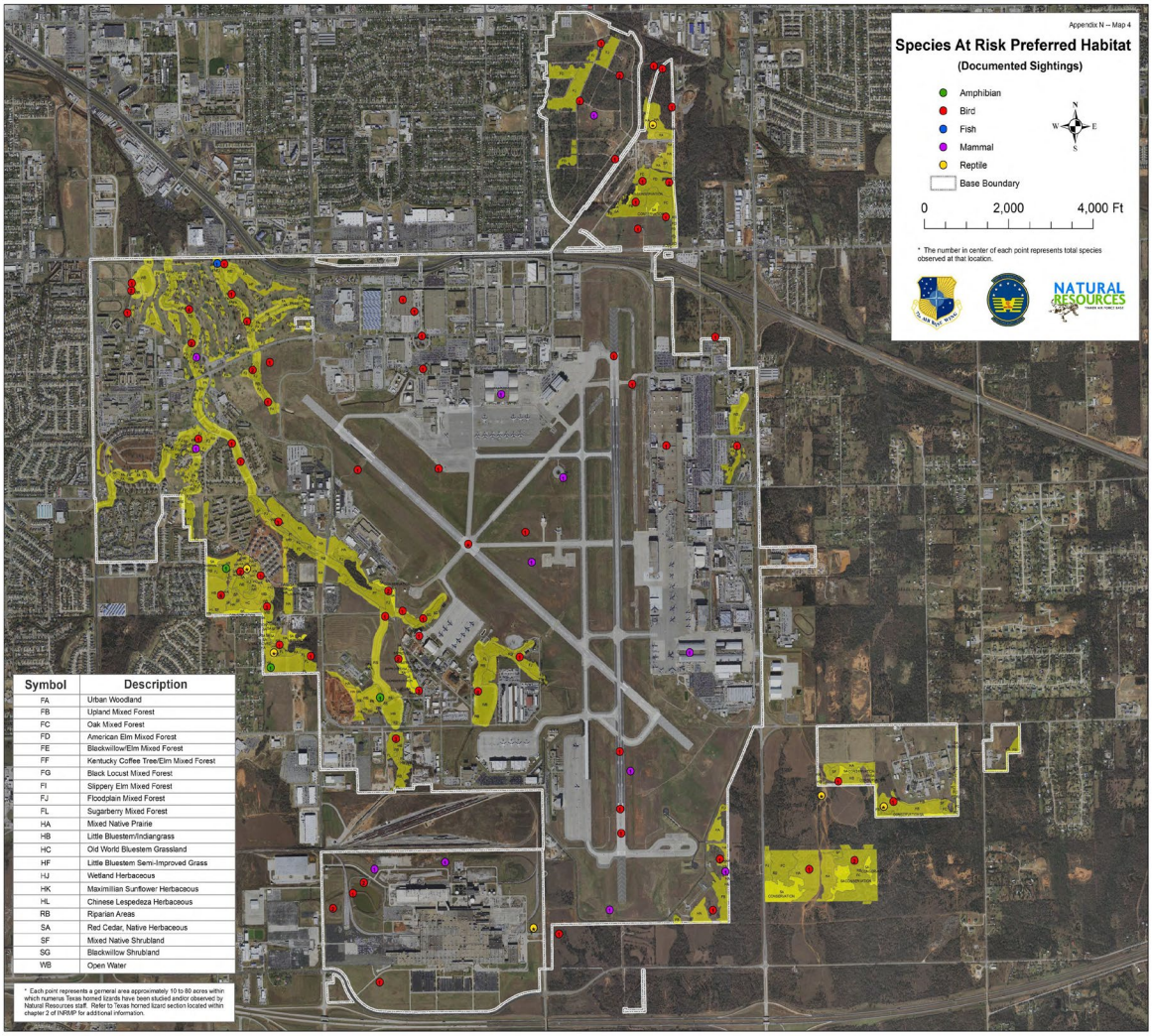
One federally threatened species, the piping plover (*Charadrius melodus*), has been documented at Tinker AFB. This plover was found dead on Runway 36/18 on 11 May 2009, the result of a bird-aircraft strike.

U.S. Fish and Wildlife Service (USFWS) and Oklahoma Department of Wildlife Conservation (ODWC) officials were contacted, and the plover was sent to verify identification. No other piping plovers have ever been observed loafing or foraging on Tinker AFB property before or after this strike. Base habitat is not managed to attract plovers.

Currently, if a piping plover or other federally listed threatened or endangered species were encountered that was impeding aircraft flying operations (i.e., planes not allowed to takeoff or land due to possibility of taking a threatened or endangered species) on the airfield, Tinker biologists would contact the USFWS Tulsa Ecological Field Services Office to request permission to haze the bird. Hazing would consist of such things as slowly driving a vehicle toward the bird to persuade it to move off the taxiway, runway, or ramp area. Other non-lethal means such as, but not limited to, honking, pyrotechnics, and propane cannons may also be used to move stubborn birds off the aircraft movement area. To further ensure Tinker's actions do not jeopardize the existence of a listed species and to ensure proactive measures (as opposed to the reactive measures stated above) are in place to limit negative impacts to the base's flying mission, USAF regional managers have completed a Biological Evaluation and intend to enter into Section 7 consultation for threatened and endangered species within the Central Flyway.

Three other threatened and endangered species—the least tern (*Sterna antillarum*), red knot (*Calidris canutus rufa*), and whooping crane (*Grus americana*)—are listed by the USFWS IPaC Report as potentially occurring in the Tinker AFB area but have not been observed on or flying over Tinker AFB. However, least terns have been observed at Lake Stanley Draper approximately 1 mile south of Tinker AFB. And, Tinker has many large, gravel-topped buildings which provide potential nesting habitat for terns. Terns have been documented nesting on graveled rooftops at other military installations such as Little Rock AFB. Therefore, periodic monitoring for terns on select rooftops (e.g., B-3001, Building 9001) will be conducted on Tinker.

While protection of SAR habitat is key to management, much can be discerned from the study and observation of such species on a military installation. The health and condition of SAR's are often a good indicator of ecosystem health.



Species at Risk (SAR) Preferred Habitat Layer: SAR preferred habitat identified by yellow-green GIS layer; alpha symbols indicate the vegetative cover type; colored points identify SAR sighting locations by animal class; numbers in points represent the number of species observed at each location (each point represents a survey area of 10-80 acres)

Texas Horned Lizard Management

The Texas horned lizard (*Phrynosoma cornutum*) is an Oklahoma state species of special concern (S2) and is listed as a state threatened species in Texas. It has a closed season in Oklahoma, making it unlawful to kill, capture, keep as pets, or sell Texas horned lizards (Oklahoma Administrative Code 800:25-7-8). Under Title 29 Oklahoma Statutes, Section 7-502, a person violating this statute is subject to a fine not less than $100 nor more than $500, or by imprisonment not to exceed 30 days, or both. The ODWC was petitioned to determine whether the lizard warranted state listing as an endangered species. In 2017, an ODWC-appointed technical committee of experts which included Tinker's staff biologist determined that sufficient evidence didn't exist to warrant listing.

The lizard has experienced declines throughout its range, but particularly in Texas (Price, 1990) and Oklahoma (Carpenter, et al., 1993). Factors suggested as causative of this decline include insecticide use (direct and indirect), effects of the red imported fire ant (*Solenopsis invicta*), habitat alteration for other

land uses (e.g., agriculture, development), roadway mortality, and commercial exploitation (Price, 1990; Donaldson, et al., 1994).

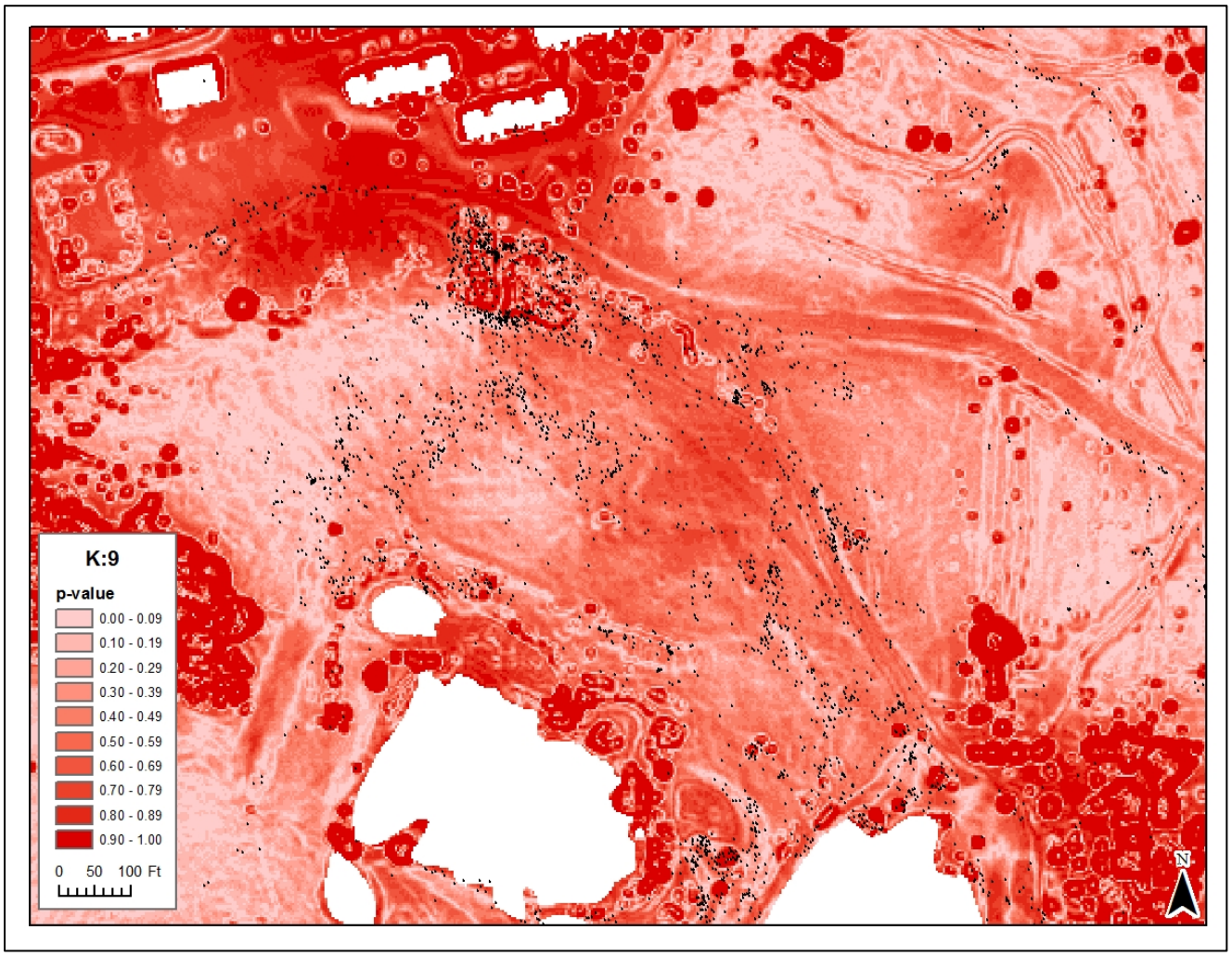
Texas horned lizards occur primarily in the southwest corner of Tinker AFB with isolated pockets in the southeast and Glenwood Area where the lizards' preferred habitat—a mosaic of grassland and bare ground areas—is present. This species is known to decline in abundance following urban and agricultural expansion. However, due to the small spatial requirements of the horned lizard, populations can survive in protected areas within urban settings such as Tinker AFB.

Working cooperatively since 2003, biologists and researchers from Tinker AFB, Southern Illinois University, Oklahoma State University and the University of Oklahoma have conducted life history and demographic research on the Texas horned lizard (Moody, Hellgren, Schauber, Siler, Watters, Bogosian, Wolfe, Mook, Vesy and Endriss, 2003-2019). During this time, four master's theses and one doctoral dissertation have been completed. Objectives of this study have included quantifying lizard distribution, habitat use, life history characteristics, and behaviors and developing relocation/husbandry techniques, new tracking technologies for hatchlings and adults, and ways to monitor lizard population trends. Radio telemetry and harmonic radar have been used to collect habitat use data, home range sizes, seasonal movement patterns, and survival rate data within and around Reserve 3 of Tinker's Urban Greenway. Data was collected using hand-held Trimble Units equipped with Global Positioning System (GPS) technology and was differentially corrected and imported into a Geographic Information System (GIS) layer and database for the horned lizards. The GIS layer has data (e.g., home ranges, hibernation sites, morphological data, habitat characteristics, and nesting locations) for over 1000 lizards with over 60,000 capture/relocation points overlaid on a high resolution, digital, color aerial photographs (GeoDatabase, 2019). Most recently, research has examined hatchling biology, translocation, and modeling of preferred habitat (see figures, "Texas Horned Lizard Habitat Suitability Model" and "2005 Light Detection and Ranging [LIDAR] Image of Preferred Hibernation Habitat") to assist with potential mitigation if needed for horned lizard conservation. Additionally, a major focus of this research has been to share information learned to aid horned lizard conservation efforts across its range. Research findings have been published in multiple scientific and professional journals (see table, "Summary of Texas Horned Lizard Research Findings at Tinker AFB").

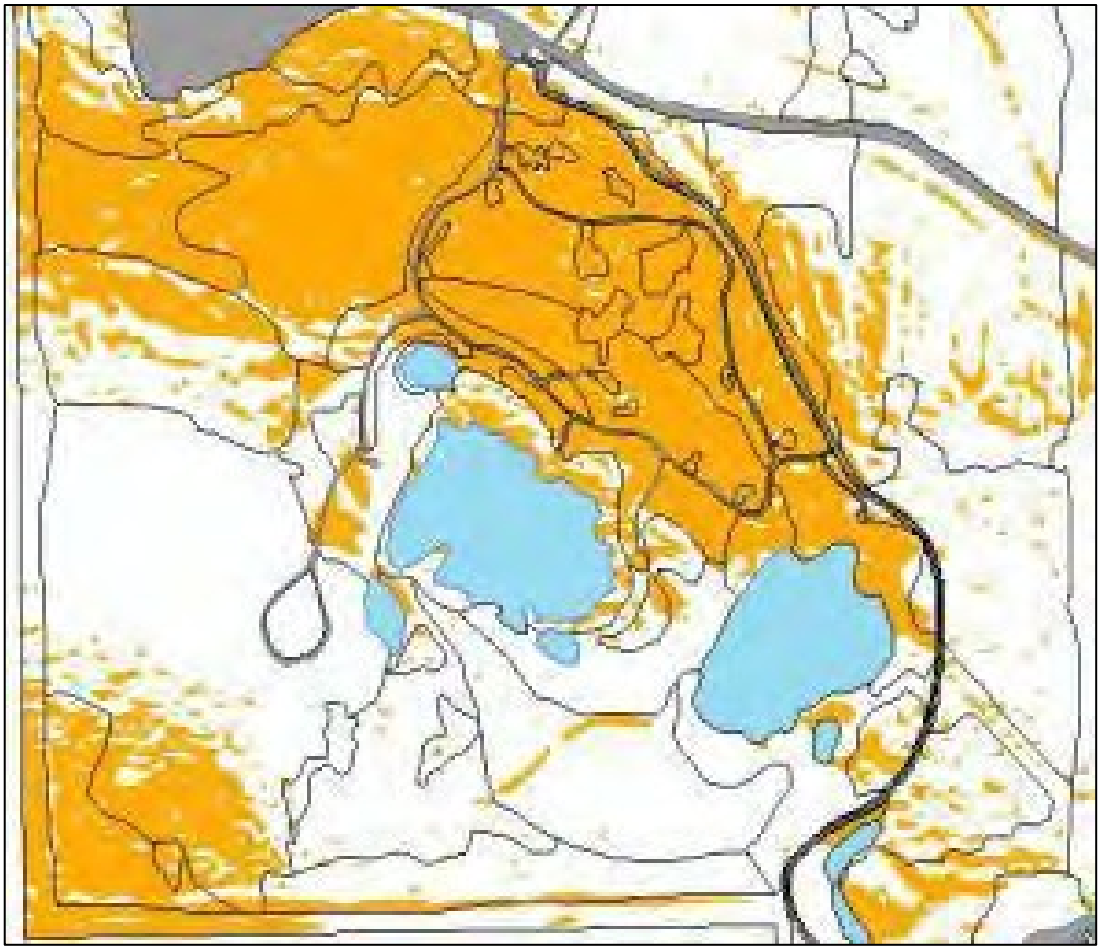
It is evident from the aforementioned research that the Tinker AFB Texas horned lizard population is established and likely in good health, but with many landscape level changes occurring, population densities have fluctuated. The most recent data shows lizard densities are increasing (see table, "Summary of Texas Horned Lizard Research Findings at Tinker AFB") on base. Continued monitoring and research of this SAR is key to proper management and vital to its survival on Tinker and across its range. This would lessen the potential for federal or state listing as a threatened or endangered species, thereby, precluding potential land use restrictions or other regulatory burdens on the military and other land owners.

Summary of Texas Horned Lizard Research Findings at Tinker AFB:
Results from a summary of cooperative research findings for the Texas horned lizard over an eight year period.

Summary of Texas Horned Lizard Research Findings at Tinker AFB			
Morphology			
	Hatchlings	*Juveniles*	*Adults*
Length (total)	27-51 mm	56-74 mm	86-93 mm
Weight	< 1 g	5-12 g	14-20 g
Males are consistently smaller than females, and lizards in northern latitudes are smaller than those in southern latitudes (i.e., diverges from Bergmann's Rule)			
Demography			
	Mating	*Nesting*	*Hatching*
Reproduction	May	June	July-Aug
	- Nests 5.0-7.5 cm depth - Clutches of 13-20 eggs; mean clutch size was 17; double-clutching recorded in 2011		
Maturation	- Sexually mature and reproduce in second year		
Incubation	- 7 – 10 weeks		
Survival rates	- adults 0.47; juveniles 0.25; and hatchlings 0.33 (TWS, Wolf, 2011)		
Ecology			
Habitat	- Mosaic of vegetation and bare ground (structure important for thermoregulation) - Utilize pond and marsh edges, close association to nature trails and other edges		
Temperatures	- Prefer 24-33° C or 75-91° F (typically 0800-1300 hours in summer months)		
Hibernation	- Enter Sept to Dec and emerge in early Apr; shallow 3-12 mm hibernacula; grassy S-SW facing slopes, <5-30 ° slopes (see Figure 2005 LIDAR Image of Preferred Hibernation Habitat)		
Home ranges	- 0.5-0.87 ha (~1-2 acres); males have larger home ranges than females		
Diet	- Primarily myrmecophagous (i.e., composed of ants); 12 different genera of ants out of 17 genera present (n=73); preference to *Crematogaster, Phiedole, Fomica*		
Territoriality	- Limited basis if at all; during the nesting season they demonstrate avoidance of one another; possible chemical signaling to limit displays of territoriality		
Pop. Densities	- 53 (± 11) individuals in Reserve 3; 5.0 lizards/ha (2005) Jolly-Seber Mod-MARK - 41 (95% CI:4-78, sample size n=8) individuals (2010) - 33 (95% CI:28.1-49) individuals (Closed captures in Program MARK 2011) - 17.71 individuals (+) 5.52 SE; 95% Cl 13.2-40.1 (2014) - 31.21 individuals (+) 13.59 SE; 95% Cl 18l.9-82.8 (2015) - 54.5 individuals (±) 21.5 SE; 95% CI 32.4-128.7), 3.56 lizards/ha, (2016)		
Habitat Model	- Important variables: bare ground, shrubs or improved grass (see Figure Texas Horned Lizard Habitat Suitability Model)		



Texas Horned Lizard Habitat Suitability Model: Above is the Texas horned lizard habitat suitability model D2 (K:9), and 2003-2008 individual lizard tracking points (note small dark points in background) on Reserve 3 of the Urban Greenway. Pink to lighter red indicates habitat more preferable to horned lizards based upon multiple habitat values of the model. Red areas indicate less favorable habitat. White space areas are cut-outs for water bodies and buildings. This model and several others were generated as a result of Bogosian's (2008) research and dissertation on the Texas horned lizard on Tinker AFB. This particular model emphasized variables for bare ground and vegetative structure.



2005 Light Detection and Ranging (LIDAR) Image of Preferred Hibernation Habitat: View of Reserve 3 in extreme SW portion of Tinker AFB. Orange shading indicates a GIS layer of preferred hibernation habitat features.

Fauna (Sensitive Species—Texas horned lizard))

Status

Trend

Metric: Status and trend of the Texas horned lizard is tracked by survival and density estimates using radio-telemetry and mark-recapture studies. Data in 2016 indicated the horned lizard population status is healthy with a population of 54 lizards within Reserve 3 of the Urban Greenway. Estimates indicate population trend is upward (recovered from 41 estimated in 2010 and 33 in 2011, using program MARK). Survival rates have also been similar over the last 12 years of study (i.e., ranging from 0.38-0.77).

Flora

Oklahoma penstemon colonies were originally identified and mapped on Tinker AFB during the 1992 flora inventory (Glenn et al., 1993). Two distinct populations were identified—one on the airfield and one on the Leased Training Area (LTA; the leased training area, sometimes referred to as Douglas Field, consisted of 80 acres of natural area southwest of CEIG; this lease was terminated in 2013). Colonies were remapped during the 1994 native tallgrass prairie assessment (Johnson et al., 1995). Both of these initial mappings were manually digitized. Recurring studies in 2005, 2006, and 2009 documented penstemon colony densities and used Global Positioning System (GPS) and Geographic Information System (GIS) technologies to survey and map penstemon populations (Dorr et al., 2005; Dorr, 2007; Dorr & Germain, 2010).

Penstemon density data was collected only for the colonies located on the airfield during the 2005 study (Dorr et al., 2005). The average size of all penstemon colonies mapped in 2005 was 4578.3 square meters (1.13 acres). Within the airfield the average penstemon colony size was 109.3 square meters (0.03 acres), and the average number of plants per colony was 28, with a maximum of 91 and a minimum of 1 plant per colony. A total of 251 individuals were documented (see figure, "Tinker AFB Total Penstemon Population by Area").

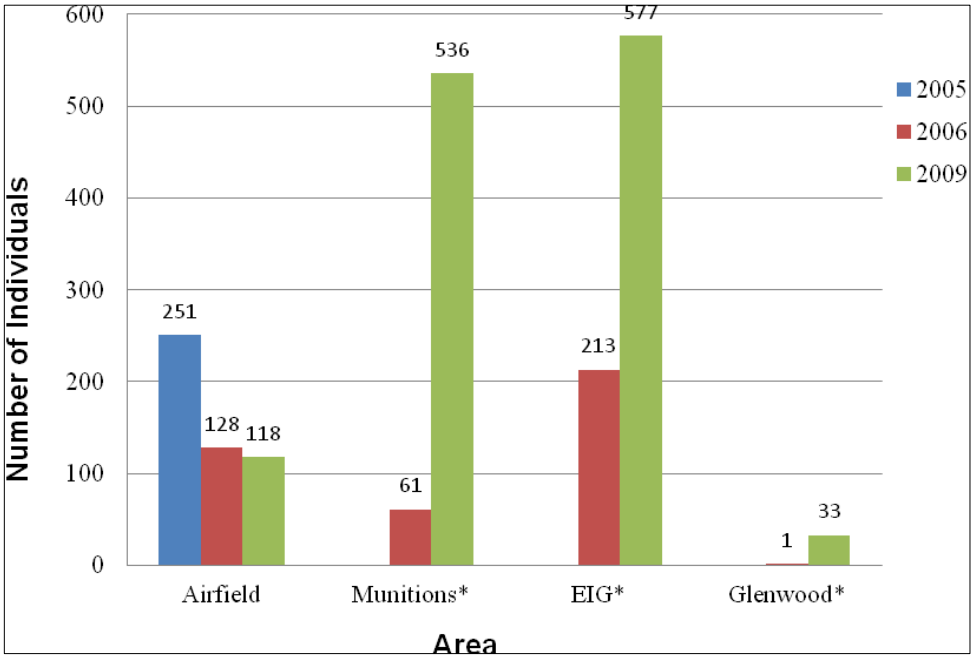
A total census of known Oklahoma penstemon colonies on Tinker AFB was conducted in May 2006 (Dorr, 2007). Locations containing penstemon colonies included the airfield, munitions, CEIG (formerly EIG), LTA, and Glenwood (see figure, "Tinker AFB Total Penstemon Population by Area"). The total size of penstemon colonies mapped in 2006 was 20,391.9 square meters (5.04 acres). The census found that the average colony encompassed 679.7 square meters (0.17 acres). The average number of plants per colony was 13, with a maximum of 63 and a minimum of 0 individuals per colony. A total of 403 individuals were documented. Penstemon colonies primarily occurred within Mixed Native Prairie or Mixed Native/Nonnative Prairie vegetation types (57.8%).

A total census of known Oklahoma penstemon colonies on Tinker AFB was conducted in May 2009 (Dorr and Germain, 2010). Locations containing penstemon colonies included the airfield, munitions, CEIG (formerly EIG), LTA, and Glenwood. A small population of penstemons located east of the Consolidated Fuels Facility (B-3902), which were not included in past studies, was lost in 2009 due to the construction of Building 3907. The total size of penstemon colonies mapped in 2009 was 61,395.7 square meters (15.17 acres). The census found that the average colony encompassed 2273.9 square meters (0.56 acres). The average number of plants per colony was 42, with a maximum of 382 and a minimum of 0 individuals per colony. A total of 1264 individuals were documented. Penstemon colonies primarily occurred within Mixed Native Prairie or Mixed Native/Nonnative Prairie vegetation types (45.7%).

Temporal variation of penstemon colonies is likely influenced by precipitation and mowing schedules. Historically, penstemon populations have not been managed except by maintaining no-mow zones in select areas until after penstemon seed dispersal in late May. Because of potential conflicts with flight operations (i.e., creation of bird/wildlife strike hazards), the areas where penstemon populations occurred within the airfield fence boundary southeast of the crosswind runway are no longer maintained as no-mow zones in the spring months. Unless these populations can tolerate repeated spring mowing, it is expected these populations will be lost over time.

Beginning in 2009, Tinker AFB began a multi-year research project on the penstemon through a cooperative agreement with the University of Oklahoma. The project entitled *"Life History and Management of the Oklahoma Beardtongue"* was designed to gather scientific data which supports understanding penstemon life history and population dynamics under natural and varying anthropogenic disturbance regimes so as to 1) better equip the military in making land-use decisions associated with this sensitive species; 2) ensure

land-use flexibility for military activities; and 3) ensure sustainable penstemon populations in the region. Several peer-reviewed articles were published from this research (refer to Section 11, Installation References).



*Areas not surveyed during the 2005 study

Tinker AFB Total Penstemon Population by Area

Flora (Sensitive Species)

Status

Trend

Metric: Status and trend of the Oklahoma penstemon is tracked by periodic monitoring of penstemon colony densities using standardized techniques used by Virginia Tech University (Dorr et al., 2005; Dorr, 2007; Dorr & Germain, 2010). The target census cycle is every three years. Based on 2009 Oklahoma penstemon monitoring on Tinker AFB, the current population status is considered GOOD and the trend is UPWARD. However, data has been collected for a relatively short period of time and has not been monitored since 2009; therefore, status and trend determinations are presented with caution, and censusing is needed.

7.5 Water Resource Protection

Applicability Statement

This section applies to AF installations that have water resources. This section **IS** applicable to Tinker AFB.

Program Overview/Current Management Practices

Proper water resources management is essential to Tinker's military operations. Compliance with water quality standards is important to ensure military operations, such as deicing aircraft and discharging of facility firefighting agents, are not hindered or restricted because of notices of violation with state and federal regulators. Water pollution is not only an indication of poor stewardship, but it also demonstrates irresponsibility and damages the public trust.

A 100- or 500-year flood event would significantly disrupt some of Tinker's military operations (see 500-Year Impact Map in Green Infrastructure Plan, Tab 1); therefore, proper management of floodplain and upland drainage areas (on- and off base) are critical. In a 100- or 500-year flood, airfield operations would remain functional.

Clean water in Tinker AFB streams and ponds adds significantly to warfighter quality of life through enhanced aesthetics and outdoor recreational opportunities such as fishing. Refer to Section 7.1, Sport Fishing, and the Green Infrastructure Plan (Tab 1) for additional information on the importance of Tinker's water resources and its connection to military readiness.

Surface Water (Streams and Ponds)

Tinker AFB discharges to stream systems are regulated under permits by the National Pollutant Discharge and Eliminations Systems (NPDES) and Storm Water Pollution Prevention (SWPP) programs. In 1996, Tinker AFB Industrial Wastewater Treatment Plant (IWTP) and Sanitary Treatment Plant (STP) discharges were rerouted to the Oklahoma City Public-owned Treatment Works. This eliminated secondary treated flows of 1.3 million gallons per day to the on-base portion of Soldier Creek (i.e., east Soldier Creek).

Although water quality has degraded since pre-settlement times, improvements have occurred over the last 30 years based on biological diversity surveys and weekly water quality monitoring. Tinker AFB collects and analyzes water samples from all Tinker AFB streams on a weekly basis. These samples are acquired to monitor compliance with Oklahoma Water Quality Standards assigned to each creek under the NPDES and storm water permits. In addition to analytical monitoring, other conditions are noted at each creek outfall during each field visit. These parameters include: clarity, algae growth, odors, presence of foam, and presence of oil sheen. All of these results and visual indicators are used to locate and eliminate illicit or harmful discharges.

Surface water degradation is primarily due to accidental spills and non-point source pollution. The most common examples include: sediment from soil erosion associated with construction/ demolition activities, automobile oil/fluid runoff from parking lots, runoff from areas treated with fertilizers and pesticides, chemical substances and fuel from spills associated with industrial and aircraft activities, and de-icing compounds from roadways, taxiways, runways, ramp areas, and aircraft. Some effects of these types of pollution include periodic fish kills which typically result from accidental chemical or fuel releases and de-icing.

Tinker AFB is considered to be a federal aviation facility and is therefore required by the Oklahoma Department of Environmental Quality (ODEQ) to possess storm water discharge permits. Tinker AFB has eleven permitted discharge points that fall into one of the following two permit categories: 1) National Pollutant Discharge Elimination System (NPDES) permit for source pollution or 2) construction site permit for all construction sites. Occasional NPDES permit exceedances and violations have occurred.

The latest Oklahoma Water Quality Standards (OWQS), as established by the Oklahoma Water Resources Board (OWRB, 1993), have designated beneficial uses for streams, named and unnamed on Tinker AFB.

Designated beneficial uses for listed surface water bodies are set out in Title 785 of the Oklahoma Administrative Code (OAC) Chapter 45, Appendix A. Water bodies present on Tinker AFB are listed in Appendix A, Table 5 of Title 785 of the OAC. Criteria for protecting surface water beneficial uses and the default beneficial uses for unlisted streams in Oklahoma are set out in Chapter 45, Subchapter 5, of Title 785 of the OAC.

Beneficial uses for the Soldier Creek tributary (referred to on Tinker AFB as East Soldier Creek), located at the NW ¼, Section 13, T11N, R2W, IM, which is a listed water body in OWQS (Waterbody ID No. 520520000290) include:

- Fish and Wildlife Propagation/Warm Water Aquatic Community (i.e., water bodies are capable of sustaining species development through all life stages),
- Agriculture/Livestock and Irrigation (i.e., toxicity will not inhibit continued ingestion by livestock or irrigation of crops),
- Industrial and Municipal Process and Cooling Water (i.e., process and cooling water quality criteria will be protected by application of the criteria for other beneficial uses),
- Secondary Body Contact Recreation, and
- Aesthetics (i.e., water is aesthetically enjoyable by being free from floating materials and suspended substances that produce objectionable color and turbidity. Water must be free from noxious odors, tastes, and materials that settle to form objectionable deposits and that produce undesirable effects or are a nuisance to aquatic life. Criteria to protect this use shall be color, nutrients, solids, taste, and odor).

The Crutcho Creek tributary at SW ¼, Section 16, T11N, R2W, IM, (Water Quality Management Segment No. 520520), a significant portion of which is off-base, has been designated with the following beneficial uses:

- Fish and Wildlife Propagation/Warm Water Aquatic Community,
- Agriculture/Livestock and Irrigation,
- Industrial and Municipal Process and Cooling Water,
- Primary Body Contact Recreation, and
- Aesthetics.

The primary portion of Crutcho Creek (Waterbody ID Nos. 520520000070_10 and 520520000090), which flows through the southern part of Tinker AFB, housing, community area, and golf course has been designated with the following beneficial uses:

- Habitat-limited Aquatic Community (i.e., water chemistry and habitat are not adequate to support a warm water aquatic community),
- Agriculture/Livestock and Irrigation,
- Industrial and Municipal Process and Cooling Water,
- Secondary Body Contact Recreation (i.e., activities where ingestion of water is not anticipated; for example, boating, fishing, and wading), and
- Aesthetics

Primary Body Contact Recreation is defined as recreation which involves direct body contact with the water where a possibility of ingestion exists. In these cases, water shall not contain chemical, physical or biological substances in concentrations that are irritating to skin or sense organs or are toxic or cause illness upon ingestion by human beings.

Secondary Body Contact Recreation beneficial use is designated where ingestion of water is not anticipated. Associated activities may include boating, fishing, or wading.

For additional information on surface water protection, refer the Green Infrastructure Plan (Tab 1) and Storm Water Management Plan (Tab 7).

Ground Water

Investigation and remediation of groundwater contamination has been ongoing at Tinker AFB for the past 25 years under the Air Force's Environmental Restoration Program. Some of the remediation technologies employed include ground water extraction, filtering, and reuse; bioremediation by injecting vegetable oil into contaminated ground water; and permeable reactive barriers to interrupt contaminated ground water migration. Today, all operations and disposal activities are governed by the Environmental Protection Agency (EPA), State of Oklahoma Department of Environmental Quality (ODEQ), or Oklahoma Corporation Commission (OCC) rules and regulations. This would include the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

Aquatic Resources (Groundwater)

Status ■

Trend ↑

Metric: There is no established metric for this resource. However, in general, the status of groundwater quality on TAFB is considered poor to good depending on location, and therefore has been given an overall rating of fair. Trend is upwards due to ongoing groundwater remediation projects.

Floodplains

Tinker's floodplains are governed by Federal Executive Order (E.O.) 11988, *Floodplain Management.* For more information on the restoration and protection of the natural and beneficial values served by floodplains, refer to the Green Infrastructure Plan (Tab 1).

Aquatic Resources (Floodplains)

Status ■

Trend ↑

Metric: A healthy floodplain is defined as one that will provide natural and beneficial functions and values such as reduced bank erosion, attenuation of flood peaks, quality fish and wildlife habitat, flood storage, enhanced aesthetics, effective filtering of pollutants, and others.

Although there is no established metric for this resource, the status of 100- and 500-year floodplain functions and values is considered fair based on field observations of TAFB natural resources staff. The trend is upward. The extent of potential flooding based on the current floodplain boundary delineations is essentially fixed due to floodwater detention pond requirements for all military

construction projects. Floodplain functions such as fish and wildlife habitat and water filtering have increased appreciably along the Crutcho Creek corridor due to the conversion of improved and semi-improved grounds to natural areas within the floodplain.

7.6 Wetland Protection

Applicability Statement

This section applies to AF installations that have existing wetlands on AF property. This section **IS** applicable to Tinker AFB.

Program Overview/Current Management Practices

Tinker's wetlands are governed by two mandates: 1) Section 404 of the Clean Water Act for jurisdictional wetlands and 2) federal Executive Order 11990, Protection of Wetlands, for non-jurisdictional wetlands.

In 2002, Tinker began wetland monitoring. The originally inventoried 65 acres (73 individual wetland areas) (see paragraph 2.3.5 for initial inventory information) were reassessed to track their status and trend (Wetland Study Report for Tinker AFB, Oklahoma, May 2003). Comprehensive assessments of wetland hydrology and habitat parameters were made on all NWI wetland sites using the Ohio Rapid Assessment Method for Wetlands (ORAM) (Mack, 2001). Intermittent and perennial stream habitats were further evaluated using the U.S. Environmental Protection Agency's Rapid Bioassessment Protocol (RBP) (Barbour, et al., 1999). These methodologies provided quantitative rating protocols which were used to rank the quality of each wetland site. Based on the survey, only two wetlands (i.e., Greenway and Prairie Pond) were classified as high quality wetlands. Thirty-four were classified as intermediate quality, and six as low quality. This study also determined that 33 of the original 73 NWI wetland areas no longer existed or were actually drainage ditches or wet-weather conveyances that did not function as wetlands or aquatic habitat. These non-wetland areas covered approximately 27 acres and most were within the airfield or other highly industrialized areas of Tinker AFB.

In 2007, SAIC conducted a five-year reassessment on 40 wetlands estimated at 38 acres (SAIC, 2008). The same protocols used in the 2002 assessment were used to determine the status and trends in these wetlands and to determine whether any wetlands on base had developed jurisdictional qualities. Twenty-five improved in quality (based on ORAM); 14 had no significant change; and one declined. The declining location was on East Crutcho Creek between the 507th and the airfield. It had little riparian vegetation due to airfield mowing requirements and suffered from high flow storm water events. Additionally in 2007, 21 streams and ponds were reassessed using the 2002 RBP scoring criteria. Ten streams/ponds had improved; 10 had no change; and 1 declined. The declining stream, formerly an unnamed tributary to Beaver Pond, was converted to a marsh filter (now named Beaver Marsh Filter Pond) to improve water quality in the Beaver Pond fishery. This newly created pond/wetland is expected to recover quickly from impoundment and quickly take on wetland characteristics that will continue to improve over time. All of the areas above were also evaluated for federal jurisdictional status. Of these, one located north of Fire Pond was determined to have jurisdictional qualities. Details are provided below on this jurisdictional wetland and others that are considered by the U.S. Army Corps of Engineers (USACE) as jurisdictional.

Tinker AFB Wetlands: Jurisdictional status, acreages, and quality rankings.

Jurisdictional Wetland	Quality Ranking+	Area (ac)
Currently Occurring		
Greenway	High	8.64
Fire Pond (below dam)	Intermediate	3.16
Historically Removed & Mitigated or Reclassified		
Fuel Control Facility (FCF) *	Intermediate	(0.8) removed (on-base) (1.0) mitigated (off-base)
Glenwood	High	(8.5) removed (off-base) (1.5) removed (on-base) (15.3) mitigated (off-base)
GWTP**	Intermediate	(0.63) removed IRP
Compressed Natural Gas (CNG)++	Intermediate	0.34 (pending USACE Doc)

** FCF wetland downgraded by USACE to non-jurisdictional just before draining; mitigation still required under E.O. 11990, Protection of Wetlands*

*** Soils removed as part of Installation Restoration Program (IRP) remediation of site under USEPA Jurisdiction*

+ Delineations & quality rankings from SAIC (2008) wetland study

++ CNG wetland downgraded by USACE to non-jurisdictional; wetland is now regulated under E.O. 11990, Protection of Wetlands

The table above describes the current jurisdictional status and history of classification of wetlands on Tinker AFB. Several of these jurisdictional wetlands have been removed, mitigated, or reclassified. In 1999, the Glenwood wetland [see figure, "Aquatic Resources (Wetlands) of Tinker AFB" in Section 2.3.5] was drained due to waterfowl attraction which presented an aircraft strike hazard. Mitigation for the Glenwood wetland removal included construction of wetlands in Choctaw, Oklahoma (two wetlands totaling 2.3 acres); McCloud, Oklahoma (one 3-acre wetland); Eagle Ridge Institute in Oklahoma City (one 3-acre wetland); and a Kids-We-Care site (three wetlands totaling 10 acres) located south of Guthrie, Oklahoma. Mitigation acreages are approximated. That same year, the Ground Water Treatment Plant (GWTP) wetland, which was located on a Superfund site under EPA jurisdiction, was removed as part of a Superfund cleanup action.

In 2011 a small wetland (0.8 ac) was drained to permit expansion of the Fuel Control Overhaul Facility. Mitigation for this project was developed through cooperative agreements with Land Legacy and Grove Valley Schools located in Edmond, Oklahoma. Mitigation created a 1.0-acre wetland under a conservation easement for Grove Valley School to use as an outdoor classroom. Tinker AFB, the school, NRCS, USFWS, and other agencies worked together in planning, designing, and planting aquatic vegetation in the spring of 2011 which resulted in a successful wetland development and mitigation project. However, in 2019, Deer Creek Schools requested that the Grove Valley mitigated wetland be relocated to school land at N. Meridian and 206th. The school has designed and plans to build an equivalent wetland meeting the same mitigation values. This would include Land Legacy placing a conservation easement on the new wetland site.

In 2016, the USACE reclassified the CNG jurisdictional wetland to non-jurisdictional. This brings the current total number of jurisdictional wetlands to two, comprising 11.8 acres (see figure, "Tinker AFB Wetlands").

Aquatic Resources (Wetlands, Streams, and Ponds)

Status

Trend

Metric: The status of Tinker's aquatic resources (which includes wetlands, streams and ponds) is good and trend is upward. This is based upon SAIC studies in 2002 and 2007 which compared ORAM and RBP scores of wetland quality. Improvements in wetland functions and values will be tracked by on-the-ground site visits/assessments every two years (odd years) and periodic (15-year; due in 2022) status and trend assessments which will be compared with the baseline and subsequent wetland quality rankings.

7.7 Grounds Maintenance

Applicability Statement

This section applies to AF installations that perform ground maintenance activities that could impact natural resources. This section **IS** applicable to Tinker AFB.

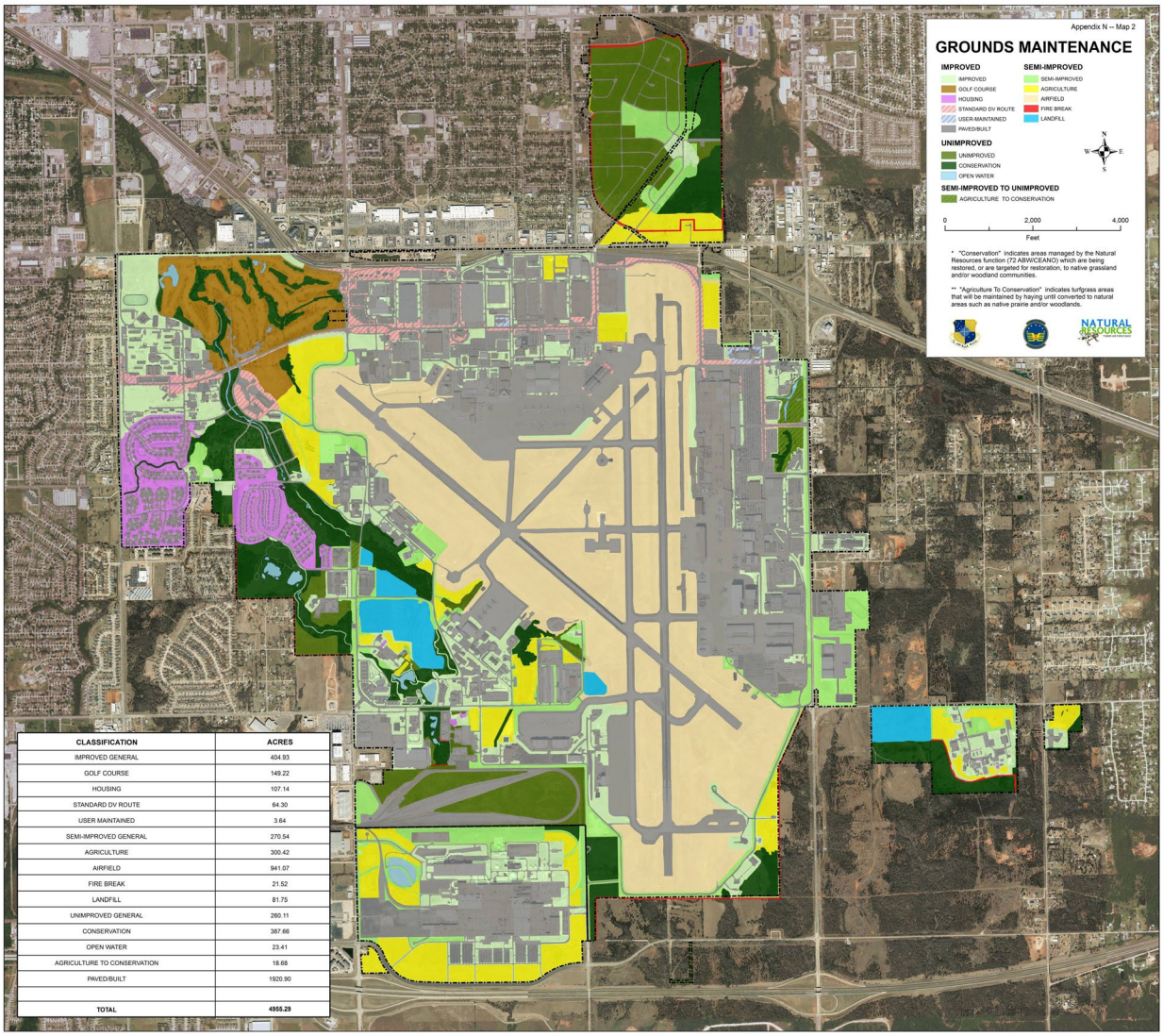
Program Overview/Current Management Practices

Tinker AFB grounds are classified into four basic categories:

1. **Improved grounds (paved/built)** – highly developed land occupied by buildings, roads, parking lots, runways, and other permanent structures.
2. **Improved grounds (turf/landscape beds)** – highly maintained areas such as lawns, athletic fields, golf courses, cemeteries, and landscape plantings on which personnel annually plan and perform intensive maintenance activities. Grass in these areas is normally maintained at a height of 2-4 inches during the growing season.
3. **Semi-improved grounds** – periodically maintained grounds where maintenance is performed primarily for operational reasons (such as erosion and dust control, bird control, and visual clear zones). This land use classification includes areas adjacent to runways, taxiways, and aprons; runway clear zones; lateral safety zones; rifle and pistol ranges; ammunition storage areas; antenna facilities; firebreaks, and golf course roughs. These areas are mowed less often to maintain grass height typically between 7-14 inches.
4. **Unimproved grounds** which are basically waterbodies and areas of relatively low mechanized vegetation maintenance. This includes areas which are managed by prescribed burning, tree thinning, invasive plant species removal, or similar conservation practices. Unimproved grounds are areas not classified as 'improved' or 'semi-improved'. Unimproved grounds include conservation areas such as natural woodlands, grasslands, ponds, wetlands, creeks, and other areas where natural vegetation is allowed to grow essentially unimpeded by maintenance activities.

Since 2007, Tinker AFB has increased in size by approximately 545 acres, primarily due to acquisition of the former General Motors, Burlington Northern-Santa Fe, and Twaddle properties and lease of the Maintenance, Repair, and Overhaul property. This change in acreage also includes the loss of 80 acres due to the termination of the Leased Training Area (east of Douglas Blvd. and south of SE 59th Street).

Grounds maintenance categories are graphically depicted in figure, “Grounds Maintenance Land Use Categories.”



CLASSIFICATION	ACRES
IMPROVED GENERAL	404.93
GOLF COURSE	149.22
HOUSING	107.14
STANDARD DV ROUTE	64.30
USER MAINTAINED	3.64
SEMI-IMPROVED GENERAL	270.54
AGRICULTURE	300.42
AIRFIELD	941.07
FIRE BREAK	21.52
LANDFILL	81.75
UNIMPROVED GENERAL	260.11
CONSERVATION	387.66
OPEN WATER	23.41
AGRICULTURE TO CONSERVATION	18.68
PAVED/BUILT	1920.90
TOTAL	**4955.29**

Grounds Maintenance Land Use Categories

Urban Forestry

Species and Age Diversity

The most common trees identified by Virginia Polytechnic Institute and State University in the 2007 Tinker AFB Urban Forest Inventory were the Eastern redcedar (*Juniperus virginiana*) (14%) and Austrian pine (*Pinus nigra*) (10%). According to Santamour’s species diversity model (Santamour 1990), less than 30% of the total population should be from a single family, less than 20% should be from a single genus, and less that 10% should be a single species. The population at Tinker AFB only exceeds the model with the single species *Juniperus virginiana*.

According to the primary age diversity model (Richards 1983), 40% of trees should be less than 20 cm (~8 in.) diameter at breast height (DBH), 30% of trees should be between 20 and 40 cm (~8-15 in.) DBH, 20% of trees should be between 40 and 60 cm (~16-24 in.) DBH, and 10% should be above 60 cm (~24 in.) DBH. As of the 2007 inventory, the urban forest at Tinker AFB was extremely close to these criteria. The 8-15 inch DBH class was just below 30%, at 29%, and the greater than 24 inch DBH class was just above 10%, at 11%.

The fundamental purpose of promoting species and age diversity in the urban forest is to ensure long-term stability of urban forest structure, function, and value. These models will be used on Tinker AFB as guidelines for species selection and timing of planting for new trees in the future.

In addition to species and age diversity, the presence of native tree species is important to urban forest sustainability and biodiversity. Therefore, a species composition objective has been established to increase native tree abundance while decreasing non-native tree abundance. This is being done primarily through attrition and by ensuring only native trees are used for new plantings. Based on the 2007 inventory, Tinker's native to non-native tree ratio was 1.32:1. Following tree loss due to the December 2007 ice storm, the ratio increased to 1.69:1 (many exotic, weak-wooded trees such as Siberian elm, lacebark elm, and Bradford pear were lost).

Percent Canopy Cover

As of 2007 (baseline year), the overall tree canopy cover for Tinker AFB, excluding the airfield where trees are not permitted, was 9.2%. Canopy cover for industrial, commercial, and residential areas was 2.2%, 13.9%, and 21.1%, respectively. At the time of this initial canopy cover determination, *industrial* was comprised of the following urban forestry management units (refer to Urban Forestry Management Procedures for map of Urban Forestry Management Units): 507th/513th, AWACS, AWACS Alert, CEIG (formerly EIG), Gator, Industrial East, Industrial North, Industrial South 1 through 6, Navy, and 3rd Herd. *Commercial* was comprised Community (Commercial) 1 and 2. *Residential* was comprised of Community (Residential—Military Family Housing), Golf Course, Munitions, and Open Space 1 through 3. In 2011, adjustments were made to these units by adding Industrial South 7 (Tinker Aerospace Complex comprising 406.6 acres); reducing Open Space 2 from 158.1 to 139.3 acres due to Medical Clinic construction; and expansion of Industrial South 4 from 45.5 to 64.1 acres due to Medical Clinic construction. In 2015, adjustments were made by adding the KC-46A site (previously Burlington Northern-Santa Fe property) to Industrial South 7 and by merging the defunct 3rd Herd with Industrial South 1. In 2017, the northern portion of Open Space 5 was redesignated as Industrial South 7 due to expansion of the KC-46A site.

In 2019, Davey Resource Group, in cooperation with the Oklahoma City Community Foundation, Oklahoma Forestry Services and the Association of Central Oklahoma Governments, completed the Central Oklahoma Tree Canopy Assessment. This assessment found that Tinker's tree canopy was 6.8%, a 25% reduction in canopy cover since 2007. From 2007 to 2019, Tinker lost over 3000 of its 6600 trees. This tree loss is attributed to a 2007 ice storm followed a few years later by a 239-week extreme drought, consequential disease and insect outbreaks, large scale construction projects and the removal of 50 acres of invasive cedars across the base. For more details, see "Recent Climatic and Ecologic Influences on Tinker's Urban Forest" below.

American Forests (a non-profit conservation organization dedicated to protecting and restoring healthy forest ecosystems) sets canopy cover goals for metropolitan areas in the Southwest and dry West as an overall coverage of 25%. This is further broken down to 35% for suburban residential areas (equivalent of Tinker's residential area described in previous paragraph); 18% for urban residential zones (equivalent of Tinker's commercial zone as described in previous paragraph); and 9% for central business districts (equivalent of

Tinker's industrial area as described in previous paragraph). Tinker AFB has adopted these percent canopy cover goals for the base.

Trees in Transitional and Approach-Departure Surfaces (Glideslope)

Trees can pose flight or glide slope instrumentation obstacles which in-turn could compromise flight safety. Accordingly, UFC 3-260-01 requires trees that project into the imaginary surfaces be removed or lowered a minimum of 10 feet below the imaginary surface. Trees are permitted near an airfield provided they are not in clear zones and do not penetrate imaginary surfaces, the taxiway clearance distance, the apron clearance distance, or instrument procedure obstacle identification surfaces as described in Terminal Instrument Procedures (TERPS) regulations.

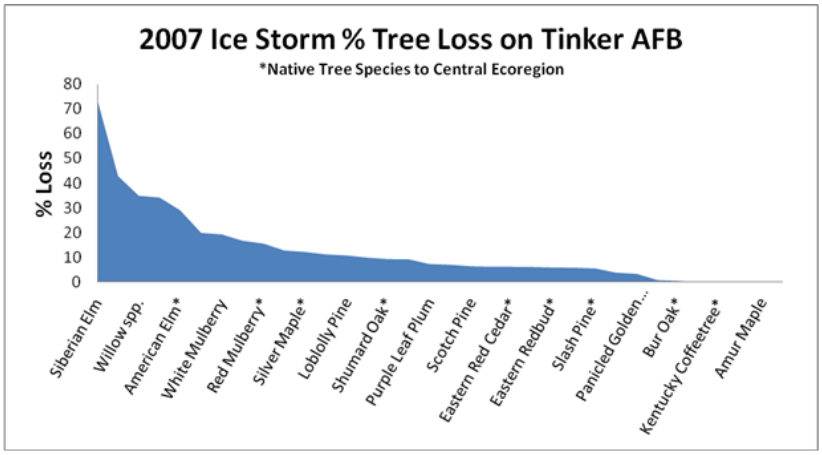
The 2007 urban forest inventory identified 182 trees which potentially breached the Transitional and Approach-Departure Surfaces. Natural Resources and Airfield Operations staff conducted a follow-up field assessment, and trees requiring removal were identified. Some, but not all, of these trees were removed. Some were left in place due to their proximity to buildings that in themselves breached the imaginary surface.

Natural Resources staff, in coordination with Airfield Operations, will assess trees every 5 years to determine violations of the abovementioned regulations. Findings and recommendations will be provided to Airfield Operations for further action.

Recent Climatic and Ecologic Influences on Tinker's Urban Forest

In December of 2007, Tinker AFB experienced a severe ice storm. Tinker's urban forest sustained major damage with cleanup costs exceeding $1M. Approximately 1035 trees [284 small (< 25'); 548 medium (25'-50'); 203 large (> 50')] were removed, and 2950 received corrective pruning. Street trees, which are typically scattered or isolated across the landscape, received the most damage. Trees located in the interior of dense tree stands sustained little damage (due to interlocking support of ice-covered branches), whereas trees on the fringes of these stands sustained more substantial damage (see figure, "Percent Tree Loss Due to 2007 Ice Storm").

In 2010, numerous eastern redcedars and pines were lost base-wide due to severe infestations of bagworms and pinewood nematodes, respectively. In 2014, another bagworm outbreak occurred to the extent that bagworms uncharacteristically infested many deciduous trees such as sycamores, redbuds, and elms. These outbreaks were the worst observed in 20 years.



Percent Tree Loss Due to 2007 Ice Storm

Forest Product Sales

Although Tinker does not manage commercial forests, many felled urban trees can provide marketable products such as firewood and furniture/craft wood. These trees can also serve other purposes such as fish and wildlife habitat structure in ponds. Diversion of landfill waste is one of the primary benefits of forest product salvage and use.

DOD and AF instructions specify that marketable forest products shall not be given away, donated, abandoned, carelessly destroyed, used to offset contract costs, or traded for services, supplies, or products, or otherwise improperly removed. To comply with this requirement, Tinker began selling forest products in 2011 (furniture and smoking wood), and in 2015 expanded with routine sales of mixed firewood.

Grounds maintenance and construction/demolition contractors are required by contract boilerplate specification to haul intact trunks/large branches or to limb, buck, and haul felled trees to the base's forest products staging area. At this site, firewood is processed for sale by conservation staff and volunteers.

Local market research was accomplished to set firewood pricing. Firewood is sold to on- and off-base buyers. Generated funds are deposited into the U.S. Treasury and are available for use by the Tinker conservation program through the Air Force's reimbursable forestry program.

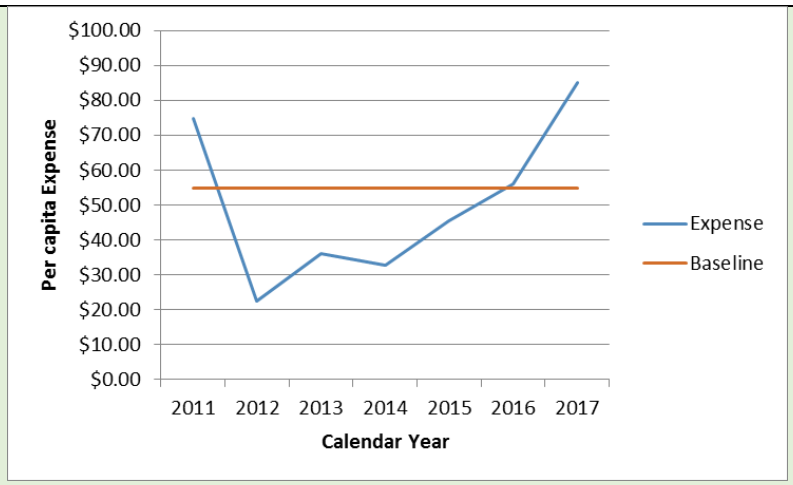
Flora (Urban Forestry)

Status ■

Trend ⬌

Metric 1: Percent tree canopy cover is used as an index to environmental quality improvement. Tracking this metric is accomplished by 15-year recalculations (due in 2022) of the percent canopy cover. The baseline (established 2007) overall percent canopy cover for Tinker AFB is 9.2%. By area, baseline percent canopy cover for industrial, commercial, and residential areas is 2.2%, 13.9%, and 21.1%, respectively.

Metric 2: Measuring efficiency of urban forest management practices on Tinker AFB will be tracked by the annual per capita expenditures for urban forestry activities. Per capita expenses are based on Tinker AFB population (military family housing and dorm residents), not the workforce. Implementation of Urban Forestry Management Procedures (Appendix G) should lead to a downward trend in annual expenditures over time. The average per capita expense from 1993 through 2005 was $54.82 which serves as the baseline.



Metric 3: Measuring effectiveness of urban forest management as it relates to flight safety will be measured by conducting targeted tree height surveys at 5-year intervals (due in 2020). UFC 3-260-01 requires trees that project into the imaginary surfaces be removed or lowered a minimum of 10 feet below the imaginary surface. Trees are permitted near an airfield provided they are not in clear zones and do not penetrate imaginary surfaces, the taxiway clearance distance, the apron clearance distance, or instrument procedure obstacle identification surfaces as described in Terminal Instrument Procedures (TERPS) regulations.

The status and trend of Tinker's urban forest is FAIR and STABLE, respectively. Although some progress (e.g., implementation of tree permit system; tree care workshops; partial implementation of Urban Forestry Management Procedures) has been made in urban forestry management in recent years, several setbacks have been experienced. Since 2007, over 800 trees were planted on base; however, due to the 2007 ice storm, the 2010 and 2014 insect and disease outbreaks, and 2011 and 2012 droughts, and tree removals in military family housing to permit construction of new houses, more than 1100 trees (~1/6 of Tinker AFB tree population) were lost. Many of these were large canopy-contributing trees; therefore, percent canopy cover has decreased. But, many of the lost trees were non-native, in decline, or generally weak-wooded; therefore, the overall net effect on the urban forest was positive. Also, due to limited manpower, the Urban Forestry Management Procedures were not fully implemented.

Prior to the above-mentioned tree losses, species and age diversity of Tinker AFB urban forest was very good. *Santamour's Species Diversity Model* and *Richard's Primary Age Diversity Model* will be reapplied periodically (same cycle as Metric 1) to determine current status of these parameters and their implications on the overall health of Tinker's urban forest.

Native Plant Landscaping

To reduce maintenance needs such as irrigation, fertilization, and pesticide use, Tinker AFB requires the use of native plant materials on most landscaping projects. This is in compliance with Presidential Memorandum, *"Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds*,"

April 26, 1994, which states that where cost effective and to the maximum extent practicable, all plants used for landscaping on federal land shall be native (varieties/ subspecies and cultivars of native species are acceptable) to the local region. For Tinker AFB, local region is defined as:

- Central Great Plains ecoregion (mixed-grass prairie) with some eastern fringe areas in the Crosstimbers ecoregion (US EPA, 2005).
- Prairie and Great Plains Region as described in *An Annotated List of the Ferns, Fern Allies, Gymnosperms and Flowering Plants of Oklahoma* (Taylor and Taylor, 1994).

Native plants approved for planting on Tinker AFB are listed in Appendix E (Native Plant Landscaping Material List). See Green Infrastructure Plan (Tab 1) for additional regulatory guidance on landscaping with native plants.

Other Vegetation Management

For additional information on Tinker AFB vegetation management, refer to Section 7.11 (Integrated Pest Management Program), Appendix E (Native Landscaping Material List), Appendix F (Mitigation Action Tracker), Appendix G (Urban Forestry Management Procedures), Tab 1 (Green Infrastructure Plan), Tab 2 (Golf Course Environmental Management Plan), and Tab 3 (Wildland Fire Management Plan).

7.8 Forest Management

Applicability Statement

This section applies to AF installations that maintain forested land on AF property. This section **IS NOT** applicable to Tinker AFB. However, Tinker AFB does manage the urban forest (see Section 7.7 and Appendix G, Urban Forestry Management Procedures)

Program Overview/Current Management Practices

N/A

7.9 Wildland Fire Management

Applicability Statement

This section applies to AF installations with unimproved lands that present a wildfire hazard and/or installations that utilize prescribed burns as a land management tool. This section **IS** applicable to Tinker AFB.

Program Overview/Current Management Practices

For information regarding installation wildland fire management and prescribed burning, refer to the Wildland Fire Management Plan (Tab 3).

7.10 Agricultural Outleasing

Applicability Statement

This section applies to AF installations that lease eligible AF land for agricultural purposes. This section **IS** applicable to this Tinker AFB.

Program Overview/Current Management Practices

Much of Tinker AFB land is suitable for agriculture. Approximately 22 acres of pasture were maintained for grazing purposes at the Tinker AFB riding stables until the 1990s when the acreage was reduced to about 15 acres to provide a site for new dormitories. Following the 1999 F-5 tornado that destroyed the riding stables and killed several horses, the pastures were converted to a softball and running track complex.

Haying was accomplished on the Tinker AFB airfield in the early to mid-1980s but was reportedly discontinued due to conflicts with the flying mission (e.g., haying interfering with flying operations, and haying becoming difficult and unprofitable due to flying operations).

In 2009, approximately 115 acres of grassland around Building 9001 were outleased for haying. This was reduced to 110 acres in 2015 and to 92 acres in 2017 due to land development. In Dec 2017, the lease was terminated due to lessee compliance violations.

In 2011, due to grounds maintenance budget cuts, the grounds maintenance contractor (i.e., Trace) began to hay some areas in lieu of mowing. This was separate from the B-9001 haying lease and expanded the base haying acreage by approximately 190 acres. This was comprised of many relatively small, fragmented areas but also included some larger areas such as airfield clear zones. Special safety practices were required in the clear zones to ensure bird/wildlife aircraft strike hazards did not increase; however, Trace elected not to hay the clear zones. All haying by Trace was discontinued about 2013 and reverted to mowing.

In 2018, 114 acres around Building 9001 and on the CEIG campus were outleased for haying. In 2019, the lease was expanded to 141 acres by adding Landfill 6 and a field on the west side of the Navy campus.

Haying leases have been executed competitively through the Tinker AFB Civil Engineering (CE) Real Estate office. Currently, the lease is jointly managed by the Tinker AFB Real Estate and natural resources functions. Compliance inspections have been conducted annually by natural resources staff using a standardized compliance checklist. The areas have typically been hayed one time annually. This has been accomplished after 1 August of each year to ensure compliance with the Migratory Bird Treaty Act (i.e., no haying within the 1 Apr - 1 Aug bird breeding season). The hay is a mixture of mostly exotic grasses (predominantly Bermuda and Johnson grasses) and forbs with some native species.

7.11 Integrated Pest Management Program

Applicability Statement

This section applies to AF installations that perform pest management activities in support of natural resources management, e.g. flora and fauna invasive species, forest pests, household pests, etc. This section **IS** applicable to Tinker AFB.

Program Overview/Current Management Practices

Animals, including but not limited to insects, spiders, snakes, rodents, skunks, raccoons, bobcats, and feral cats/dogs that pose human health and safety hazards or that damage government property are controlled by Tinker AFB Pest Management personnel. Pest birds (to include BASH related issues) and most large animals such as deer, coyotes, and beaver are controlled by United States Department of Agriculture–Wildlife Services (USDA–WS) personnel who are officed with the Civil Engineering natural resources function. Improved and semi-improved grounds weed control, including but not limited to weeds in cracks of concrete/asphalt, graveled storage yards, planting beds, and turfgrass is accomplished by the grounds maintenance contractor or golf course personnel depending on location. Invasive weeds in natural

areas are typically controlled by contractors who specialize in natural area restoration; this is overseen by Tinker natural resources staff.

For more specific information on Tinker AFB integrated pest management, refer to Section 5 (Training), Section 6.2 (Reporting), Section 7.12 (Bird/Wildlife Strike Hazard), and Tab 5 (Integrated Pest Management Plan). Information on flora and fauna invasive species management is detailed below.

Invasive Species (Flora)

Executive Order 13112, Invasive Species, requires all federal agencies to prevent the introduction of invasive species, provide for their control, and minimize their economic, ecological, and human health impacts. Invasive species are defined as indigenous and non-indigenous plants, including their seeds, spores, or other biological material, that have a propensity to aggressively invade and/or displace native vegetation. These plants tend to have high reproductive rates, rapid establishment and dispersal, and are very adaptable. If not controlled, invasive plants can cause negative economic, ecological, military operational, and human health and safety impacts.

Five plant-related studies/surveys conducted on Tinker AFB [i.e., Vegetation Inventory of Tinker AFB, Oklahoma (Glenn, et al., 1993); Native Tallgrass Prairie Assessment/Management Plan (Johnson, et al., 1995); Non-Native/Invasive Plant Species in the Urban Greenway (Dorr & Pokorski, 2007); Tinker AFB Urban Tree Inventory (Dorr, et al., 2007); and Invasive Species Assessment, Tinker Air Force Base (Whitsitt, et al., 2011)] provide useful invasive species information. Plants identified in these studies/surveys were compared with plants listed in the Oklahoma Non-Native Invasive Plant Species (Oklahoma Invasive Plant Council, 2011) and Invasive Plants in Southern Forests (Miller, et al., 2010) publications. This indicated that 68 exotic/invasive plant species currently occur on Tinker AFB (see table, "Invasive Plant Species Known to Currently Exist on Tinker AFB."

Quantitative data were collected during the 2007 non-native/invasive plant survey of the Urban Greenway. Though this study was not conducted base-wide, it identified the predominate invasive woody species in the Urban Greenway to be lacebark elm, Siberian elm, Chinese privet, Japanese honeysuckle, Morrow's bush honeysuckle, and multiflora rose (Dorr & Pokorski, 2007).

Invasive Plant Species Known to Currently Exist on Tinker AFB

Common Name	Botanical Name	Common Name	Botanical Name
Trees		**Shrubs**	
Amur maple	*Acer ginnala*	Amur honeysuckle+	*Lonicera maackii*
Tree of heaven+	*Ailanthus altissima*	Morrow's honeysuckle+	*Lonicera morrowii*
Mimosa (Silktree)	*Albizia julibrissin*	Multiflora rose+	*Rosa multiflora*
Paper mulberry	*Broussonetia papyrifera*	**Vines**	
Russian olive	*Elaeagnus angustifolia*	Oriental bittersweet	*Celastrus orbiculatus*
Eastern redcedar*+	*Juniperus virginiana*	Ivyleaf morning-glory	*Ipomoea hederacea*
Panicled golden raintree**	*Koelreuteria paniculata*	Japanese honeysuckle+	*Lonicera japonica*
Chinese privet+	*Ligustrum sinense*	Kudzu	*Pueraria lobata*
White mulberry	*Morus alba*	**Forbs**	
Japanese black pine	*Pinus thunbergii*	Thymeleaf sandwort	*Arenaria serpyllifolia*
White poplar	*Populus alba*	Shepherd's purse	*Capsella bursa-pastoris*
Lombardy poplar	*Populus nigra*	Hoary cress	*Cardaria draba*
Callery pear+	*Pyrus calleryana*	Canada thistle	*Cirsium arvense*
Sawtooth oak	*Quercus acutissima*	Asiatic dayflower	*Commelina communis*
Lacebark elm+	*Ulmus parvifolia*	Sulphur cosmos	*Cosmos sulphureus*
Siberian elm+	*Ulmus pumila*	Queen Anne's lace	*Daucus carota*
		Deptford pink	*Dianthus armeria*
Grasses		Redstem stork's bill	*Erodium cicutarium*
Jointed goatgrass	*Aegilops cylindrica*	Flower-of-an-hour	*Hibiscus trionum*
Plains bluestem+	*Bothriochloa ischaemum*	Prickly lettuce	*Lactuca serriola*
Japanese brome+	*Bromus arvensis*	Henbit deadnettle	*Lamium amplexicaule*
Cheatgrass+	*Bromus tectorum*	Sericea lespedeza+	*Lespedeza cuneata*
Bermuda grass+	*Cynodon dactylon*	Black medick	*Medicago lupulina*
Yellow nutsedge	*Cyperus esculentus*	White sweet clover	*Melilotus alba*
Nutgrass	*Cyperus rotundus*	Yellow sweet clover	*Melilotus officinalis*
Barnyardgrass	*Echinochloa crus-galli*	Narrowleaf plantain	*Plantago lanceolata*
Indian goosegrass	*Eleusine indica*	Prostrate knotweed	*Polygonum aviculare*
Weeping lovegrass+	*Eragrostis curvula*	Sulphur cinquefoil+	*Potentilla recta*
Japanese stilt grass	*Microstegium vimineum*	Curly dock	*Rumex crispus*
Dallisgrass	*Paspalum dilatatum*	Bouncingbet	*Saponaria officinalis*
Annual bluegrass	*Poa annua*	Common dandelion	*Taraxacum officinale*
Bulbous bluegrass	*Poa bulbosa*	Yellow salsify	*Tragopogon dubius*
Tall fescue+	*Schedonorus phoenix*	White clover	*Trifolium repens*
Meadow fescue	*Schedonorus pratensis*	Common vetch	*Vicia sativa*
Green bristlegrass	*Setaria viridis*	Winter vetch	*Vicia villosa*
Johnson grass+	*Sorghum halapense*	Common periwinkle	*Vinca minor*
Bamboo spp.++	*Species unknown*		

+Plants have been observed on Tinker AFB to be very aggressive and cause ecological concern.

++Bamboo occurs in a dense, 0.5-acre stand in the northwest quadrant of Glenwood

*The eastern redcedar is not an exotic species; however, it can be very invasive if land is not properly managed and therefore is included here as a species requiring monitoring/control.

**The panicled golden raintree, a non-native tree on Tinker AFB, is not classified as an invasive species, yet natural resources personnel have witnessed invasive tendencies (i.e., highly reproductive; rapidly establishes/disperses) in this species in native grassland areas on Tinker AFB.

Tinker AFB Invasive Flora Species Characterizations

Problems associated with invasive species on Tinker AFB have been primarily ecological and human safety-related (i.e., redcedar fire hazard). The most notable known, ecologically disruptive invasives on Tinker AFB are sericea lespedeza, Johnson grass, Bermuda grass, tall fescue, Japanese brome, cheatgrass, plains bluestem, weeping lovegrass, lacebark elm, Siberian elm, Callery pear, Tree of heaven, panicled golden raintree, eastern redcedar, Chinese privet, Japanese honeysuckle, and Amur/Morrow bush honeysuckle.

Sericea lespedeza is a warm-season forb that has rapidly invaded remnant prairie areas in Reserves 1 and 3 of Tinker's Urban Greenway (refer to the Tab 1, Green Infrastructure Plan, for Greenway locations). A small colony has also been observed in the unimproved fringes of Soldier Creek. Control of this invasive has been conducted since 2006 by a combination of herbiciding and prescribed burning. Without this control in Reserve 3, much habitat for the Texas horned lizard would be lost, and extirpation of this lizard would likely occur over time.

Johnson grass is a very robust and stubborn warm-season perennial found base-wide and will out-compete or significantly degrade native grass stands if left unchecked. Herbicidal control of these species is ongoing within the Urban Greenway.

Bermuda grass is a warm-season perennial found at numerous locations base-wide. It has historically been the primary turfgrass on Tinker AFB and is very similar to Johnson grass in its invasive and persistence tendencies, but because of is prostrate growth habit it is less threatening to healthy native grass areas that are protected from mechanical disturbance. Herbicidal control of these species is ongoing within the Urban Greenway.

Tall fescue is a cool-season perennial found base-wide and is a threat to established native grass stands particularly in wet, shady, and disturbed areas. Primary control of this species has been along the southwest fringes (i.e., interface of firebreak and native grass remnant) of Reserve 3 in the Greenway.

Japanese brome and cheatgrass are cool-season annuals found in grassland and woodland areas base-wide, particularly in areas of disturbance. Control of this species has been accomplished within the Urban Greenway by mowing prior to brome seeding and by prescribed burning.

Plains bluestem is an aggressive warm-season perennial found primarily in Reserves 1 and 3 of the Urban Greenway but also occurs in lighter infestations base-wide (see figure, "Plains Bluestem Monoculture"). It will invade healthy native grassland areas upon minor disturbance. Control by spot and broadcast herbicide treatments are on-going within the referenced Reserves.

Weeping lovegrass has invaded a significant acreage in the northeast corner of Glenwood, but limited control has been initiated to date. A small infestation has also been observed and control initiated in the Urban Greenway immediately adjacent to the south of B-1049.

Lacebark and Siberian elms are the most aggressive exotic tree invaders on Tinker AFB, rapidly establishing in many unmowed areas in and around the Urban Greenway, golf course native grass areas, and in unimproved fringes of Soldier Creek. Cut-and-treat (i.e., herbicide) techniques have been used to eradicate hundreds of these trees in Reserve 1 of the Greenway. Additionally, about 5 acres of dense lacebark and Siberian elm woodland areas have been removed by mastication machines in the Greenway since 2011.

Plains Bluestem Monoculture: Plains bluestem located in Tinker AFB Urban Greenway significantly lowers biological diversity and ecosystem health.

Callery pear occurs Greenway-wide with greatest occurrence observed in Reserve 2 (North) and Reserve 3 of the Greenway. Control by cut-and-treat and prescribed burning has been accomplished in Reserve 3. Mastication has removed most pears in Reserve 2 (North).

Tree of heaven is an aggressive, rapidly growing and spreading tree. It has been identified only in Reserve 2 (South) of the Greenway and in Glenwood. Limited control has been initiated for this species.

Panicled golden raintree is a common ornamental in the region and has invaded a native grassland area on the golf course. The invasion was dense, but the spread of this species appears to restrict itself to areas immediately surrounding the parent plant, possibly due to raintree seeds being relatively large and less mobile. If left unchecked, however, this plant would become problematic in the long-term. Some cut-and-treat of this species has been accomplished, and scheduled prescribed burning is expected to subdue spread.

Eastern redcedar is an evergreen tree. Although it is native, it can be very invasive if not properly managed. These trees will severely degrade existing native grasslands and threaten to eliminate Oklahoma penstemon (a rare plant) colonies in grassland areas. Invasion also can result to the decline of other biota such as the Texas horned lizard. Redcedar populations in Glenwood could become so dense that land becomes unsuitable for military training, and the probability of catastrophic wildfires during dry periods increases significantly due to heightened fuel loads.

Redcedar control has been accomplished on Tinker AFB by mechanical removal (i.e., mowing, chain sawing, brush trimming, masticating) and prescribed burning. Since 1999, approximately 3980 redcedars have been mechanically removed with chainsaws and brush trimmers, with hundreds of seedling/sapling redcedars eradicated during prescribed burns. Also, approximately 36.5 acres of cedars have been removed base-wide by mastication since 2012.

Chinese privet is an evergreen/semi-deciduous shrub of woodland areas on Tinker AFB. Small-scale control has been accomplished by cut-and-treat methods in Reserve 1 of the Greenway.

Japanese honeysuckle occurs throughout the Urban Greenway and SE corner of Glenwood. No control has been initiated for this plant.

Amur/Morrow's bush honeysuckle occurs throughout the Urban Greenway. Aggressive control of bush honeysuckle has been initiated in Reserve 1 of the Greenway with 1500+ plants removed 2008-present.

Kudzu occurs in one isolated location in the southeast corner of CEIG.

Aquatic Plant Rules:

The Oklahoma Department of Wildlife Conservation has enacted statewide aquatic nuisance species restrictions. Specifically, Rule 800:20-4-2, Movement of Aquatic Plants, states: "No person may transport aquatic plants between waters of this state. Persons leaving any water of this state must remove all aquatic plants from boat, trailer, or any other gear capable of holding aquatic plants immediately after leaving the body of water from which the plants originated."

Flora (Invasive Species)

Status ■

Trend ⬇

Metric: Although metrics have not been established for this resource area, based on limited field surveys and incidental observations, the status and trend of Tinker AFB native vegetation communities as related to invasive species is currently rated as POOR and DOWNWARD, respectively. Although pockets of progress have been made, invasive plant species are present and spreading in many other natural areas on Tinker AFB. The degree and rate of invasion are unknown. However, this is forecasted to be reversed within the next decade for the following reasons:

- Base-wide Invasive Species Assessment to identify infestations has been completed and will foster a targeted and prioritized control strategy;
- Ongoing and currently programmed projects for eradication/control of invasives and conversion to native prairies/woodlands on golf course and Urban Greenway system; and
- Base-wide expansion of annual prescribed burning

Invasive Species (Fauna)

There are sixteen non-native wildlife species that occur, or have occurred, on Tinker AFB (see table, "Non-native Species Occurring on Tinker AFB"). These species have been documented as a result of faunal inventories (see Appendix D, "Fauna List"). Some of these species (i.e., trout) have been stocked and managed for sport fisheries and only inhabit Tinker AFB when water temperatures are cold enough for survival. Triploid grass carp (*Ctenopharyngodon idella*) also have been periodically stocked in base ponds to control nuisance aquatic plant growth. Grass carp have been stocked only in triploid sterile form in accordance with Oklahoma Administrative Code (OAC) 800:20-1-2. This is the only species known to occur on Tinker AFB that is listed as a "Restricted Aquatic Nuisance Species" under OAC 800. Of these 16 non-native wildlife species, the birds, domestic cat, common carp, basket clams, and red imported fire ants are considered invasive due to rapid spread and resultant ecological harm.

Four non-native avian species have been documented on Tinker AFB. The Eurasian collared dove (*Streptopelia decaocto*) was originally introduced in the U.S. from Eurasia likely through the Bahamas and spread to southern Florida and portions of the midwest to the California coast (NatureServe, 2011). While clearly invasive in the U.S., it is unclear at this time what negative impact this species may have. Also from Europe, the European starling (*Sturnus vulgaris*) was introduced to the U.S. in 1890 in New York City, and has spread and currently breeds across all of North America. The greatest concern for Tinker AFB is this invasive species flocking behavior in the fall as it stages for migration. This represents a significant threat to aircraft operations at Tinker AFB, which require implementation of flight restrictions during the fall time period (see BASH Plan 91-212). These birds also can usurp the nests of native cavity-nesting birds such as bluebirds and woodpeckers. The Rock dove (*Columbia livia*) and European house sparrow (*Passer domesticus*) have also been widely distributed across North America and represent threats primarily to aviation and competition with native species. All of these birds receive no protection under the Migratory Bird Treaty Act and are routinely controlled as nuisance species.

Feral dogs (*Canis domesticus*), and especially cats (*Felis catus*), have been documented worldwide as causing harm to native wildlife populations; however, no specific incidents have been documented on Tinker AFB. Humane trapping and removal of feral cats and dogs is performed by Tinker AFB Pest Management Shop and USDA Wildlife Services. This is required under DODI 4715.03, Natural Resources Conservation Program, which requires the DOD to control feral animals on military installations as needed.

Common carp (*Cyprinus carpio*), occasionally found in Tinker AFB streams, are often regarded as a nuisance species, but not listed in OAC 800 (see figure, "Invasive Species Common Carp"). This is due to its undesirable effects on water bodies such as increasing turbidity and elimination of vegetation and aquatic habitat. Many other aquatic species such as the goldfish and common carp have become naturalized and often hybridize across large portions of the U.S. (Fuller et. al., 1999). However, for the Goldfish, much of its established range is restricted to portions of certain drainages. Some areas may represent repeated escapes or releases rather than established populations (Fuller et.al., 1999).

Widespread across the U.S., the Asian basket clam (*Corbicula fluminea*) is also found in Tinker AFB streams and ponds. Although not regulated under section 800 and despite little research being done to determine the extent of this invasive's impacts, it is known to clog intakes of dams and likely compete with highly vulnerable native bi-valves. Since boating is not permitted on Tinker AFB ponds, concerns with other listed aquatic species such as the zebra mussel (*Dreissena polymorpha*) or quagga mussel (*Dreissena bugensis*) is not an issue on Tinker AFB.

Another invasive invertebrate species is the red imported fire ant (RIFA), (*Solenopsis invicta*). It has spread across much of the southern U.S. and has been documented in all of Oklahoma, with the exception of the

panhandle. Historically, the RIFA had been found just off Tinker AFB, associated with electrical transformers and lines. In 2016, it was discovered in several locations on base where it was believed to have been introduced through sod and landscape plantings. Broadcast treatments with granular insecticides and drenches are routinely accomplished where needed (see figure, "Red Imported Fire Ant Locations").

Non-native Species Recorded on Tinker AFB

Non-native Species Recorded on Tinker AFB	
Eurasian Collared-Dove	*Streptopelia decaocto*
Rock dove	*Columba livia*
European starling	*Sturnus vulgaris*
House sparrow	*Passer domesticus*
Domestic cat	*Felis catus*
Domestic dog	*Canis domesticus*
Mediterranean gecko E	*Hemidactylus turcicus*
Brook trout S	*Salvelinus fontenalis*
Brown trout S	*Salmo trutta*
Rainbow trout S	*Oncorhynchus mykiss*
Common carp	*Cyprinus carpio*
Fathead minnow (Rosy-red)	*Pimephales promelas 'Golden Strain'*
Goldfish D	*Carassius auratus*
Grass carp S *(Triploid)	*Ctenopharyngodon idella*
Basket clams v	*Corbicula fluminea*
Red imported fire ant	*Solenopsis invicta*

* Regulated under section OAC 800
S Species stocked for sport fish management

Invasive Common Carp:
Common carp seined in Crutcho Creek
often reach large sizes even in small streams.

Some non-native wildlife, like the gold fish, Rosy-red minnow, and Turkish house gecko, are not necessarily considered invasive. A portion of Kuhlman Creek flowing through Tinker's golf course was recently found to contain large numbers of goldfish (*Carassius auratus*), likely due to an aquarium release. Earlier stream sampling had not shown goldfish to be present (Moody & Lemmons, 2005). They appeared to be confined to the stream's uppermost section, likely due to lack of predators. These goldfish were easily eliminated through the introduction of adult largemouth bass.

The Rosy-red minnow (*Pimephales promelas* 'Golden Strain') has also been documented in Tinker AFB stream surveys. While not completely a non-native species, it is a species strain derived from the fathead minnow breed of the aquarium industry and was introduced through bait or aquarium releases. It does compete with native fish populations, but has not been documented as doing significant ecological harm.

The Turkish house gecko (*Hemidactylus turcicus turcicus*), formerly called the Mediterranean gecko, has spread worldwide and can be found across most of the southern United States. It is known for its tendency to inhabit human dwellings. This, along with the lack of predators in introduced areas, has contributed to its proliferation (Franklin, 1997). It has been occasionally found on Tinker AFB, particularly in facilities such as Building 1 and former Building 460. It is likely these hitchhikers found their way here on military cargo aircraft from the Mediterranean region. They have not been observed in Tinker's native habitat and are believed to require climate controlled building environments to survive Oklahoma winters.

Red Imported Fire Ant Locations: RIFAs have been identified at many locations on and adjacent to TAFB.

Fauna (Invasive Species)

Status Unknown

Trend Unknown

Metric: No metric has been established for invasive fauna species, and status and trend is unknown.

7.12 Bird/Wildlife Aircraft Strike Hazard (BASH)

Applicability Statement

This section applies to AF installations that have a flying mission and the potential for bird/wildlife aircraft strike hazards. This section **IS** applicable to Tinker AFB.

Program Overview/Current Management Practices

Tinker AFB manages wildlife, particularly birds and larger mammals, consistent with the Air Force's Bird/Wildlife Aircraft Strike Hazard (BASH) Program. Tinker's flight safety office is primarily responsible for BASH program management. The Civil Engineering (CE) natural resources function serves as liaison to state and federal conservation agencies and advisor to the BASH committee which is chaired by the 72 ABW Installation Commander. CE natural resources staff maintain a migratory bird depredation permit issued by the USFWS to conduct intentional takes of migratory birds. The United States Department of Agriculture–Wildlife Services (USDA-WS) and Base Operations staff serve as sub-permittees.

Wildlife damage control is accomplished by USDA-WS and Civil Engineering Pest Management shop in coordination with Tinker's natural resources program. Wildlife Services entered into their first cooperative agreement with Tinker AFB for integrated wildlife damage management including avian species control in 2001. Since that time, the agreement has evolved into a recurring five-year cooperative agreement for integrated wildlife damage management. The most recent agreement has expanded to include increased monitoring of wildlife and development of metrics to improve focus and management of damage control. A full-time wildlife biologist and full-time wildlife technician are provided through the agreement. They are officed with and coordinate closely with Tinker AFB natural resources staff.

Since Tinker AFB is highly urbanized, human-wildlife conflicts are not uncommon. Primary wildlife species which pose BASH concerns include beaver, coyotes, Canada geese, egrets, gulls, rock doves, European starlings, and occasionally deer. Beaver are found base-wide and are managed as important parts of Tinker's aquatic systems. They typically are not removed unless they disable creek spill gates, cause flooding issues, or their ponded areas attract waterfowl or wading birds near the airfield. Coyotes frequent the airfield and have been struck by aircraft; therefore, they are actively managed to limit their numbers on the airfield. Geese have nested on Tinker AFB in the past and if not regularly hazed will populate to numbers which pose aircraft safety concerns. Gulls frequent the airfield during spring and fall migrations particularly after precipitation events when forage is found on runways (see figure, "Gulls on Tarmac"). Egrets and herons have historically established rookeries (i.e., nesting locations) near Tinker AFB. Hundreds of birds migrated at low altitude across the base, particularly during the morning and evening. Egrets have been struck by aircraft in Tinker's flight pattern; therefore, active management for these species and their habitat on and off-base is conducted. Rock doves and European starlings inhabit many buildings and other structures and are controlled to reduce BASH and potential health hazards and corrosive damage to aircraft

caused by the birds' excreta. Specific information about species control is addressed in Tab 4 (Bird-Aircraft Strike Hazard Plan—Tinker AFB Plan 91-212) and Animal Damage Management Cooperative Agreement and Work Plans (see Appendix H, "Natural Resources Cooperative Agreements/Memorandums").

Gulls on Tarmac: Ring-billed and Franklin's gulls are typical visitors to the airfield following rain events during spring and fall migration seasons.

Air Force and Tinker AFB policy is to employ non-lethal control methods such as hazing, trapping, relocation, early nest removal, and other techniques to control wildlife. However, at times, lethal control is necessary. Lethal means are used with discretion, typically when persistent wildlife species are posing significant health, safety, or environmental damage concerns. For example, lethal control is used for coyotes on the airfield, beaver, and for small numbers of gulls to reinforce pyrotechnic hazing of larger flocks. Lethal methods are also frequently required for resident geese.

Several metrics for avian bird control and bird aircraft strikes have been developed in conjunction with the study "Inventory of Avian Species on Tinker AFB" (St. Germain, 2010). They include relative abundance (ra), strike numbers, and strike probability for the airfield. The top eleven bird threats have been consolidated into a table where they were ranked by these metrics and categorized by size and behavior (see table, "Top Eleven Bird Threats at Tinker AFB"). Birds were divided into large and small categories since large birds pose more dangerous strike hazards than small birds. In addition, birds that exhibit flocking behaviors were more likely to result in multiple strikes and ingestion into engines. To further evaluate strike threats, some birds were grouped by similar species, habits, and associations. For example, three different species of gulls were grouped together due to typical flocking and associations to one another. Another example is waterfowl, which was put into one group due to similar habits, such as flocking, use of similar habitats, and potential for strike behavior. Metric data were utilized from the St. Germain (2010) study to rank the birds. Eleven species/groups were identified in these rankings as having the highest threat potentials. The results provide a picture of the birds that present the greatest threat

potential under current management practices and abatement procedures of the Wildlife Damage Management (WDM) program. It should be noted that if these programs were not on-going and aggressive, the ranking would likely be much different. For example, resident geese numbers would be much higher due to favorable habitat such as the golf course and green space environments. Therefore, the list provides insight into current conditions for species and groups of birds for further focus of control efforts.

Top Eleven Bird Threats at Tinker AFB: The top eleven bird threats were compiled and ranked into metrics derived from data collected by the Virginia Tech bird survey.

TOP ELEVEN BIRD THREATS AT TINKER AFB

Bird Strike Probabilities and Relative Abundances Categorized by Size and Flocking Behavior and Ranked by Relative Abundance, Strike Probability and Actual Strike Numbers (metrics compiled in Aug 2011)

METRIC RANKS							
Probability	**Relative Abundance**	**No. Strikes**	**Group Name**	**Common /Scientific Name**	**No. Strikes** *	**Relative Abundance (ra)****	**% Probability by season ***
Large - Flocking Birds (>200g)							
3	1	1	Gulls	*Franklin gull (280g), Ring-billed gull (520g)*	30	0.775	*54 (spr)* *1 (w)*
-	10	6	Waterfowl	*American white pelican (7500g), Canada goose (4500g), Bufflehead (380g), Canvasback (1220g), Grebe, Gadwall (910g), Hooded merganser (620g), Scaup, Mallard (1100g), Ring-necked, Coot, Blue-winged teal (380g)*	6	0.000	ND
Small - Flocking Birds (<200g)							
5	3	6	Black birds	*European starling (82g)*	6	0.512	1 (spr) 3 (s) 17 (f) 1 (w)
7	5	6	Swallows	*Barn swallow (19g)*	6	0.20410	7 (spr) 10 (s)
-	-	3	Goat suckers	*Common night hawk (62g)*	19	ND	ND
Large Birds (>200g)							
8	6	7	Raptors	*Turkey vulture (1830g), Swainson's hawk (855g), Mississippi kite (280g), Cooper's hawk (450g),Red-tailed hawk (1080g), Red-shouldered hawk (630g), Long-eared owl (260g)*	3	0.164	2 (spr) 2 (f) 4 (w)

9	9	8	Herons & Egrets	*Great blue heron (2400g), Green heron (210g), Little-blue heron (340g), Yellow-crowned night heron (690g), Great egret (870g), Cattle egret (340g)*	2	0.014	1 (spr)
Small Birds (<200g)							
1	4	2	E. Meadowlark	*Sturnella magna (90g)*	27	0.419	31% (spr) 72% (s) 47% (f)
2	2	7	Horned lark	*Eremophila alpestris (32g)*	3	0.727	1% (spr) 1% (s) 84% (w)
6	8	4	Killdeer	*Charadrius vociferous (95g)*	14	0.107	1% (spr) 5% (s) 14% (f)
4	7	5	Mourning dove	*Zenaida macroura (120g)*	11	0.119	1% (spr) 7% (s) 15% (f)

** Number of strikes taken from Tinker AFB BASH data sets 1991-2010. ** Relative abundance (ra) on the airfield (St.Germain, 2010).*
**** Strike probabilities were determined by relative strikes reported x relative abundances surveyed and then standardized (St.Germain, 2010).*
ND – *no data available, these entries were either due to the lack of field survey data or zero detection for species relative abundance which disallowed calculations for strike probability.*
Note – data was taken from the "Inventory of Avian Species on Tinker AFB" (St. Germain, 2010) and table, rankings and categorizations were determined by NR staff using experience within the WDM program and "The Sibley Guide to Birds" (Sibley, 2009).

To improve aircraft safety, Tinker AFB strives to comply with the Federal Aviation Administration's Advisory Circular 150/5200-33B, Hazardous Wildlife Attractants on or Near Airports. This circular provides guidance on certain land uses that cause movement of hazardous wildlife onto, into, or across an airport's approach or departure airspace or air operations area (AOA). The circular recommends specific separation distances from the AOA within which wildlife attractants, such as retention/detention ponds, wetlands, and certain types of agricultural and landscaping activities, should be avoided, eliminated, or mitigated.

Of particular concern on Tinker are numerous wetlands and retention/detention ponds that are within the separation distance (i.e., 10,000 feet) specified in the circular. Natural resources and USDA-WS staff have employed avoidance, elimination, and mitigation in managing these water bodies to promote a safe flying environment and sustain the ecological services and recreational benefits the water bodies provide. Since the mid-1990s, Tinker has eliminated or modified three water bodies which were attracting hazardous wildlife in close proximity of the airfield. A detention basin located adjacent to Landfill 5 (about 800 feet from Runway 18/36) was outfitted with concrete trickle channels to eliminate standing water. The 10-acre Glenwood wetland, located ½ mile north of Runway 18, was removed. The 5-acre Fire Pond located ½ mile west of Runway 18/36 was removed. Also, although not removed due to hazardous wildlife attraction, the Fuel Control Facility Wetland, located about ¾ mile east of Runway 18/36, was removed for

construction purposes. Mitigation required the wetland to be replaced, which was done 18 miles away from the base.

In addition to these actions, avoidance is being employed by not developing additional ponds or wetlands on base with the exception of relatively small detention ponds necessary to comply with storm water regulations and policies. For all other existing ponds and wetlands, mitigation is employed to maintain a safe flying environment. Specifically, USDA-WS staff monitor and manage hazardous wildlife populations associated with on- and off-base water bodies to ensure flight safety on and around Tinker AFB.

Fauna (Wildlife Damage Management)

Status

Trend Unknown

Metric: Three metrics are used for wildlife damage management: relative abundance, bird strikes, and strike probability (see table, "Top Eleven Bird Threats at Tinker AFB"). The following is a discussion of these metrics and predicted threats.

One of the highest observed threats appears to be gulls which have high strike probabilities Air Force-wide (i.e., 30% for Franklin's gulls in spring alone). On a worldwide basis, gulls present the largest threat to aircraft (Buckley and McCarthy, 1994; Burger, 1985). Gulls tend to have peak strike times between 0500 and 0900 hours with another peak around 1200 hours (Burger 1985). During base surveys (St. Germain, 2010), the greatest number of birds observed was migrating flocks of Franklin's gulls. During springtime, numerous large waves of these gulls were detected on several occasions passing over the Tinker AFB airspace. This species has also been observed foraging on taxiways and runways after rains. Findings of the St. Germain (2010) study showed a high probability of gull strikes at Tinker AFB, 54% as compared to 30% AF-wide.

While waterfowl activity during survey periods ranged from very low to non-detected, much of this is contributed to wildlife damage management activities and habitat modification efforts to control this species group. However, during spring and fall migration seasons, waterfowl and other water birds such as pelicans can represent significant threats, for example, when large flocks of pelicans stop over at Lake Stanley Draper.

A top threat in the small flocking bird category is blackbirds, primarily European starlings but also brown-headed cowbirds. Cowbirds occur in significant numbers as they stage in Oklahoma during fall migration. Probability of starling strikes was highest in fall at 17%. Relative abundance was also high at 0.512 with six strikes being recorded historically at Tinker AFB. Overall strike probability ranks 5th at Tinker AFB for this species. Another smaller flocking bird that is indicated on the threat list, but without data on abundance or probability, is goatsuckers. This group of birds is active at dawn, dusk, and night. The nighthawk is the most common species in this category. Survey data on nighthawks were not available due to their crepuscular and nocturnal behavior. The behavior of concern for this species is its attraction to airfield lights for foraging on flying insects. The number of strikes occurring with this species ranks it 3rd on the list in number of strikes on Tinker AFB.

Second highest number of strikes at Tinker AFB occurs with the eastern meadowlark. Fortunately, this species is also one of the lightest birds on the threat list with a weight of only 90 grams. It also ranked 4th in relative abundance at 0.419 and first in strike probability at 72%. It is most likely struck in summer followed

by spring and fall with probabilities of 31% and 47%, respectively. Eastern meadowlark control on the airfield is ongoing due to the birds' year-round presence on the airfield's grassland habitat. Another small bird leading in strike probability is the horned lark. This 32-gram bird had high relative abundance (0.727) and probability (84%) of being struck in winter. However, this bird only ranked 7th in number of strikes, with three being hit in a ten-year period.

Non-flocking large birds such as raptors, egrets, and herons that do not typically exhibit flocking behavior were found to be lower on the threat list. This is likely due to ongoing control and hazing measures in the airfield environment. They ranked lowest in relative abundance with raptors at 0.164 and egrets and herons at 0.014. Strike probability was also lowest with these species ranging from 1-4%. When raptors are trapped on the airfield, they are relocated away from Tinker AFB. In the spring, egret and heron activity is closely monitored around Tinker AFB and in the metro vicinity. When evidence of rookery establishment or colonial behavior is observed around Tinker AFB, the birds are first hazed. When possible, this is followed by habitat alteration when the birds migrate south for the winter. This typically prevents future rookery establishment. As evidenced by the St. Germain (2010) study, numbers of these birds have been held down, which had not always been the case. Several rookeries were historically located around Tinker AFB, and birds had established migration routes over the airfield. These routes and behaviors have been eliminated through persistent efforts of wildlife damage management at Tinker AFB.

7.13 Coastal Zone and Marine Resources Management

Applicability Statement

This section applies to AF installations that are located along coasts and/or within coastal management zones. This section **IS NOT** applicable to Tinker AFB.

Program Overview/Current Management Practices

N/A.

7.14 Cultural Resources Protection

Applicability Statement

This section applies to AF installations that have cultural resources that may be impacted by natural resource management activities. This section **IS** applicable to Tinker AFB.

Program Overview/Current Management Practices

For more information, refer to Tab 6 (Integrated Cultural Resources Management Plan).

7.15 Public Outreach

Applicability Statement

This section applies to all AF installations that maintain an INRMP. Tinker AFB **IS** required to implement this element.

Program Overview/Current Management Practices

Public outreach and education are integral to Tinker's natural resources program. Tinker's "People" goal, which emphasizes the human dimension of natural resources conservation, states, "Establish and sustain

community-wide (on and off base) pride and ownership in the installation's natural resources, focusing on a common vision and facilitating active participation from all who use, value, and influence natural resources." Working in coordination with base Public Affairs (72 ABW/PA), Tinker natural resources staff use a multidimensional approach to achieve this goal and promote understanding of natural resources stewardship objectives in support of the military mission. Targeted efforts include but are not limited to:

- Publications
  - Peer-reviewed articles in scientific journals (e.g., Herpetologica; Journal of Herpetology)
  - Natural Resources Annual Report
  - Magazine articles (e.g., Outdoor Oklahoma; Redbook; Air Force Magazine)
  - Newspaper articles ("Tinker Take Off" [weekly base paper]; The Oklahoman [daily regional newspaper]; USA Today)
- Televised/broadcast media
  - Statewide newscasts with local news stations
  - National Public Radio
  - Outdoor Oklahoma show
- Tours
  - Annual Employee Enhancement Program; Base Commanders; Air Force Junior Reserve Officers' Training Corps (JROTC); local municipality representatives; other DOD staff
- Presentations
  - National Military Fish and Wildlife Association; local municipalities; non-governmental organizations (NGOs); multi-county Master Gardeners; elementary/high school students
- Volunteerism
  - College, university, and high school student volunteers; work force volunteers; and conservation interns
- Internet
  - *i*Sportsman (i.e., customized, interactive, web-based service facilitates distribution of fishing, sensitive species, and herpetofauna information)
- Conservation exhibits and informational signage
  - Trailside interpretive exhibits
  - Trailhead signage
  - Permanent exhibit at Oklahoma City Zoo "Military and Wildlife"
- Conservation events
  - Oklahoma Wildlife Expo (Oklahoma's largest indoor and outdoor recreation exhibit)
  - Arbor Day
  - Fishing derbies/clinics
  - Earth Day
  - Oklahoma Department of Wildlife Conservation's Aquatic Resource Education Program (AREP)
  - Endangered Species Day at the Zoo
- Conservation brochures/posters

7.16 Geographic Information Systems (GIS)

Applicability Statement

This section applies to all AF installations that maintain an INRMP, since all geospatial information must be maintained within the AF GeoBase system. Tinker AFB **IS** required to implement this element.

Program Overview/Current Management Practices

The primary data management tool used by natural resources staff is a geographic information system (GIS), specifically ArcMap. Spatial and temporal data are currently being collected and managed for all natural resources areas including by not limited to:

- Flora
- Fauna
- Hydrology
- Soils
- Outdoor Recreation

This data is managed by the Center for Environmental Management of Military Lands (CEMML) in the Warner College of Natural Resources at Colorado State University. This AFCEC-funded position provides a specialist who manages all environmental GIS data for Tinker AFB, Vance AFB, Altus AFB, and Little Rock AFB. The specialist is officed on Tinker AFB. Other base GIS data such as facilities, utilities, and other gray infrastructure is managed by other contracted staff in the Tinker Civil Engineering Directorate.

8.0 MANAGEMENT GOALS AND OBJECTIVES

The installation establishes a natural resources mission and vision statement. The mission is a galvanizing statement of purpose. The vision is the program's desired future. Long term, expansive goals and supporting objectives further organize and focus the program's efforts to manage and protect natural resources while supporting the military mission. Objectives indicate a management initiative or strategy for specific long or medium range outcomes and are supported by projects, activities, and tasks. Projects, activities, and tasks are specific actions that can be accomplished within a single year and appear in the Annual Work Plan (Section 10). Also, in cases where off-installation land uses may jeopardize AF missions, this section may list specific goals and objectives aimed at eliminating, reducing, or mitigating the effects of encroachment on military missions.

These natural resources management goals and objectives have been formulated by the preparers of the INRMP from an assessment of the natural resources, current condition of those resources, mission requirements, and management issues previously identified. The goals and objectives are displayed in the 'Installation Supplement' section below in a format that facilitates an integrated approach to natural resource management. By using this approach, measurable objectives can be used to assess the attainment of goals.

Installation Supplement – Management Goals and Objectives

The setting of objectives and dates to accomplish them by is a collaborative process involving Tinker AFB, the U.S. Fish and Wildlife Service, and the Oklahoma Department of Wildlife Conservation. A significant amount of time has been spent collaborating, preparing the first draft of the Plan, coordinating with the agencies involved, incorporating their comments, and incorporating comments from others within the Air Force.

Some of the objectives will be accomplished by the dates set, and others, due to unforeseen circumstances, will not. Any objectives that have not been accomplished during the current fiscal year typically will be

carried forward for planning purposes into the next fiscal year. The Annual Work Plan (Section 10) for the next year is then revised to set new dates, including objectives not met during the previous year.

Mission:

Strengthen our warfighter and surrounding community by building a healthy, native, urban ecosystem.

Vision:

The following is a description of the *desired future* of Tinker's urban ecosystem and its connection to the military mission:

The military, their families, and local community are stronger as a result of the quality of life provided by Tinker's award-winning natural resources program.

This action-oriented, self-sustaining program has high on- and off-base community involvement through active stakeholder participation, volunteerism, partnerships, and other collaborative efforts. A model for industrial complexes, it thrives because the local community has taken pride and ownership in their surrounding natural environment. From senior-level management to entry-level staff, and from contractors to visitors, commitment to sound environmental stewardship is strong.

Balance between gray infrastructure (built environment) and green infrastructure (natural environment) is the hallmark of the program and ensures a quality environment which fully supports and sustains military operational needs and expeditionary combat capability. The green infrastructure has expanded to form a base-wide network making for a greener, more vibrant, and livable community. Native fish and wildlife populations are healthy and productive. Tinker AFB ponds, creeks, and wetlands are clear and clean. From the main entrance gates to the heart of the industrial complex, Tinker's image is outstanding! Intensely developed industrial areas have been transformed by oases of healthy, low-maintenance, native trees, shrubs, tall grasses, and wildflowers. These natural additions attractively compliment manicured grounds and display the area's proud prairie heritage.

Natural resources-related outdoor recreation opportunities are unmatched for an industrial military installation and greatly contribute to the health and wellness of the workforce. Miles of high-quality greenway trails take pedestrians, joggers, cyclists, and rollerbladers to any place on Tinker AFB and have evolved into a system for alternative transportation. Families can safely view an abundance of urban wildlife year-round. One can relax and readily catch fish at one of Tinker's many tree-lined ponds, and trophy-sized bass are not uncommon at Prairie and Primrose Ponds.

New media initiatives have greatly enhanced program communication, education, and awareness; program identity and public trust are high. Foundational office and field process improvements have transformed the program into a highly effective and efficient operation – one whose stability and momentum carry it smoothly through frequent Tinker AFB leadership and other key personnel transitions. New natural resources storage/maintenance facility has greatly enhanced field project organization and productivity.

The program is fully funded and staffed with well-paid, expert, managerial, technical, and field personnel in all major resource areas. Natural resources staff have become valued team members by putting customer needs at the forefront of the program – customer satisfaction is at an all-time high.

The bottom line: As an integral part of Team Tinker, the natural resources program has served as a catalyst for vast improvements to Tinker's natural systems resulting in a healthy and sustainable built environment that supports military readiness and strengthens community health and wellbeing.

Long-Range Goals:

Flora:
Effectively and efficiently develop and manage Tinker's natural and urban landscape to provide a safe, attractive, functional, low maintenance, and ecologically sound environment in character with the local ecoregion to support mission completion and provide a sustainable living and working environment.

Fauna:
Establish a healthy and sustainable native fish and wildlife community that enhances warfighter quality of life and reduces human-wildlife conflicts.

Hydrology:
Using a watershed management approach, provide for water conservation, flood control, and high water quality.

Soil:
Protect, restore, and wisely use our soil resources.

People:
Establish and sustain community-wide (on and off base) pride and ownership in the installation's natural resources, focusing on a common vision and facilitating active participation from all who use, value, and influence natural resources.

Program Management:
Manage the natural resources program to promote an effective, efficient, economical, and customer-oriented public service.

Flora Implementation Strategy

GOAL 1: Effectively and efficiently develop and manage Tinker's natural and urban landscape to provide a safe, attractive, functional, low maintenance, and ecologically sound environment in character with the local ecoregion to support mission completion and provide a sustainable living and working environment.

Urban Forestry

Objective 1: By 2023, improve environmental quality by increasing base urban forest percent canopy cover towards an overall canopy coverage of 25% [9% for industrial areas; 18% for commercial areas; and 35% for residential areas (including golf course)] and move towards a base-wide native to non-native tree ratio of 100:0.

Objective 2: By 2023, promote urban forestry awareness and a culture of effective and efficient and ecologically sound urban forestry protection and management practices on base in accordance with the Tinker AFB Urban Forestry Management Procedures (Appendix G).

Invasive Species (Flora)

Objective 1: By 2023, in accordance with Executive Order 13112, *Invasive Species*, prevent the introduction of invasive plant species, provide control, and minimize their negative economic, ecological, military operational, and human health impacts on Tinker Air Force Base [refer to Tab 1 (Green Infrastructure Plan) for scheduled invasive species activities].

Sensitive Species (Flora)

Objective 1: By 2023, move towards stabilizing and enhancing existing Oklahoma penstemon populations to ensure penstemon population sustainability and land-use flexibility for military activities.

General (Flora)

Objective 1: By 2023, update TAFB Vegetation Communities Map to reflect present status.

Green Infrastructure

Objective 1: By 2023, continue to promote on- and off-base awareness of green infrastructure (GI) plan benefits and requirements and institutionalize conservation planning principles and philosophies in all applicable base projects.

Objective 2: Through 2023, continue to restore and maintain Tinker's green infrastructure to improve habitat structure/health for species at risk (SAR), reduce base mowing requirements, increase and sustain free ecological services provided by the network, promote wildland fire safety, and enhance aesthetics (including required mowed spaces within the green infrastructure network).

Golf Course Management

Objective 1 (Challenge 1: Installation Compatibility Use Zone): To meet clear zone requirements, demolish existing clubhouse, and remodel B-6001 as the new clubhouse, which is outside the clear zone. (This objective has been established for general planning purposes consistent with the Installation Development Plan; no completion date is set due to uncertainty of funding).

Objective 1 (Challenge 2: Floodplains/Wetlands): By 2023, and following completion of Challenge 7 (Objectives 2 & 3), improve floodplain and adjacent habitat functions by initiating conversion of turf grass areas to native grasses. ***[Mgt, Habitat (WWYKA53206119 and out-years)]***

Objective 1 (Challenge 3: Water quality; Groundwater Management Unit; Installation Restoration Program Sites): By 2023, improve water quality by reducing pesticide and fertilizer inputs to waterways.

Objective 1 (Challenge 5: Oklahoma Species of Concern; Migratory Birds; Bird/Wildlife Aircraft Strike Hazard): Through 2023, maintain golf course diurnal raptor nesting at zero and minimize diurnal raptor foraging to ensure a safe aircraft flying environment northwest of Runway 13-31.

Objective 1 (Challenge 7: Vegetation Management): Through 2023, as funding permits support Tinker's Urban Forestry Objective 1 which states, *"By 2023, improve environmental quality by increasing base urban forest percent canopy cover towards and overall canopy coverage of 25%; 9% for industrial areas; 18% for commercial areas; and 35% for residential areas (including golf course) and move towards a base-wide native to non-native tree ratio of 100:0."*

Vegetation Management

Objective 1: By 2023, lower grounds maintenance by reducing/eliminating select maintenance activities on improved, semi-improved, and unimproved grounds while maintaining attractiveness, functionality, safety, and ecological integrity.

Fauna Implementation Strategy

GOAL 2: Establish a healthy and sustainable native fish and wildlife community that enhances warfighter quality of life and reduces human-wildlife conflicts.

Wildlife

Objective 1: By 2030, increase and sustain urban indigenous fish and wildlife species richness and abundance on Tinker AFB, except in the airfield environment.

Objective 2: Through 2023, continue management of the Glenwood deer herd within the carrying capacity of the Glenwood area.

Fish

Objective 1: By 2023, continue improvement of warfighter quality of life by increasing fishing satisfaction through the development of a model urban fishing program.

Objective 2: By 2023, increase awareness and use of urban fishing program while maintaining healthy sustainable sport fish populations.

Objective 3: By 2023, continue management of base sports fisheries utilizing an ecosystem management approach while maximizing fishing opportunities, biodiversity and sustained yields of fish stocks.

Objective 4: By 2023, influence watershed management to restore and enhance stream habitat, stabilizing species richness and abundance to levels typical of Midwestern/Great Plains stream fish assemblages.

Invasive Species (Fauna)

Objective 1: Through 2023, in accordance with Executive Order 13112, *Invasive Species*, prevent the introduction of invasive fauna species, provide control, and minimize their negative economic, ecological, military operational, and human health impacts on Tinker Air Force Base.

Sensitive Species (Fauna)

Objective 1: By 2023 and in concert with the Installation Development Plan, provide more military land use options/flexibility and increase horned lizard population densities/distribution on Tinker AFB and/or adjacent off-base lands by establishing viable horned lizard management and translocation methodologies.

Objective 2: By 2030, excluding the airfield, increase native wildlife species richness and abundance on base and on lands adjoining the base, focusing on species of greatest conservation concern.

Animal Damage Control

Objective 1: By 2023, while maintaining a healthy and sustainable native fish and wildlife community and consistent with the Migratory Bird Treaty Act and other applicable laws and regulations, continue to reduce human-wildlife conflicts on Tinker AFB, with a focus on flight safety.

Hydrology Implementation Strategy

GOAL 3: Using a watershed management approach, provide for water conservation, flood control, and high water quality.

Floodplain Management

Refer to Green Infrastructure (GI) Plan (Tab 1) and Golf Course Environmental Management (GEM) Plan (Tab 2) for scheduled floodplain-related projects and activities.

Wetland Management

Objective 1: By 2023, enhance, rehabilitate, and sustain wetland functions and values in Tinker AFB wetland systems.

General (Hydrology)

Objective 1: By 2023, keep 100- and 500-year floodplain data current to ensure adequate support for mission project needs.

Soil Implementation Strategy

GOAL 4: Protect, restore, and wisely use our soil resources.

Objective 1: By 2023, keep base soil data current and soil resources protected and available to support mission project needs.

People Implementation Strategy

Goal 5: Establish and sustain community-wide (on- and off-base) pride and ownership in the installation's natural resources, focusing on a common vision and facilitating active participation from all who use, value, and influence natural resources.

Objective 1: Increase base-wide natural resources program awareness and a culture of effective and efficient natural resources stewardship.

Objective 2: By 2023, continue to encourage community natural resources pride/ownership and accelerate natural resources project and activity accomplishment by maintaining a strong and sustainable volunteer-based military and civilian labor force.

Program Management Implementation Strategy

GOAL 6: Manage the natural resources program to promote an effective, efficient, economical, and customer-oriented public service.

Objective 1: By Jul of each year, meet execution timelines to ensure natural resources program is moving toward and supporting Program Management goal.

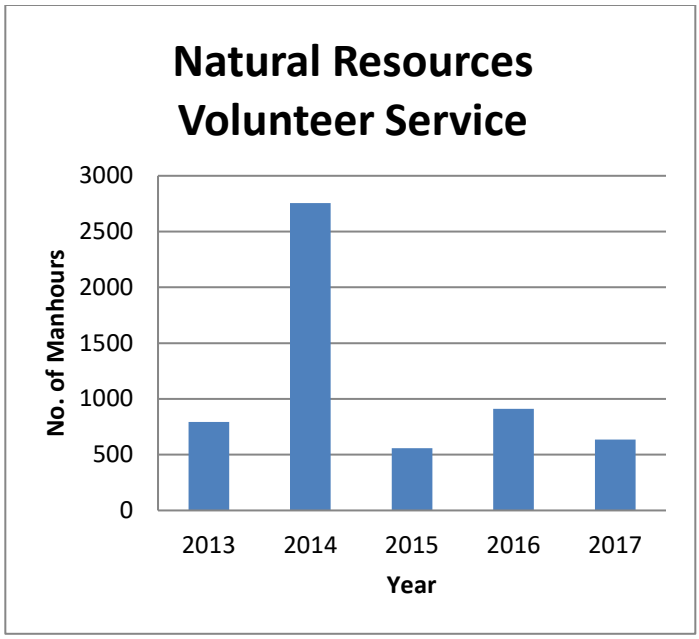
Objective 2: By 2023, apply 6S principles and institutionalize standardized business and organizational practices to improve and sustain high-level agility, compliance, and performance.

9.0 INRMP IMPLEMENTATION, UPDATE, AND REVISION PROCESS

9.1 Natural Resources Management Staffing and Implementation

Every Airmen (military, civilian, and contractor), including family members and visitors, is responsible for the stewardship of natural resources on and adjacent to Tinker Air Force Base. The lead base organization overseeing the implementation of this plan is the Civil Engineering Directorate, specifically the natural resources program office (72 ABW/CEIEC). This office has primary responsibility for ensuring execution of must-fund and other projects identified in this plan.

Permanent internal staffing required to implement the INRMP includes the natural resources program manager and a natural resources biologist. This is supplemented by internal civilian summer hires. External staffing includes a Geographic Information System (GIS) specialist, two USDA biologists, seasonal conservation interns, and other contract project support. Additionally, volunteer support is critical to INRMP implementation (see figure, "Natural Resources Volunteer Service). Volunteers have assisted with deer spotlight surveys, boardwalk renovation, invertebrate inventories, sensitive species research, and urban forestry projects such as developing tree planting plans, pruning trees, and transplanting trees. Volunteers include private individuals, Tinker AFB employees, scouting troops, area high school and college students, Oklahoma City Zoo staff, and others. Employing volunteers for conservation projects is authorized by DODI 1100.21, *Voluntary Services within DOD.*



The INRMP is initially considered approved and compliant with the Sikes Act when signed by the Tinker AFB commander, the Oklahoma Department of Wildlife Conservation (ODWC) director, and the United States Fish and Wildlife Service (USFWS), Region 2, director within the past five years. When the latest dated signatory expires (i.e., exceeds 5 years), the plan is non-compliant.

9.2 Monitoring INRMP Implementation

INRMP implementation is monitored through various metrics (see Status/Trend boxes in Sections 1.1, 7.0-7.16, and 9.1) and through the annual review process (see paragraph 9.3).

9.3 Annual INRMP Review and Update Requirements

To sustain approval, the INRMP is annually reviewed by the Civil Engineering natural resources function (72 ABW/CEIEC) and other internal base stakeholders in coordination with ODWC and the USFWS and ultimately approved/signed by the installation commander (see "TAFB INRMP Annual Review and Coordination Checklist" Note: Checklist dates are approximate, and execution may be completed earlier in the FY. Also, internal and external reviews may be accomplished concurrently.). The review aims to ensure the INRMP remains current as to operation and effect with respect to the Sikes Act. The annual review consists of conducting a natural resources assessment using, as a minimum, the following DOD-mandated focus areas to monitor program compliance with the Sikes Act:

INRMP project implementation

- Federally listed species and critical habitat
- Partnership effectiveness
- Fish and wildlife management and public use
- Team adequacy
- Ecosystem integrity
- INRMP impact on the installation mission

Findings of the annual review will be documented in the Annual INRMP Review Summary which includes:

- A summary of specific INRMP accomplishments since the last review
- A Work Plan for implementing the INRMP that includes the current year and at least four future fiscal years.
- A statement that sufficient numbers of qualified natural resources management personnel and resources are available to oversee implementation of projects and activities identified in the INRMP Work Plan.
- A summary of the required INRMP changes that will be incorporated into the document to keep it current in operation and effect for the management of installation natural resources; or a statement that significant changes to the installation mission or natural resources goals require a major INRMP revision (to include resigning by the Tinker AFB commander, ODWC director, and the USFWS Region 2 director).

The Annual INRMP Review Summary will be signed by the base commander and the collaborating agency representatives asserting concurrence with findings and that the natural resources management program is current as to operation and effect and compliant with the Sikes Act.

TAFB INRMP Annual Review & Coordination Checklist:

1 May 20__ – 15 Jun 20__: 72 ABW/CEIEC review and update INRMP by in-house conservation staff with agency input

- ☐ Complete Stage 2 self-inspection using Federal, State, and AF ECAMP inspection protocols and other internal checklists, as applicable.
- ☐ In main body of ***INRMP***, make changes and highlight in yellow for easy review by internal stakeholders and agencies.
- ☐ Adjust ***Annual Work Plan*** for upcoming FY and next two out-years
- ☐ Complete ***NR Program Annual Report*** documenting current fiscal year's accomplishments

16 Jun 20__ – 7 Jul 20__: Review by internal AF stakeholders (mandatory 21 calendar days)

- ☐ Send ***INRMP***, ***Annual Report***, and ***Annual Work Plan*** to internal TAFB stakeholders/reviewers through 72 ABW/XPX review process. Annual reviewers include:
    - AFSC/LG
    - OC-ALC
    - AWACS
    - Navy
    - 507th/513th
    - 38 CEIG
    - 72 ABW/JA
    - 72 ABW/PA

- 72 ABW/SE
- 72 MSG
- 72 FSS
- 72 OSS
- 72 SFS
- 72 ABW/CE
- AFCEC/CZO

8 Jul – 15 Jul 20__: Comment adjudication (internal stakeholders)

- ☐ 72 ABW/CEIEC adjudicate internal AF stakeholder comments

16 Jul 20__ – 13 Aug 20__: Review by agencies (USFWS & ODWC)

a. Send ***INRMP***, ***Annual Report*** and ***Annual Work Plan*** to USFWS and ODWC for review and comment.

14 Aug 20__ – 17 Aug 20__: Comment adjudication (agencies)

- ☐ 72 ABW/CEIEC adjudicate agency comments

18 Aug 20__ – 26 Aug 20__: Draft Annual Review Summary

- ☐ 72 ABW/CEIEC draft ***Annual Review Summary*** and obtain agency signatures on ***Agency Annual Coordination Form*** signifying operation and effect concurrence. The ***Annual Review Summary*** shall include:
  - **TAFB Natural Resources Annual Report** (summary of program accomplishments since last review)
  - **Annual Work Plan** (current and two out-years)
  - **Natural resources management personnel statement** (a statement that sufficient numbers of qualified natural resources personnel are available to oversee implementation of INRMP)
  - **Summary of incorporated updates from current INRMP annual review**

27 Aug 20__ – 31 Aug 20__: Prepare an Electronic Staff Summary Sheet (eSSS) for routing to 72 ABW/CC

- ☐ 72 ABW/CEIEC prepare eSSS (to include revised ***INRMP, Annual Report, Annual Work Plan, Annual Review Summary***, and agencies signed ***Annual Coordination Forms***) for routing of INRMP

1 Sep 20__ – 30 Sep 20__: Base Commander Certification/Signature

- ☐ Using 72 ABW/XPX coordination process, route eSSS through CE chain-of-command to 72 ABW to obtain wing commander's certification on ***Annual Review Certification***

Record, verifying the ***INRMP*** is valid and current, meeting the requirements of AFI-32-7064.

1 Oct 20__: Update Out-year Budget

- ☐ Upload updated ***INRMP, Annual Review Summary***, ***Agency Annual Coordination Forms (signed),*** and ***Annual Review Certification Record*** into eDASH
- ☐ Forward new projects identified in INRMP update to AFCEC for insertion into out-year budget

IMPORTANT DATES: INRMP must be revised and receive new agency signatures every 5 years. The current INRMPs term is Mar 2019 to Mar 2024 and expires on **15 Mar 2024**.

10.0 ANNUAL WORK PLANS

The INRMP Annual Work Plans are included in this section. Executing these projects, activities, and tasks are intended to meet the prescribed goals and objectives identified in Section 8 and move the program towards its vision.

Each year during natural resources planning sessions, select projects, activities, and tasks which support the program goals and objectives will be targeted to formulate this annual work plan. Some of the projects, activities, and tasks will be accomplished as scheduled; however, due to unforeseen circumstances, others may not. For planning purposes, any projects, activities, or tasks that have not been accomplished as scheduled will be carried forward into the next fiscal year.

These projects, activities, and tasks are listed by fiscal year, including the current year and four succeeding years. For each project, activity, and task a specific timeframe for implementation is provided (as applicable), as well as the appropriate funding source, and priority for implementation. The work plans provide all the necessary information for building a budget within the AF framework. Priorities are defined as follows:

High (H): The INRMP signatories assert that if the project is not funded the INRMP is not being implemented and the Air Force is non-compliant with the Sikes Act; or that it is specifically tied to an INRMP goal and objective and is part of a "Benefit of the Species" determination necessary for ESA Sec 4(a)(3)(B)(i) critical habitat exemption.

Medium (M): Project supports a specific INRMP goal and objective, and is deemed by INRMP signatories to be important for preventing non-compliance with a specific requirement within a natural resources law or by EO 13112 on Invasive Species. However, the INRMP signatories would not contend that the INRMP is not being implemented if not accomplished within programmed year due to other priorities.

Low (L): Project supports a specific INRMP goal and objective, enhances conservation resources or the integrity of the installation mission, and/or promotes long-term compliance with specific requirements within natural resources law, but is not directly tied to specific compliance within the proposed year of execution.

Annual Work Plan (FY 2020)

Flora Implementation Strategy

GOAL 1: Effectively and efficiently develop and manage Tinker's natural and urban landscape to provide a safe, attractive, functional, low maintenance, and ecologically sound environment in character with the local ecoregion to support mission completion and provide a sustainable living and working environment.

Urban Forestry

Objective 1: By 2023, improve environmental quality by increasing base urban forest percent canopy cover towards an overall canopy coverage of 25% [9% for industrial areas; 18% for commercial areas; and 35% for residential areas (including golf course)] and move towards a base-wide native to non-native tree ratio of 100:0.

Activity 1: By the end of each fiscal year, annually complete the Urban Forestry Management Checklist by dates specified [See Appendix G, Urban Forestry Management Procedures] **[L]**

Activity 2: By 2021, work with Balfour Beatty Communities to replant trees in base housing area. **[L]**

Objective 2: By 2023, promote urban forestry awareness and a culture of effective and efficient and ecologically sound urban forestry protection and management practices on base in accordance with the Tinker AFB Urban Forestry Management Procedures (Appendix G).

Activity 1: Annually, update/modify as appropriate base contract boiler plate sections (e.g., Sections 00 70 00 and 00 72 00), Architectural Compatibility Guide, grounds maintenance and exterior electric performance work statements, AAFES maintenance agreements, Military Family Housing maintenance standards, and other documents as necessary to reflect new requirements of Tinker's Urban Forestry Management Procedures. **[L]**

Task 1: Incorporate firewood program requirements in 00 72 00 and Grounds Maintenance Contract.

Activity 2: By 31 Mar, annually host base celebration of Arbor Week (last full week of March). **[L]**

Activity 3: By 15 Dec of each year, convene Urban Forestry Working Group for annual meeting. **[L]**

Invasive Species (Flora)

Objective 1: By 2023, in accordance with Executive Order 13112, *Invasive Species*, prevent the introduction of invasive plant species, provide control, and minimize their negative economic, ecological, military operational, and human health impacts on Tinker Air Force Base [refer to Tab 1 (Green Infrastructure Plan) for scheduled invasive species activities].

Activity 1: Continue invasive species control basewide with priority given to the Urban Greenway and lightly infested, high quality natural areas. **[M]**

Sensitive Species (Flora)

Objective 1: By 2023, move towards stabilizing and enhancing existing Oklahoma penstemon populations to ensure penstemon population sustainability and land-use flexibility for military activities.

> **Project 1:** Every other even year, and consistent with Tinker-specific monitoring methodologies established by Virginia Tech, census all on-base Oklahoma penstemon populations (densities; total acreage; number per colony; graphs for each population to track trends). **[L]**

General (Flora)

Objective 1: By 2023, update TAFB Vegetation Communities Map to reflect present status.

> **Activity:** By 2021, incorporate vegetation communities map into INRMP **[M]**

Green Infrastructure

Objective 1: By 2023, continue to promote on- and off-base awareness of green infrastructure (GI) plan benefits and requirements and institutionalize conservation planning principles and philosophies in all applicable base projects.*

Objective 2: Through 2023, continue to restore and maintain Tinker's green infrastructure to improve habitat structure/health for species at risk (SAR), reduce base mowing requirements, increase and sustain free ecological services provided by the network, promote wildland fire safety, and enhance aesthetics (including required mowed spaces within the green infrastructure network).

*Refer to Tinker AFB Green Infrastructure (GI) Plan (Tab 1) for projects, activities, and tasks.

Golf Course Management

Objective 1 (Challenge 1: Installation Compatibility Use Zone): To meet clear zone requirements, demolish existing clubhouse, and remodel B-6001 as the new clubhouse, which is outside the clear zone. (This objective has been established for general planning purposes consistent with the Installation Development Plan; no completion date is set due to uncertainty of funding).*

Objective 1 (Challenge 2: Floodplains/Wetlands): By 2023, and following completion of Challenge 7 (Objectives 2 & 3), improve floodplain and adjacent habitat functions by initiating conversion of turf grass areas to native grasses. ***[Mgt, Habitat, (WWYKA53206119 and out-years)]***

Objective 1 (Challenge 3: Water quality; Groundwater Management Unit; Installation Restoration Program Sites): By 2023, improve water quality by reducing pesticide and fertilizer inputs to waterways.

Objective 1 (Challenge 5: Oklahoma Species of Concern; Migratory Birds; Bird/Wildlife Aircraft Strike Hazard): Through 2023, maintain golf course diurnal raptor nesting at zero and minimize diurnal raptor foraging to ensure a safe aircraft flying environment northwest of Runway 13-31.

Objective 1 (Challenge 7: Vegetation Management): Through 2023, as funding permits support Tinker's Urban Forestry Objective 1 which states, *"By 2023, improve environmental quality by increasing base urban forest percent canopy cover towards and overall canopy coverage of 25%; 9% for industrial areas; 18% for commercial areas; and 35% for residential areas (including golf course) and move towards a base-wide native to non-native tree ratio of 100:0."*

*Refer to Tinker AFB Golf Course Environmental Management (GEM) Plan (Tab 2) for projects, activities, and tasks.

Vegetation Management

Objective 1: By 2023, lower grounds maintenance by reducing/eliminating select maintenance activities on improved, semi-improved, and unimproved grounds while maintaining attractiveness, functionality, safety, and ecological integrity.

Project 1: By 2020, continue base haying lease for the areas around Building 9001, CEIG campus, Navy campus, and Landfill 6 and expand to other areas where haying would reduce grounds maintenance costs. **[L]**

Task 1: Annually conduct pre- and post-haying lease inspections (Lease Compliance Inspection Checklist) to ensure compliance with lease agreement and land use regulations.

Fauna Implementation Strategy

GOAL 2: Establish a healthy and sustainable native fish and wildlife community that enhances warfighter quality of life and reduces human-wildlife conflicts.

Wildlife

Objective 1: By 2030, increase and sustain urban indigenous fish and wildlife species richness and abundance on Tinker AFB, except in the airfield environment.

Activity 1: Annually spot check stream fish diversity by sampling multiple locations and compare to baseline surveys in Fishes of Crutcho Creek Drainage Basin. **[L]**

Activity 2: Annually continue baseline invertebrate survey focusing on pollinators and develop entomological reference collection (volunteer). **[L]**

Objective 2: Through 2023, continue management of the Glenwood deer herd within the carrying capacity of the Glenwood area.

Activity 1: By Dec of each year, conduct fall spotlight surveys to estimate deer population and reproductive success (recurring). **[L]**

Activity 2: By Jan of each year, evaluate need for deer control, and as necessary implement measures to reduce numbers to maintain healthy deer densities at Glenwood and donate all harvested deer to ODWC's Hunter's Against Hunger Program, local zoos or similar programs. **[L]**

Fish

Objective 1: By 2023, continue improvement of warfighter quality of life by increasing fishing satisfaction through the development of a model urban fishing program.

Project 1: Continue a quality winter trout fishing program that has become well known on- and off-base through awareness events and has produced high catch rates with large trout frequently being caught. **[L]**

Task 1: By Nov of each year, kick off winter trout fishing season with an AREP event (recurring).

Task 2: Continue trout permit system to support stocking efforts on an annual basis (recurring).

Task 3: By Sep, coordinate purchase of trout to ensure availability of funds and provide trophy trout (4 pounds and greater).

Task 4: By Jan, coordinate with USFWS Neosho Missouri Hatchery the availability of trout, and if available make arrangements for pickup and hauling.

Project 2: By 2023, increase the number of trophy-sized fish (largemouth bass over 8 pounds and trout over 4 pounds) caught on Tinker AFB by 50%. **[L]**

Task 1: By 2020, move harvestable and trophy bass to Beaver and Primrose ponds.

Task 2: Annually evaluate fisheries survey results and adjust creel limits and other management recommendations to meet fishery expectations for each pond.

Project 3: By 2020, continue to enhance fishing-related infrastructure by improving access and adding amenities that enhance fishing experiences and promote low cost and convenience (i.e., trails, footbridges, docks, and signage). **[L]**

Task 1: By 2020, update and replace sign/graphics in Angler Information Station at Beaver Pond, ensuring UV protection of signage.

Task 2: By 2020, identify and post on tinker.isportsman.net areas open for fishing along Crutcho Creek.

Task 3: Maximize opportunities to utilize salvaged materials from constructions sites, urban tree work, and prairie restoration (e.g., boulders, logs, stumps, cedar trees) to enhance fishing access and habitat in Base ponds and streams.

Task 4: Conduct tree lifts/thinning and maintain mow paths for improved fishing access at Beaver Marsh Filter, and Crutcho Creek.

Objective 2: By 2022, increase awareness and use of urban fishing program while maintaining healthy sustainable sport fish populations.

Project 1: Annually maintain an on-line fishing permit purchasing system (USAF-contracted iSportsman). Maintenance of page to include: bulletin board, fishing guide, access information, fish identification, pond record fish, bragging board photo gallery, rules, regulations, and natural resource information pages (i.e., Tinker snakes and protected species) (recurring). **[M]**

Objective 3: By 2023, continue management of base sports fisheries utilizing an ecosystem management approach while maximizing fishing opportunities, biodiversity and sustained yields of fish stocks.

Activity 1: Capitalize on partnering activities as they become available particularly to facilitate stocking of fish for base ponds (e.g., ODWC catfish stocking). **[L]**

Activity 2: Annually survey base ponds, assess populations, and apply fisheries management recommendations (recurring). **[L]**

Activity 3: Annually facilitate and assist anglers in fishing derbies and clinics as opportunities arise. **[L]**

Activity 4: Conduct permit courtesy checks for anglers fishing base waters at least monthly during peak fishing seasons. **[L]**

Activity 5: Continue implementing strategy to control white crappie populations in base ponds. **[L]**

Activity 6: Continue to manage Beaver Pond as a "Kids & Family" fishing pond that produces quality, easy-to-catch sunfish. **[L]**

Task 1: Stock hybrid green sunfish in Beaver and Redbud Ponds (via ODWC promoting kids fishing programs).

Activity 7: Continue to manage Beaver Marsh Filter, Primrose, and Prairie Ponds for high quality trophy bass fishing. **[L]**

Objective 4: By 2023, influence watershed management to restore and enhance stream habitat, stabilizing species richness and abundance to levels typical of Midwestern/Great Plains stream fish assemblages.

Project 1: Restore floodplain vegetation in accordance with Green Infrastructure Plan (Tab 1). **[M]**

Task 1: Restore 50 acres of native vegetation within the 500-year floodplain (KC-46A mitigation).

Project 2: By 2023 continue implementing the strategy for base streams rehabilitation and conservation from the Matthews, Matthews-Marsh, and Moody (2010 & 2020) stream studies (Note: some cross-over into other sections of work plan). **[L]**

Project 3: By 2020, continue monitoring fish biodiversity at select stream sites utilizing methodology from the Matthews, Matthews-Marsh, and Moody (2010) stream studies. Evaluate results and make recommendations to the strategy for stream rehabilitation. ***[Mgt, Species, Native Fish Survey (WWYKA53206120)]*** **[L]**

Activity 1: Annually, enforce a riparian vegetation protection policy. **[M]**

Invasive Species (Fauna)

Objective 1: Through 2023, in accordance with Executive Order 13112, *Invasive Species*, prevent the introduction of invasive fauna species, provide control, and minimize their negative economic, ecological, military operational, and human health impacts on Tinker Air Force Base.

Activity 1: Annually incorporate/update monitoring/prevention requirements in base contract boiler plate sections (i.e., Sections 00 70 00 and 00 72 00), Architectural Compatibility Guide, grounds maintenance statements of work (e.g., Trace, AAFES), etc. to prevent the introduction and spread of Red Imported Fire Ants (RIFA) (*Solenopsis invicta*) and other invasive species on Tinker. **[M]**

Activity 2: Annually survey, monitor and treat areas on base infested with RIFAs. **[M]**

Sensitive Species (Fauna)

Objective 1: By 2023 and in concert with the Installation Development Plan, provide more military land use options/flexibility and increase horned lizard population densities/distribution on Tinker AFB and/or adjacent off-base lands by establishing viable horned lizard management and translocation methodologies.

Project 1: Continue comprehensive study for conservation and management of Texas horned lizards, particularly focusing on development of methodology for translocation ***[Mgt Species, WWYKA53206120 and out-years)]***. **[M]**

Task 1: Monitor density and population size of Texas horned lizards in Reserve 3 of the Urban Greenway.

Task 2: Assess the feasibility of Texas horned lizard hatchling translocation to establish or restore populations. ***[USACE-CERL ESTCP Transferring "Translocation Science" to Wildlife on DoD—3-year Grant]***

Task 3: Monitor stressors, survival, diet, and movements of hatchling and adult Texas horned lizards.

Task 4: Examine the effects of prairie restoration activities (herbicide, mowing, disking) and construction projects on Texas horned lizard population.

Task 5: Communicate results of study through publications and presentations at meetings.

Task 6: Further develop and implement existing joint partnership with USACE-CERL, University of Oklahoma and Oklahoma City Zoo to perform husbandry and translocation trials on hatchling horned lizards.

Objective 2: By 2030, excluding the airfield, increase native wildlife species richness and abundance on base and on lands adjoining the base, focusing on species of greatest conservation concern.

Activity 1: Continue to consult and advise Tinker's Readiness and Environmental Protection Integration (REPI) team to look at conservation easement establishment on nearby lands identified in the REPI Master Plan. **[M]**

Animal Damage Control

Objective 1: By 2023, while maintaining a healthy and sustainable native fish and wildlife community and consistent with the Migratory Bird Treaty Act and other applicable laws and regulations, continue to reduce human-wildlife conflicts on Tinker AFB, with a focus on flight safety.

Project 1: By 1 Sep, renew USDA Wildlife Services (WS) Memorandum of Understanding (MOU) and each fiscal year, renew ***USDA WS Financial/Work Plan (Agreement No. 06-7340-5525-IA)*** Renewal due by Sep 2021 **[H]**

Task 1: Each year, exercise Financial/Work Plan option and approve MIPR's for USDA WS animal damage control services for upcoming fiscal year.

Task 2: By Feb each year, reapply for annual Depredation Bird Permit.

Task 3: By Mar each year submit migratory bird depredation take report to the USFWS.

Task 4: Conduct migratory bird protection training for depredation sub-permittee holders.

Hydrology Implementation Strategy

GOAL 3: Using a watershed management approach, provide for water conservation, flood control, and high water quality.

Floodplain Management

Refer to Green Infrastructure (GI) Plan (Tab 1) and Golf Course Environmental Management (GEM) Plan (Tab 3) for scheduled floodplain-related projects and activities.

Wetland Management

Objective 1: By 2023, enhance, rehabilitate, and sustain wetlands functions and values in Tinker AFB wetland systems.

> **Project 1:** Every even year (starting in 2020), conduct on-the-ground site assessment of all base-affiliated wetlands (on- and off-base) and document findings. **[M]**
>
> **Project 3:** By 2020, mitigate loss of KC-46A wetlands via available on site opportunities (record actions taken in Appendix F, Mitigation Action Tracker). Refer to the Green Infrastructure (GI) Plan (Tab 1) and Golf Course Environmental Management (GEM) Plan (Tab 2) for additional scheduled wetland related projects and activities. **[H]**

General (Hydrology)

Objective 1: By 2023, keep 100- and 500-year floodplain data current to ensure adequate support for mission project needs.

> **Project 1:** As needed and in conjunction with projects potentially impacting floodplains, projects involving acquisition of new properties, and projects involving 100- and 500-year flood studies, revise base floodplain mapping accordingly. **[M]**

Soil Implementation Strategy

GOAL 4: Protect, restore, and wisely use our soil resources.

Objective 1: By 2023, keep base soil data current and soil resources protected and available to support mission project needs.

> **Activity 1:** Modify 00 70 00 and 00 72 00 contract boilerplates as appropriate to ensure that base topsoil and boulders are not hauled off from construction sites or disposed of off Tinker AFB property. **[L]**
>
> > **Task 1:** Conduct basewide (including airfield) evaluation to identify areas (e.g., holes; low, water-holding depressions; poor soil sites, etc.) where base topsoil could be reused.
> >
> > **Task 2:** Secure a soil stockpile site for base use.
>
> **Activity 2:** By 2020, update base soil mapping to reflect current state. **[L]**

People Implementation Strategy

Goal 5: Establish and sustain community-wide (on- and off-base) pride and ownership in the installation's natural resources, focusing on a common vision and facilitating active participation from all who use, value, and influence natural resources.

Objective 1: Increase base-wide natural resources program awareness and a culture of effective and efficient natural resources stewardship.

Activity 1: By 15 Nov of each year, publish Natural Resources Program Annual Report (for previous fiscal year) and distribute base-wide via email, base distribution, iSportsman, Civil Engineering web site and INRMP. **[M]**

Activity 2: By 2020, develop and distribute newcomers' natural resources packet. **[L]**

Activity 3: As 72 ABW senior leadership changes occur, conduct 2-hour natural resources program tour for new leadership (e.g., 72 ABW/CC, CV, DS, CCC, CE etc.) to maintain program momentum and promote program continuity during leadership transitions (Refer to Tab 1, Green Infrastructure Plan for additional program awareness activities) **[M]**

Activity 4: By 2020, increase natural resources program tours for a diverse cross-section of on- and off-base stakeholders to improve/broaden installation conservation awareness; encourage transparency and strengthened relationships with regulators and contractors; and encourage support unit staff who seldom get to see the on-the-ground fruit of their supporting efforts.

Activity 5: By 2020, working with 72 ABW Public Affairs, work with Oklahoma Gardening Show team to determine possibility of filming an episode on Tinker's Urban Greenway.

Objective 2: By 2020, continue to encourage community natural resources pride/ownership and accelerate natural resources project and activity accomplishment by maintaining a strong and sustainable volunteer-based military and civilian labor force.

Activity 1: Continue use of base personnel and local college and high school students aged 15 and older for conservation program volunteer service. **[L]**

Program Management Implementation Strategy

GOAL 6: Manage the natural resources program to promote an effective, efficient, economical, and customer-oriented public service.

Objective 1: By Jul of each year, meet execution timelines indicated below to ensure natural resources program is moving toward and supporting Program Management goal.

Project 1: By 1 Aug of each year, execute ***Equipment Purchase/Maintain, CN (WWYKA53200399 and out-years)***. **[H]**

Project 2: By 1 Aug of each year, execute ***Supplies, CN (WWYKA53200699 and out-years)***. **[H]**

Project 3: By 30 Sep of each year, execute ***Management Habitat (WWYKA53206119 and out-years).*** **[**Cooperative Agreement with University of Oklahoma via Great Plains Cooperative Ecosystem Study Unit (CESU) through the Fort Worth District of the Corps of Engineers—Agreement period: 24 Sep 2019 - 23 Sep 2020 (Base Year) + 4 option years (expires 23 Sep 2024, with last option year needing to be exercised by 23 Sep 2023).] **[H]**

Task 1: By Sep 2020, develop and implement natural resources technician checklist to facilitate timely completion of annually recurring natural resources projects, activities, and tasks.

Activity 1: By 30 Sep of each year, complete INRMP Annual Review and Coordination with internal stakeholders and local representatives of the USFWS and ODWC and document action according to tasks below. **[H]**

Task 1: Starting 1 May of each year, complete items identified in Tinker AFB INRMP Annual Review and Coordination Checklist (see Section 9).

Task 2: With Oklahoma Department of Wildlife Conservation (ODWC) and U.S. Fish and Wildlife Service (USFWS) participation, conduct internal natural resources self-assessment using the following DOD metrics (if required—refer to DODI 4715.03, Enclosure 5):

-INRMP project implementation

-Federally-listed species of critical habitat

-Partnership effectiveness

-Fish and wildlife management and public use

-Team adequacy

-Ecosystem integrity

-INRMP impact on the installation mission

Objective 2: By 2023, apply 6S principles and institutionalize standardized business and organizational practices to improve and sustain high-level agility, compliance, and performance.

Project 1: By 2020, initiate project to construct lean-to/pole barn on south side of B-809 for natural resources equipment and materials storage/staging. **[L]**

Project 2: By 2020, move natural resources equipment from Air Container 1 to Air Container 2 and demolish/recycle Air Container 1. **[L]**

Activity 1: Annually maintain natural resources program documents and utilize document management system. **[L]**

Task 1: Annually, organize and download photos into proper reorganized photo directories.

Task 2: Utilize Electronic Records Management System (ERMS) for storage and archiving natural resource documents.

Activity 2: By 2020, complete natural resources program plan to facilitate seamless staff transitions (e.g., during retirements or other separations) focusing on maintaining program momentum and vision trajectory. **[L]**

Task 1: By 2020, meet with CE management to develop personnel transition plan to ensure well qualified personnel are in place and have been adequately exposed to the program prior to key personnel separations.

Task 2: By 2020, develop natural resources program continuity book.

Activity 3: By 2020, organize office/equipment keys **[L]**

Task 1: Purchase key tags, make key spares, organize keys, and install new key boxes at Buildings 811 and 808.

Activity 4: Sort, update, and organize personal and reference desk/email files (including archive system; metadata/ERMS compliance) **[L]**

Activity 5: By 2020, develop maintenance schedules/record keeping for all natural resources equipment. **[L]**

Objective 3: By 2021, using Tinker AFB as a platform, host 3-day national workshop to train natural resources staff in how to build robust conservation programs that strengthen the Air Force mission.

Activity 1: By early 2021, coordinate with invited speakers

Activity 2: Perform B-811 upgrades in support of workshop

Task 1: Complete B-811 landscaping (self-help)

Task 2: Install front entrance canopy (self-help)

Task 3: Install heat and air unit stockade fence (self-help)

Task 4: Interior decorating with conservation theme (self-help)

Activity 3: Perform Urban Greenway upgrades in support of workshop

Task 1: Refurbish wildlife observation blind (self-help)

Task 2: Repair split-rail fencing Greenway-wide

Task 3: Design and install new interpretive panels, entrance signs, and angler information station signs

Task 4: Install trash can anchor system

11.0 REFERENCES

11.1 Standard References *(Applicable to all AF installations)*

- AFI 32-7064, *Integrated Natural Resources Management*
- Sikes Act
- eDASH Natural Resources Program Page
- Natural Resources Playbook – a Internal AF reference available at https://cs1.eis.af.mil/sites/ceportal/CEPlaybooks/NRM2/Pages/

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12.0 ACRONYMS

12.1 Standard Acronyms (Applicable to all AF installations)

- Natural Resources Playbook – Acronym Section
- U.S. EPA Terms & Acronyms

12.2 Installation Acronyms

- **AAFES –** Army and Air Force Exchange Service
- **ABW –** Air Base Wing
- **ACC –** Air Combat Command
- **ACW –** Air Control Wing
- **AF –** Air Force
- **AFB –** Air Force Base
- **AFCEC –** Air Force Civil Engineer Center
- **AFI –** Air Force Instruction
- **AFPD –** Air Force Policy Directive
- **AFRIMS –** Air Force Records Information Management System
- **AFSC –** Air Force Sustainment Center
- **AICUZ –** Air Installation Compatible Use Zone
- **AOA –** Air Operations Area
- **APZ –** Accident Potential Zone
- **AREP –** Aquatic Resources Education Program
- **BASH –** Bird/Wildlife Aircraft Strike Hazard
- **CCDB** – Crutcho Creek Drainage Basin
- **CE** – Civil Engineering

- **CEIG –** Cyber Engineering Installation Group
- **CEMML –** Center for Environmental Management of Military Lands
- **CERCLA –** Comprehensive Environmental Response, Compensation, and Liability Act
- **CERL –** Construction Engineering Research Lab
- **CESU –** Cooperative Ecosystem Study Unit
- **CFR –** Code of Federal Regulations
- **CIRE –** Center for Integrated Research on the Environment
- **CNG –** Compressed Natural Gas
- **CWD –** Chronic Wasting Disease
- **CZ –** Clear Zone
- **DASD –** Deputy Assistant Secretary of Defense
- **DBH –** Diameter at Breast Height
- **DoD –** Department of Defense
- **DoDI –** Department of Defense Instruction
- **DRMO –** Defense Reutilization and Marketing Office
- **ECAMP** – Environmental Compliance Assessment and Management Program
- **EIAP –** Environmental Impact Analysis Process
- **EIG** – Engineering Installation Group
- **EMP –** Environmental Management Plan
- **EMS** – Environmental Management System
- **EPA –** Environmental Protection Agency
- **EQ –** Environmental Quality
- **ERMS** – Electronic Records Management System
- **ESOH** – Environmental Safety and Occupational Health
- **eSSS –** Electronic staff summary sheet
- **FCF** – Fuel Control Facility
- **FGS –** Final Governing Standards
- **FLETC –** Federal Law Enforcement Training Center
- **FONPA** – Finding of No Practicable Alternative
- **FSS –** Force Support Squadron
- **G** – Global (rank)
- **GEM –** Golf Course Environmental Management Plan
- **GI** – Green Infrastructure
- **GIS** – Geographic Information System
- **GPS** – Global Positioning System
- **GSU –** Geographically Separated Unit
- **GWTP** – Ground Water Treatment Plant
- **HQ AFMC –** Headquarters Air Force Materiel Command
- **IAW –** In accordance with
- **ICRMP –** Integrated Cultural Resources Management Plan
- **IDP –** Installation Development Plan
- **INRMP –** Integrated Natural Resources Management Plan
- **IPaC –** Information for Planning and Consultation
- **IPM –** Integrated Pest Management
- **IPMP –** Integrated Pest Management Plan
- **IST –** Installation Support Team
- **ITNS –** Information Transfer Node System

- **IUCN –** International Union for Conservation of Nature
- **JI –** Jaccard's Index
- **JLUS –** Joint Land Use Study
- **JROTC** – Junior Reserve Officers' Training Corps
- **LIDAR** – Land Detection and Ranging
- **LTA** – Leased Training Area
- **MBTA –** Migratory Bird Treaty Act
- **MICT –** Management Internal Control Toolset
- **MIPR –** Military Interdepartmental Purchase Request
- **MROTC** – Maintenance, Repair and Overhaul Technology Center
- **MSL –** Mean Sea Level
- **NATO –** North Atlantic Treaty Organization
- **NCAR –** National Center for Atmospheric Research
- **NGO –** Non-governmental organization
- **NMFS –** National Marine Fisheries Service
- **NOAA –** National Oceanic and Atmospheric Administration
- **NPDES –** National Pollutant Discharge Elimination Systems
- **NR –** Natural Resources
- **NRCS –** Natural Resources Conservation Service
- **NRM –** Natural Resources Manager
- **OAC –** Oklahoma Administrative Code
- **OC-ALC** – Oklahoma City Air Logistics Complex
- **OCAMA –** Oklahoma City Air Materiel Area
- **OCC –** Oklahoma Corporation Commission
- **ODEQ** – Oklahoma Department of Environmental Quality
- **ODWC** – Oklahoma Department of Wildlife Conservation
- **ONHI** – Oklahoma Natural Heritage Inventory
- **ORAM** – Ohio Rapid Assessment Method for Wetlands
- **OSU** – Oklahoma State University
- **OWQS** – Oklahoma Water Quality Standards
- **OWRB –** Oklahoma Water Resources Board
- **PC –** Personal Computer
- **POC –** Point of contact
- **PPAP –** Pollinator Partnership Action Plan
- **PRECIP –** Average Annual Precipitation
- **PSI –** Percent Similarity Index
- **RBP –** Rapid Bioassessment Protocol
- **RCP –** Representative Concentration Pathway
- **RCRA –** Resource Conservation and Recovery Act
- **RDS –** Records Disposition Schedule
- **REPI –** Readiness and Environmental Protection Integration
- **RIFA –** Red Imported Fire Ant
- **RV** – Recreational Vehicle
- **S** – State (rank)
- **SAIC** – Science Applications International Corporation

- **SAR –** Species at Risk
- **SIU** – Southern Illinois University
- **SME –** Subject Matter Expert
- **SMS –** Subject Matter Specialist
- **SOW –** Statement of Work
- **STP** – Sanitary Treatment Plant
- **SWPP –** Storm Water Pollution Prevention
- **TAFB** – Tinker Air Force Base
- **TAC –** Tinker Aerospace Complex
- **TAVE –** Annual Average Temperature
- **TERPS** – Terminal Instrument Procedures
- **THL –** Texas Horned Lizard
- **TMAX –** Annual Average Maximum Temperature
- **TMIN –** Annual Average Minimum Temperature
- **TTO –** Tinker Take Off
- **UEC –** Unit Environmental Coordinator
- **UFC –** Unified Facilities Criteria
- **UFWG** – Urban Forestry Working Group
- **USA –** United States of America
- **USACE** – United States Army Corps of Engineers
- **USAF** – United States Air Force
- **USAO –** University of Science and Arts of Oklahoma
- **USDA-WS** – United States Department of Agriculture—Wildlife Services
- **USFWS –** United States Fish and Wildlife Service
- **UV –** Ultraviolet
- **WDM –** Wildlife Damage Management
- **WFMP –** Wildland Fire Management Plan

13.0 DEFINITIONS

13.1 Standard Definitions (Applicable to all AF installations)

- Natural Resources Playbook – Definitions Section

13.2 Installation Definitions

- Add unique state, local and installation-specific definitions

14.0 APPENDICES (Appendices are attached as separate documents)

Appendix A: Annotated Summary of Key Legislation Related to Design/Implementation of the INRMP

Appendix B: Natural Resources Annual Reports

Appendix C: Flora List

Appendix D: Fauna List

Appendix E: Native Landscaping Plant Material List

Appendix F: Mitigation Action Tracker

Appendix G: Urban Forestry Management Procedures

Appendix H: Natural Resources Cooperative Agreements/Memorandums

Appendix I: Species at Risk

Appendix J: Natural Resources Equipment and Supply Inventory

15.0 ASSOCIATED PLANS (Tabs 1, 2, 3, and 8 are attached as separate documents. Refer to OPRs for other plans)

Tab 1 – Green Infrastructure (GI) Plan

Tab 2 – Golf Course Environmental Management (GEM) Plan

Tab 3 – Wildland Fire Management Plan (WFMP)

Refer to Green Infrastructure Plan (Tab 1) for current WFMP.

Tab 4 – Bird/Wildlife Aircraft Strike Hazard (BASH) Plan

Refer to plan OPR (Tinker Flight Safety office)

Tab 5 – Integrated Pest Management Plan (IPMP)

Refer to plan OPR (Tinker Installation Pest Management Coordinator)

Tab 6 – Integrated Cultural Resources Management Plan (ICRMP)

Refer to plan OPR (Tinker Cultural Resources Program Manager)

Tab 7 – Storm Water Management Plan

Refer to plan OPR (Tinker Storm Water Program Manager)

Tab 8 – Climate Change Supporting Information

Refer to information OPR (Tinker Natural Resources Program Manager)

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, D.C. 20314-1000

EM 385-1-1

CESO-ZA

Manual
No. 385-1-1

30 November 2014

Safety

SAFETY AND HEALTH REQUIREMENTS

1. Purpose. This manual prescribes the safety and health requirements for all Corps of Engineers activities and operations.

2. Applicability. This manual applies to Headquarters, US Army Corps of Engineers (HQUSACE) elements, major subordinate commands, districts, centers, laboratories, and field operating activities (FOA), as well as USACE contracts and those administered on behalf of USACE. Applicability extends to occupational exposure for missions under the command of the Chief of Engineers, whether accomplished by military, civilian, or contractor personnel.

3. References.

a. 29 Code of Federal Regulation (CFR) 1910, Occupational Safety and Health Standards for General Industry

b. 29 CFR 1926, Occupational Safety and Health Standards for Construction

c. 29 CFR 1960, Basic Program Elements for Federal Employees, OSHA

d. Executive Order (EO) 12196, Occupational Safety and Health Programs for Federal Employees, 26 Feb, 1980

e. Federal Acquisition Regulation (FAR) Clause 52.236-13, Accident Prevention, Nov 1991

f. Department of Defense Instruction (DODI) 6055.1, DOD Safety and Occupational Health Program, 14 Oct 2014

g. Army Regulation (AR) 40-5, Preventive Medicine

h. AR 385-10, Army Safety Program

This Manual supersedes EM 385-1-1, dated 15 September 2008

4. General.

a. The provisions of this manual implement and supplement the safety and health standards and requirements referenced above. Where more stringent safety and occupational health standards are set forth in these requirements and regulations, the more stringent standards shall apply.

b. Mission applicability introduced in paragraph 2 above shall include the following:

(1) Construction contract work under the provisions of FAR Clause 52.236-13. Contractors shall comply with the latest version of EM 385-1-1 (including interim changes) that is in effect on the date of solicitation. Prior to making an offer, bidders should check the HQUSACE Safety and Occupational Health web site (see paragraph c) for the latest changes. No separate payment will be made for compliance with this paragraph or for compliance with other safety and health requirements of this contract. Note: Existing contracts will continue to apply the provisions of the previous edition of this manual until contract completion.

(2) Service, supply, and research and development contracting actions. Compliance with this manual shall be a contract requirement for such activities unless technical representatives (in coordination with safety and health professionals) advise that special precautions are not appropriate due to extremely limited scope of services or similar. However, it is understood that this manual in its entirety may be too complex for the type of work being performed under these contracts. These contractors may reference Appendix A, for abbreviated Accident Prevention Plan (APP).

(3) Contracting actions for hazardous, toxic, and radioactive waste site investigation, design, or remediation activities. Compliance with this manual shall be a contract requirement.

c. Changes. All interim changes (changes made between publication of new editions) to this manual, and the effective date of change, will be posted on the Safety and Occupational Health Office web site: http://www.usace.army.mil/CESO/Pages/Home.aspx and in USACE Electronic bid Sets. Hard copies of this manual are available from the local contracting official.

d. Interpretations. Within the Corps of Engineers, interpretations to the requirements contained within this manual shall be executed in accordance with the process contained in Appendix C. Interpretations will apply only to the specific situation in question and may not be used as a precedent to determine the meaning of a requirement as it may apply to another circumstance.

e. Variances and Waivers. Within the Corps of Engineers, variances and waivers to provisions of this manual require the approval of the Chief of Safety and Occupational Health, HQUSACE. Variances or waivers shall provide an equal or greater level of protection, shall be substantiated with a hazard analysis of the activity and shall be documented and forwarded through channels to Chief of Safety and Occupational Health, HQUSACE. The process for requesting variances or waivers is contained in Appendix D.

f. Activities performed OCONUS. Some of the technical requirements of this manual may not be applicable to overseas activities due to conflicting circumstances, practices, and laws or regulations of the locality or the unavailability of equipment. In such instances, means other than the ones specified in this manual may be used to achieve the required protection. In such instances, a hazard analysis must be developed to document that the required protection will be achieved by the alternate means.

g. Unless otherwise indicated, when publications are referenced in this manual, the most recent edition is to be used.

h. The use of underlining in this manual indicates new or changed text from the 2008 version.

i. Supplementation of this manual is not authorized except as published by the Safety and Occupational Health Office, HQUSACE.

(1) Local USACE organizations may develop Standard Operating Procedures (SOPs) to implement the provisions contained within this manual, but may not implement new requirements (e.g., more stringent, differing intent, etc.) without the specific approval of HQUSACE.

(2) Locally developed Safety and Health Requirements will not be included in contract requirements without the approval of HQUSACE.

FOR THE COMMANDER:

WILLIAM H. GRAHAM
COL, EN
Chief of Staff

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, DC 20314-1000

EM 385-1-1

CESO

Manual
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Safety
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SECTION 1

Program Management

01.A General. This Section provides the overall programmatic guidance for developing, managing and implementing a safety and occupational health (SOH) program.

01.A.01 No person shall be required, instructed or allowed to work in surroundings or under conditions that are unsafe or dangerous to his or her health.

01.A.02 The employer is responsible for initiating and maintaining a SOH program that complies with the US Army Corps of Engineers (USACE) SOH requirements.

- Note 1: Supplementation of this manual is not authorized except as published by the HQUSACE SOH Office.

- Note 2: Local USACE Commands may develop Standard Operating Procedures (SOPs) to implement the provisions contained within this manual, but may not implement new requirements (e.g., more stringent, differing in intent, etc.), without the specific approval of HQUSACE-SO.

01.A.03 Each employee is responsible for complying with applicable SOH requirements, wearing prescribed SOH equipment, reporting unsafe conditions or activities, preventing avoidable mishaps, and working in a safe manner.

01.A.04 Supervisors shall remove employees from exposure to work hazards, or the work site when they are observed acting in an unsafe manner, or otherwise pose a potential SOH threat to themselves or others. Employees may return to the work environment after appropriate supervisory action has occurred (i.e., re-training on proper safe procedures, etc.).

01.A.05 SOH programs, documents, signs, and tags shall be communicated to employees in a language that they understand.

01.A.06 Worksites with non-English speaking workers shall have a person(s), fluent in the language(s) spoken as well as English, on-site when work or training is being performed, to interpret and translate as needed.

01.A.07 SOH Bulletin Board. The Contractor or USACE Project shall erect and maintain a SOH bulletin board in a commonly accessed area in clear view of the on-site workers. The bulletin board shall be continually maintained and updated and placed in a location that is protected against the elements and unauthorized removal. It shall contain, at minimum, the following SOH information:

a. A map denoting the route to the nearest emergency care facility;

b. Emergency phone numbers;

c. A copy of the most current Accident Prevention Plan (APP) or Project Safety and Occupational Health (SOH) Plan, mounted on/adjacent to the bulletin board, or a notice on the bulletin board stating the location of the Plan. The location of the Plan shall be accessible on the site by all workers;

d. The Occupational Safety and Health Administration (OSHA) Form 300A, Summary of Work Related Injuries and Illnesses, posted in accordance with OSHA requirements (from February 1 to April 30 of the year following the issuance of this form). It shall be mounted on/adjacent to the bulletin board, accessible on the site by all workers;

e. A copy of the SOH deficiency tracking log mounted on/adjacent to the bulletin board or a notice on the bulletin board shall state the location where it may be accessed by all workers upon request; > See 01.A.13.d.

f. SOH promotional posters;

g. Date of last lost workday injury and date of last OSHA recordable injury;

h. OSHA Safety and Health Poster;

i. A copy of the hazardous material inventory, identification of use, approximate quantities and site map detailing location as required by Section 06.B.01.a.

01.A.08 USACE Business Process. USACE Project Managers (PMs), in accordance with the SOH Reference Document (Ref Doc 8016G) contained in the USACE Business Manual, shall ensure that a SOH plan is developed for funded projects and incorporated into each Project Management Plan (PMP)/Program Management Plan (PrgMP).

a. The PM shall collaborate with the customer and the local SOH office (SOHO) on project safety goals and objectives and communicate these through the PMP/PrgMP SOH plan and Project Delivery Team (PDT) meetings.

b. Coordination between local SOHOs of the design district and the construction district shall occur during the development of the PMP.

01.A.09 USACE Project Management Plan. USACE PMs and the PDT shall develop the SOH program requirements to be incorporated in the PMP and are responsible for assuring that SOH requirements are properly addressed and executed throughout the life cycle of each project.

a. The PM shall ensure that identified hazards, control mechanisms, and risk acceptance are formally communicated to all project stakeholders.

b. The current Unified Facilities Guide Specification (UFGS) for Safety and Health in effect on the date of solicitation shall be used in all USACE contract work administered on behalf of the USACE under the provisions of FAR Clause 52.236-13 and on other contracts as deemed appropriate based on the risk assessment.

c. Military Construction (MILCON) Transformation contracts will include the Federal Acquisition Regulation (FAR) Clause 52.236-13 as well as the Model Request for Proposal (RFP).

d. Locally developed SOH requirements will not be included in contract requirements without the concurrence of the Contracting Officer (KO) and local SOHO.

e. When an employee is deemed to be in imminent danger, the COR or a designated representative shall immediately stop the unsafe work being performed. > See Federal Acquisition Regulation (FAR) Clause 52.236-13(d).

01.A.10 USACE Project SOH Plan. For USACE activities where USACE employees are engaged in functions other than routine office or administrative duties, a Project SOH Plan shall be developed, implemented, and updated as necessary.

a. Such activities include operations and maintenance; recreational resource management; in-house conducted environmental restoration (investigation, design, and remediation); surveying, inspection, and testing; construction management; warehousing; transportation; research and development; and other activities when the Government Designated Authority (GDA) and the command’s local SOHO agree on the benefit of such a program for accident prevention.

b. The Project SOH Plan shall address applicable items listed in Appendix A, and in addition, any local SOPs or requirements identified in the USACE Command's SOH Program. > See Section 01.A.02, Notes 1 and 2.

c. For Hazardous Waste Operations and Emergency Response (HAZWOPER) sites, refer to Section 33 for Site Safety and Health Plan (SSHP) guidance.

01.A.11 Position Hazard Analyses (PHA) for USACE Employees. A PHA shall be prepared, updated as necessary, documented by the supervisor, and reviewed by the command’s SOHO f or each USACE position according to the hazards associated with the position's tasks. A generic PHA may be used for groups of employees performing repetitive office/administrative tasks where the primary hazards result from ergonomic challenges, lighting conditions, light lifting and carrying tasks, and indoor air quality. > See Figure 1-1 for an outline of a PHA. An electronic, fillable version of a PHA may be found on the HQUSACE Safety Office Website.

a. The USACE Supervisor, in coordination with the SOHO, shall determine the need for analysis of each position within his or her area of responsibility.

b. In developing the analysis for a particular position, supervisors shall draw upon the knowledge and experience of employees in that position in addition to that of the SOHO.

c. A complete PHA document shall indicate that the hazards, medical surveillance requirements, control mechanisms, personal protective equipment (PPE) and training required for the position were discussed with the employee. The PHA shall be signed by the supervisor and employee. A PHA shall contain a copy of the employee's training certificate of completion for all required training.

d. Supervisors shall review the PHAs with employees upon initial assignment to a position, whenever there is a significant change in hazards and during their annual performance review or at least annually.

01.A.12 Accident Prevention Plans (APP) for Contract Work. Before initiation of work at the job site, an APP shall be reviewed and found acceptable by the GDA. > See Appendix A.

a. APPs shall be developed and submitted by the Contractor. The Contractor shall address each of the elements/sub-elements in the outline contained in Appendix A in the order that they are provided in the manual. If an item is not applicable because of the nature of the work to be performed, the Contractor shall state this exception and provide a justification.

(1) The Contractor shall identify each major phase of work that will be performed on this contract. Within each major phase, all activities, tasks or Definable Features of Work (DFOWs) shall be identified that will require an Activity Hazard Analysis (AHA). > See Section 01.A.14 and Appendix A, paragraph 3.j.

(2) The APP shall also address any unusual or unique aspects of the project or activity.

FIGURE 1-1

Position Hazard Analysis (PHA)

Position Hazard Analysis (PHA) for USACE Employees	
Name: (Print - Last, First, Mi): _____ Job Series: _____ Job Title: _____ Job Number (SF52): _____	Prepared By: (Print – Last, First, MI): _____ Reviewed By (SSHO):_____ Date (Mo) _ _ (Day) _ _ (Year) _ _ _ _
Command Name & Organization Code: _____ Primary Duty Location: _____	
Clearances Required EM OPS Team ☐ First Aid/CPR ☐ Respirator ☐ CDL Crane Operator ☐ Diver ☐ HTRW ☐ Other ☐	

Position Tasks	Safety and/or Occupational Health Hazards*	Recommended Controls
1. 2. 3. 4. 5.	1. 2. 3. 4. 5.	1. 2. 3. 4. 5.

*Note - Examples of potential hazards are as follows:

Safety:	Excavating; electrical; slips, trips, falls; falls from heights, motor Vehicle/equipment operation; compressed air; fire; etc.
Physical Agent:	Exposure to heat/cold; noise; stress; vibration; radiation, hot substances; radio frequency; EMF, etc.
Chemical Agent:	Exposure to solvents; cadmium; paints; welding fumes; lead; asbestos; pesticides; etc.
Biological Agent:	Exposure to bloodborne pathogens; poison ivy; insects; fungi; etc.

FIGURE 1-1 (Cont'd)

Position Hazard Analysis (PHA)

Equipment, Materials & Chemicals To Be Used	Inspection Requirements	Training Requirements
List for each task [include Material Safety Data Sheets(MSDSs)]	List inspection requirements for each work task	List safety/health training requirements
1.	1.	1.
2.	2.	2.
3.	3.	3.
4.	4.	4.
5.	5.	5.
6.	6.	6.

Note: This PHA serves as the hazard assessment required by Sections 01, 05, and 06 of this Manual. The employee covered by this PHA has been instructed in the tasks to be performed, the hazards that may be encountered, potential adverse effects of the hazards and controls to be used. He/she has received adequate, specific training related to safe work practices, administrative and engineering controls and PPE to be used to ensure assigned work tasks are conducted in a safe/healthful manner. He/she has demonstrated an understanding of the safety/health equipment/PPE to be used, including its limitations, useful shelf-life, how to properly don, doff, adjust, and wear required PPE, how to properly care for, inspect, maintain, store, and dispose of same. Attached is documentation of the training received, dates of such training, and the subject matter taught.

Supervisor Signature: _____ Employee Signature: _____

Date __ __/__ __/__ __ __ __ Date __ __/__ __/__ __ __ __

b. The APP shall be written in English by the Prime Contractor and shall articulate the specific work, work processes, equipment to be used, and hazards pertaining to the contract. The APP shall also implement in detail the pertinent requirements of this manual.

c. The APP shall contain appropriate hazard-specific plans as needed for the work being performed (e.g., appendices that include a SSHP for hazardous waste site cleanup operations; a Lead Compliance Plan when working with lead, or an Asbestos Hazard Abatement Plan when working with asbestos).

d. All highly complex or high-hazard projects shall be coordinated with the local SOH office.

e. For limited-scope supply, service and R&D contracts, the KO and local SOHO may authorize an abbreviated APP. > See Appendix A, Paragraph 2 for details.

f. The APP shall be developed and signed by Qualified Person (QP) and then signed. The Contractor shall be responsible for documenting the QPs' credentials.

g. The Contractor's APP shall be job-specific and must include work to be performed by subcontractors.

(1) If at the time of submission of the APP, portions of the work have yet to be known or sub-contracted, that portion will be added to the APP, submitted and accepted by the GDA prior to initiation of the sub-contracted work.

(2) In addition, the APP shall include measures to be taken by the Contractor to control hazards associated with materials, services, or equipment provided by suppliers.

(3) Each sub-contractor shall be provided a copy of the APP by the prime contractor and be required to comply with it.

h. The contractor shall provide on-going evaluations of the APP throughout the life of the project. Changes, revisions and updates to the APP shall be reviewed and accepted by the GDA.

➢ Note: When USACE or other government employees are on a site that is controlled by a contractor and are affected by the contractor-managed APP (e.g., QA's on construction sites, etc.), they shall comply with the contractor's APP and associated programs (i.e., Fall Protection, Hazardous Energy Control, Diving, Blasting, etc.).

01.A.13 Inspections - Contractor and USACE Projects.

a. The APP or the USACE Project SOH Plan shall provide for frequent safety inspections/audits, conducted by a Competent Person (CP), of the work sites, material, and equipment to ensure compliance with the plan and this manual. These inspections/audits shall be documented in writing and available upon request to the GDA. They shall include the name of the inspector, date, and all findings.

b. In addition, Contractor Quality Control (QC) and USACE Quality Assurance (QA) personnel as part of their QC and QA responsibilities, shall conduct and document daily SOH inspections in their daily logs.

c. Inspection reports shall document any identified SOH issues and deficiencies, and the actions, timetable, and responsibility for correcting the deficiencies. Follow-up inspections to ensure correction of any identified deficiencies must also be conducted and documented in inspection reports.

d. The Contractor or USACE Project shall establish a SOH deficiency tracking system that lists and monitors the status of SOH deficiencies in chronological order. The tracking system provides useful information that must be used to evaluate the effectiveness of the APP. A monthly evaluation of the data should be discussed in the QC or SOH meeting with everyone on the project. The list shall be posted on the project bulletin board, be updated daily, and should provide the following information:

(1) Date deficiency identified;

(2) Description of deficiency;

(3) Name of person responsible for correcting deficiency;

(4) Projected resolution date;

(5) Date actually resolved.

e. The Contractor shall immediately notify the GDA of any OSHA or other regulatory agency inspection and provide GDA an opportunity to accompany the Contractor on the inspection. The inspection will not be delayed due to non-availability of the GDA. The Contractor shall provide the GDA with a copy of any citations or reports issued by the inspector and any corrective action responses to the citation(s) or report(s).

f. The GDA shall notify the local SOHO of any regulatory visits.

g. The USACE Project personnel shall immediately notify the local SOHO of any OSHA or other regulatory agency inspection. The Project shall provide the local SOHO with a copy of any citations or reports issued by the inspector and any corrective action responses to the citation(s) or report(s). Local SOHO shall immediately provide this documentation to HQUSACE-SO.

01.A.14 Contractor Risk Management Process. Risk management is a business process that includes the identification, assessment, and prioritization of risks, followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events to an acceptable level. The USACE uses the Activity Hazard Analysis (AHA) as part of a total risk management process. > See Figure 1-2 for a NON-MANDATORY formatted outline of an AHA. An electronic version AHA may be found on the HQUSACE Safety Office Website.

➢ Note: Contractors and other individual employer's typically use Job Safety Analyses (JSAs), Job Hazard Analyses (JHAs), or similar Risk Management assessment tools. These documents are considered equivalent to, and acceptable substitutes for, the USACE's AHA provided the data collected is the same as that required by the AHA.

a. AHAs shall define the steps being performed within the activity, task or Defined Feature of Work (DFOW), and identify the work sequences, specific anticipated hazards, site conditions, equipment, materials, personnel and the control measures to be implemented.

b. Before beginning each work activity, task or DFOW, the Contractor performing that work activity shall prepare the initial AHA. A Risk Assessment Code (RAC) is assigned to each step, to the risk that remains after controls have been applied (residual risk).

(1) Once this process has occurred, a RAC will be assigned to the activity as a whole (cannot be lower than the highest step RAC).

(2) Acceptance of risk. This residual risk must then be communicated to the proper authority for acceptance in order to proceed with the activity.

(3) The names of the Competent Person(s) (CP) and Qualified Person(s) (QP) required for a particular activity (e.g., excavation, scaffolding, fall protection, or other activities as specified by OSHA and this manual) shall be identified and included in the AHA, as well as proof of their competency/qualification.

(4) If more than one CP/QP is used on the AHA activity, a list of names and appropriate qualifications shall be submitted as an attachment to the AHA. Those listed must be CPs/QPs for the type of work involved in the AHA and familiar with current site safety issues.

c. Work shall not begin until the AHA with RAC for the work activity has been accepted by the GDA and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.

d. AHA's are intended to be developed and used by the field crews/workers performing the work, with the assistance of others (SSHO, QC, Superintendent, etc) as needed. The initial, accepted AHA shall be provided to and used by the field crews/workers that are performing that activity. AHAs are to be considered living documents and are intended to be created in the field and updated by the workers as needed.

e. The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of CP(s)/QP(s).

(1) If a new CP/QP (not on the original list) is added, the list shall be updated (an administrative action not requiring an updated AHA). The new CP/QP shall acknowledge in writing that they have reviewed the AHA and is familiar with current site safety issues.

(2) If the initial RAC increases due to a change made to the AHA by the workers, the AHA shall be resubmitted to GDA for acceptance prior to work proceeding.

(3) Changes to or updates to an AHA that do not increase the RAC are not required to be resubmitted for acceptance by the GDA.

(4) Workers/crews shall have in their possession the current AHA that reflects current site conditions, personnel, equipment, control measures, etc while the work is being performed.

f. The AHA shall be used by the contractor and USACE personnel to assure work is being performed consistent with the AHA. In the event that the work is not being conducted in a safe manner, the contractor and/or the USACE (COR or designated representative) shall immediately stop the unsafe work being conducted until it is in compliance with this manual, APP and the AHA or the APP/ AHA is revised and accepted by the GDA, if necessary.

g. AHAs for completed work for the same contract or project work shall be readily available on site (e.g., office, trailer, etc.) and accessible on site by all workers, for a period of 12 months or, for contract work, the length of the contract;

01.A.15 USACE Risk Management Process. Risk management is a business process that includes the identification, assessment, and prioritization of risks, followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events to an acceptable level. The USACE uses the Activity Hazard Analysis (AHA) as part of a total risk management process. > See Figure 1-2 for a NON-MANDATORY formatted outline of an AHA and n electronic version of this AHA may be found on the HQUSACE Safety Office Website. Work crews may use other forms/formats as long as the information contained within is the same.

a. An AHA shall be prepared and documented for each USACE activity as warranted by the hazards associated with the activity. Typically, an AHA shall be prepared for all field, laboratory, industrial and maintenance activities.

b. The supervisor, utilizing the recommendations of the SOHO, should determine the need for an AHA for each activity within his/her area of responsibility. AHAs shall define the steps being performed within the activity or task, identify the work sequences, specific anticipated hazards, site conditions, equipment, materials, personnel and the control measures to be implemented.

c. Before beginning each work activity, the workers performing that work activity shall prepare the initial AHA. A Risk Assessment Code (RAC) is assigned to each step, to the risk that remains after controls have been applied (residual risk). In developing the AHA for a particular activity, the involved workers should draw upon the expertise (knowledge, skill and experience) of the USACE supervisor for that activity as well as the SOH Office.

(1) Once this process has occurred, a RAC will be assigned to the activity as a whole (cannot be lower than the highest step RAC).

(2) Acceptance of risk. This residual risk must then be communicated to the proper authority for acceptance in order to proceed with the activity.

(3) The names of the Competent Person(s) (CP) and Qualified Person(s) (QP) required for a particular activity (e.g., confined space entry, scaffolding, fall protection or other activities as specified by OSHA/this manual) shall be identified and included in the AHA, as well as proof of their competency/qualification.

(4) If more than one CP/QP is used on the AHA activity, a list of names and appropriate qualifications shall be noted on the AHA. Those listed must be CPs/QPs for the type of work involved in the AHA and familiar with current site safety issues.

d. Work shall not begin until the AHA with RAC for the work activity has been discussed with all engaged in the activity in a job pre-brief (to include Supervisor and/or local SOHO if applicable).

FIGURE 1-2

Activity Hazard Analysis (AHA)

Activity/Work Task: _____	Overall Risk Assessment Code (RAC) (Use highest code)					
Project Location: _____	Risk Assessment Code (RAC) Matrix					
Contract Number: _____	Severity	Probability				
Date Prepared: _ _/_ _/_ _ _ _		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): _____	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
Reviewed by (Name/Title): _____	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each "Hazard" with identified safety "Controls". Determine RAC (See above)					
	Probability: likelihood the activity will cause a Mishap (near miss, incident or accident). Identify as Frequent, Likely, Occasional, Seldom or Unlikely.	RAC Chart				
	Severity: the outcome if a mishap occurred. Identify as Catastrophic, Critical, Marginal, or Negligible	E = Extremely High Risk				
		H = High Risk				
	Step 2: Identify the RAC (probability vs. severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	M = Moderate Risk				
		L = Low Risk				

Job Steps	Hazards	Controls	RAC
1. 2.	1. 2.	1. 2.	1. 2.
Equipment to be Used	Training Requirements & Competent or Qualified Personnel name(s)	Inspection Requirements	

e. AHA's are intended to be developed and used by the field crews/workers performing the work, with the assistance of others (CDSO, Superintendent, etc.) as needed. The initial AHA shall be provided to and used by the field crews/workers that are performing that activity. AHAs are to be considered living documents and are intended to be created in the field and updated by the workers as needed.

f. The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of CP(s)/QP(s).

(1) If a new CP/QP (not on the original list) is added, the list shall be updated (an administrative action not requiring an updated AHA). The new CP/QP shall acknowledge in writing that he/she has reviewed the AHA and is familiar with current site safety issues.

(2) If the initial RAC increases due to a change made to the AHA by the workers, the AHA shall be re-reviewed by the supervisor and local SOHO for acceptance prior to work proceeding.

(3) Changes to or updates to an AHA that do not increase the RAC are not required to be re-reviewed.

(4) Workers/crews shall have in their possession the current AHA that reflects current site conditions, personnel, equipment, control measures, etc while the work is being performed.

g. The AHA shall be used to assure work is being performed consistent with the AHA. In the event that the work is not being performed/conducted in a safe manner, work shall stop until it is in compliance with this manual, and the AHA.

h. Once the activity has been completed, the AHA shall be available and kept on file on site for 6 months minimum.

01.A.16 To ensure compliance with this manual, the Contractor may be required to prepare for review specific SOH submittal items. These submittal items may be specifically required by this manual or may be identified in the contract or by the Contracting Officer's Representative (COR). All SOH submittal items shall be written in English and provided by the Contractor to the GDA.

01.A.17 Contractor Site Safety and Health Officer (SSHO). The Contractor shall employ a minimum of one CP at each project site to function as the SSHO (primary), depending on job complexity, size and any other pertinent factors.

a. The SSHO shall:

(1) Be a full-time responsibility. The SSHO shall be present at the project site, located so they have full mobility and reasonable access to all major work operations during the shift.

(2) Be an employee other than the supervisor, unless specified differently in the contract and coordinated with the local SOH Office, and

(3) Report to a senior project (or corporate) official.

b. The SSHO, as a minimum, must produce a copy of their instructor-signed OSHA 30-hour training card (or course completion if within 90 days of having completed the training and card has not yet been issued). They will have completed:

(1) The 30-hour OSHA General Industry safety class (may be web-based training if the student is able to directly ask questions of the instructor by chat or phone) or

(2) The 30-hour OSHA Construction Industry safety class (may be web-based training if the student is able to directly ask questions of the instructor by chat/phone), or

(3) As an equivalent, formal construction or industry safety and health training covering the subjects of the OSHA 30-hour course and the EM 385-1-1 [see Appendix A, Paragraph 3.d.(3)] applicable to the work to be performed and given by qualified instructors - may be web-base training if the student is able to directly ask questions of the instructor by chat/phone).

➢ Note: The local SOHO having jurisdiction over the work shall evaluate the proposed equivalent training for applicability to the contract work to be performed.

c. In addition, the SSHO is also required to have proof of employment for:

(1) Five (5) years of continuous construction industry safety experience in supervising/ managing general construction (managing safety programs or processes or conducting hazard analyses and developing controls), or

(2) Five (5) years of continuous general industry safety experience in supervising/ managing general industry (managing safety programs or processes or conducting hazard analyses and developing controls), or

(3) If the SSHO has a Third-Party, Nationally Accredited (ANSI or National Commission for Certifying Agencies - NCCA) SOH-related certification, only 4 years of experience is needed. > See Appendix Q for list of certifications.

d. SSHOs shall maintain competency through having taken 8 hours of documented formal, on-line, or self-study safety and health related coursework every year. Examples of continuing education activities that meet this requirement are: writing an article, teaching a class, reading/writing professional articles, attendance/participation in professional societies/meetings, etc.

e. For projects with multiple shifts, an Alternate SSHO as identified in the AHA will be assigned to insure SSHO coverage for the project at all times work activities are conducted.

➢ Note: The Alternate SSHO must meet the same requirements and assume the responsibilities of the project SSHO. > See Appendix Q for "Alternate SSHO" and "SSHO" definitions.

f. If the SSHO is off-site for a period longer than 24 hours, an Alternate SSHO shall be provided and shall fulfill the same roles and responsibilities as the primary SSHO.

g. When the SSHO is temporarily (up to 24 hours) off-site, a Designated Representative (DR), as identified in the AHA may be used in lieu of an Alternate SSHO, and shall be on the project site at all times when work is being performed.

➢ Note: DRs are collateral duty safety personnel, with safety duties in addition to their full-time occupation.

h. If an activity, task or DFOW contains multiple sites and has been assessed and given an activity RAC of low or medium, a DR shall be appointed for each site where remote work locations are more than 45 minutes travel time from the SSHO's duty location.

(1) DRs shall perform safety program tasks as designated by the SSHO and report safety findings to the SSHO.

(2) A DR may NOT be assigned to projects that have a RAC level of high or extremely high.

i. The Contractor's project management team, with the assistance of the SSHO, is responsible for managing, communicating, implementing and enforcing compliance with the Contractor's APP and other accepted safety and health submittals.

➢ Exception 1: For dredging contracts, the SSHO requirements established in the standardized contract clause for dredging project site safety personnel shall be used as it is included in the current UFGS for Governmental Safety Requirements.

➢ Exception 2: For limited service contracts, for example, mowing only, park attendants, rest room cleaning, etc., the KO and SOH Office may modify SSHO requirements and waive the more stringent elements of this Section. > See Appendix A, Paragraphs 2 and 3.i.

➢ Exception 3: For field walk-over, surface soil sampling, or long term water sampling, in which there is no exposure to mechanical or explosive hazards, the SSHO may be collateral duty and shall have a minimum of 8 hours of training annually and specific knowledge of the potential hazards of the tasks being completed.

01.A.18 USACE SOH Professional and Collateral Duty Safety Officer (CDSO). > See Appendix Q. Organizations shall assign a safety point of contact (POC) for all construction and/or maintenance activities, dredging, field sampling, drilling and any other potentially hazardous tasks. A safety POC is a worker that has knowledge of the work being performed and the associated hazards and controls associated with it.

a. For all activities with a high potential for injury or illness and/or a RAC on the AHA of high or extremely high, a SOH Professional shall be on site full time. The SOH Professional shall have reviewed the hazards and appropriate controls with the local SOHO.

b. If a project or task has been assessed with a RAC of low:

(1) A Safety POC or CDSO as identified in the AHA, shall be on the project site at all times when work is being performed.

(2) And it contains multiple sites, a Safety POC shall be appointed for each site where remote work locations are more than 45-minutes travel time from the CDSO's main duty location. POCs shall perform safety program tasks as designated by the SOH Professional, Project Safety Officer or CDSO and report safety findings to the appropriate level.

➢ Note: CDSOs are formerly identified personnel with safety duties in addition to their full-time occupation.

c. If a project or task has been assessed with a RAC for the project of medium:

(1) A CDSO, as identified in the AHA, shall be on the project site at all times when work is being performed.

(2) And it contains multiple sites, a Safety POC shall be appointed for each site where remote work locations are more than 45-minutes travel time from the CDSO's main duty location. POCs shall perform safety program tasks as designated by the SOH Professional, Project Safety Officer or CDSO and report safety findings to the appropriate level.

d. A CDSO may NOT be assigned to projects that have a RAC level of high or extremely high.

e. The responsibilities of the government Safety POC/CDSO are:

(1) To ensure the hazards identified in the AHA are appropriately addressed;

(2) Provide training on the hazards of the activity and PPE or controls to be utilized;

(3) Provide feedback on the work activities as to how to improve the safety of the activity, and

(4) Document the safety and health controls being used and implemented.

f. Project SO, CDSO and Safety POC shall seek support and information from the local SOHO if there is a verbalized concern or someone becomes injured or ill.

01.A.19 USACE Collateral Duty Safety Officers (CDSOs). USACE organizations shall designate CDSOs as recommended by the SOH Office. CDSOs shall:

a. Be selected, then trained per Section 01.A.19.b, then appointed through written orders;

b. On appointment of an employee to CDSO, SOH training commensurate with the scope of their assigned responsibilities shall be provided. > See 29 CFR 1960.58. Training shall include:

(1) USACE EM 385-1-1;

(2) Section 19 of the OSH Act, Executive Order 12196 and 29 CFR 1960.58;

(3) USACE procedures for the reporting, evaluation and abatement of hazards;

(4) Hazard recognition and Risk Management Processes;

(5) USACE procedures for mishap reporting and investigation and use of lessons learned;

(6) Any local SOH SOPs, to include other appropriate rules and regulations; or

(7) A USACE-instructed or provided (e.g., Prospect classes) 30-hour OSHA General Industry safety class or 30-hour Construction Industry safety class can be taken and will successfully satisfy all training material above except for local SOPs and information.

c. Maintain their competency through taking a minimum of 24-hours of documented formal or online safety and health related coursework, training and webinars over a period of 4-years. The training must be applicable to the work being performed. Teaching is not considered the equivalent of attending training.

d. Give their safety duties proper priority;

e. Report directly to their unit manager concerning safety–related matters;

f. Coordinate activities with their supporting SOHO.

01.A.20 Fatigue Management Plan (FMP).

a. A FMP shall be completed as part of the APP/Project SOH Plan whenever work hours:

(1) Exceed 10-hours a day for more than 4 consecutive days;

(2) Exceed 50-hours in a 7-day work week;

(3) Exceed 12-hours a day for more than 3 consecutive days, or

(4) Exceed 58-hours a week for sedentary (to include office) work.

b. The FMP shall address the following conditions for operator work hour limitations:

(1) Equipment Operators. Operators of equipment, such as hoisting equipment and draglines, mobile construction equipment, electrical power systems, hydropower plants, industrial manufacturing systems, hydraulically operated equipment, powered vessels, and boats, shall not be permitted to exceed 12-hours of duty time in any 24-hour period, including time worked at another occupation. A minimum of 8 consecutive hours of rest between shifts in a 24-hour period is required.

➢ Note: See “Rest”, in Appendix Q.

(2) Motor Vehicle Operators. Operators of motor vehicles, while on duty, shall not operate vehicles for a continuous period of more than ten 10-hours in any 24-hour period; moreover, no employee, while on duty, may operate a motor vehicle after being in a duty status for more than 12-hours during any 24-hour period. A minimum of 8 consecutive hours shall be provided for rest in each 24-hour period.

(3) Floating Plant. All floating plant personnel shall be scheduled to receive a minimum of 8-hours rest in any 24-hour period, except:

(a) When quarters are provided immediately adjacent to, or aboard the work site, these hours of rest may be divided into no more than 2 periods, one of which must be at least 6 continuous hours in length.

(b) Rest periods may be interrupted in case of emergency, drill, or other overriding operational necessity.

c. FMP shall identify affected workers, management responsibility, training, and the controls established at the worksite.

(1) Training shall include symptoms of fatigue, habits and actions the worker may take to avoid fatigue, actions workers should take if they observe fatigue in a co-worker, and controls in place to prevent fatigue.

(2) Controls for fatigue shall include a discussion of driving to and from work and any possible mitigation of driving as a factor of fatigue. > See Appendix Q, “Rest”.

(3) Controls for fatigue may include work scheduling (limit number of consecutive night shifts), rotating jobs to prevent repetitive work, breaks at critical times in the work cycle, control of environmental factors (heat, cold, use of personal protective equipment), buddy check-in for individuals working alone, and alternate transportation for long commutes.

01.B Indoctrination and Training.

01.B.01 A Competent Person (CP), qualified in the material presented, shall conduct all training required by this manual. All training shall correspond to American National Standards Institute (ANSI) regulation Z490.1.

01.B.02 Employees shall be provided an SOH indoctrination prior to the start of work as well as continuous SOH training to enable them to perform their work in a safe manner. All training, meetings and indoctrinations shall be documented in writing by date, name, content and trainer.

01.B.03 Indoctrination and training should be based upon the existing SOH program of the Contractor or Government agency, as applicable, and shall include but not be limited to:

a. Requirements and responsibilities for accident prevention and the maintenance of safe and healthful work environments;

b. General SOH policies and procedures and pertinent provisions of this manual;

c. Employee and supervisor responsibilities for reporting all mishaps;

d. Provisions for medical facilities and emergency response and procedures for obtaining medical treatment or emergency assistance;

e. Procedures for reporting and correcting unsafe conditions or practices;

f. Job hazards and the means to control/eliminate those hazards, including applicable PHAs and/or AHAs;

g. Specific training as required by this manual.

01.B.04 Visitors and Authorized Entrants.

a. A visitor is anyone coming to the site for short-term action (e.g., inspection, meetings, deliveries, etc.). An authorized entrant is anyone entering the site that is assigned to the site but is not a site worker (e.g., security forces, other military forces, etc.). Signs shall be posted at all site entrances requiring anyone entering the site to report to the project office for a safety briefing.

b. All visitors and authorized entrants to USACE Government- or Contractor-controlled sites presenting hazardous conditions shall be briefed by a CP on the hazards to be expected on the site and the safety and health controls required (e.g., hard hat, foot protection).

c. All personnel who escort visitors are responsible for their visitors and shall ensure that all visitors entering the site are properly protected and are wearing or provided the appropriate PPE.

➢ Note: If visitors can be escorted along a designated safe path through the site where they are not exposed to the hazards, the use of PPE is not necessary.

d. Contractor and/or Project site personnel shall maintain a stock of common PPE, such as hard hats, eye protection, ear plugs, and reflective vests, for use by visitors

e. All visitors shall be escorted by appropriate site personnel.

f. A visitor sign-in/out log shall be maintained on site. The site manager shall maintain a roster of all authorized entrants that enter the site.

01.B.05 Safety meetings shall be conducted to review past activities, plan for new or changed operations, review pertinent aspects of appropriate AHA (by trade), establish safe working procedures for anticipated hazards, and provide pertinent SOH training and motivation.

a. Meetings shall be conducted at least once a month for all supervisors on the project location and at least once a week for all workers by SSHO, supervisors, foremen or CDSO's.

b. Meetings shall be documented, including the date, persons in attendance, subjects discussed, and names of individual(s) who conducted the meeting. Documentation shall be maintained and copies furnished to the GDA on request.

c. The GDA shall be informed of all scheduled meetings in advance and be invited to attend.

01.B.06 Emergency situations.

a. The employer shall provide training in handling emergency situations that may arise from project activities or equipment operation.

b. All persons who may have occasion to use emergency and rescue or lifesaving equipment shall be familiarized with the equipment location, trained in its proper use, be instructed in its capabilities and limitations, and medically qualified for its use.

01.C Physical Qualifications of Employees.

01.C.01 All persons shall be physically and medically qualified for performing the duties to which they are assigned. Some factors to be considered in making work assignments are strength, endurance, agility, coordination, and visual and hearing acuity.

a. At a minimum, employees shall meet the physical requirements for specific job tasks and hazards as required by this document, the position, the job description, OSHA guidelines, applicable Department of Transportation (DOT) regulations or applicable U.S. Coast Guard (USCG) requirements.

b. Medical documentation shall be recorded using applicable medical screening and/or medical history and examination forms and shall be maintained in accordance with 5 CFR 293 and Privacy Act requirements.

01.C.02 While on duty, employees shall not use or be under the influence of alcohol, narcotics, intoxicants, or similar performance or mind-altering substances.

a. Contractors shall enforce the drug-free workplace requirements. Employees found to be under the influence of or consuming such substances will be immediately removed from the job site.

b. Any employee under a physician's treatment and taking prescribed narcotics or any medication that may prevent one being ready, willing and able to safely perform position duties shall provide a medical clearance statement to his supervisor.

01.C.03 Operators of any equipment or vehicle shall be able to read and understand the signs, signals, and operating instructions in use.

01.D Mishap Reporting and Investigation.

01.D.01 A mishap is any unplanned, undesired event that occurs during the course of work being performed. The term “mishap” includes accidents, incidents and near misses. > See Appendix Q and reporting thresholds and criteria in Section 01.D.03.

01.D.02 All mishaps occurring incidentally to an operation, project, or facility for which this manual is applicable shall be reported, investigated and analyzed as prescribed below and in accordance with ER 385-1-99.

a. Employees are responsible for reporting ALL mishaps immediately to their employer or supervisor.

b. Employers and supervisors are responsible for reporting all recordable mishaps to the GDA within 24-hours after notification from the affected employee. > See also immediate notification requirements in Sections 01.D.04 and 01.D.05.

c. No supervisor may decline to accept a report of an mishap from a subordinate.

01.D.03 In addition to the reporting requirements identified above, the employer is required to report:

a. Property damage (exceeding $5,000 is recordable);

b. Days Away Injuries;

c. Days Away Illnesses;

d. Restricted/Transfer Injuries.

01.D.04 Boards of Investigation. Any accident that has, or appears to have, any of the consequences listed below shall be immediately reported to the GDA. These accidents shall be investigated in depth to identify all causes and to recommend hazard control measures. The GDA shall immediately notify the SOHO when any of these occurs and subsequently follow-up with official accident reports as prescribed by regulation.

a. Fatal injury/illness;

b. Permanent totally disabling injury/illness;

c. Permanent partial disabling injury/illness;

d. One (1) or more persons hospitalized as inpatients as a result of a single occurrence;

e. $500,000 or greater accidental property damage;

f. Three (3) or more individuals become ill or have a medical condition which is suspected to be related to a site condition, or a hazardous or toxic agent on the site;

g. USACE aircraft destroyed or missing;

h. Contractors are responsible for notifying OSHA in accordance with 29 CFR 1904.39 within 8-hours when their employee(s) is fatally injured or 1 or more persons are hospitalized as inpatients as a result of a single occurrence.

01.D.05 In addition to the above, any mishap occurring in any of the following high hazard areas shall be immediately reported to the GDA. These mishaps shall be investigated in depth to identify all causes and to recommend hazard control measures. The GDA shall immediately notify the local SOHO when any one of these occurs and subsequently follow-up with official reports as prescribed by regulation. HQUSACE-SO must also be notified immediately (within 24-hours) and provided follow-up investigative findings within 10-days of occurrence.

a. Electrical – to include Arc Flash, electrical shock, etc.;

b. Uncontrolled Release of Hazardous Energy (includes electrical and non-electrical);

c. Load Handling Equipment (LHE) or Rigging;

d. Fall-from-Height (any level other than same surface), and

e. Underwater Diving.

➢ Note: The reporting and associated investigation of these mishaps is considered a leading indicator. As such, this information is to be used for data collection, data trending and correction of hazards or program deficiencies before they result in an accident. To encourage reporting of these mishaps, for the betterment of all, this data is NOT to be used for any other reason. > See Appendix Q for “Mishap” definitions.

01.D.06 Except for rescue and emergency measures, the mishap scene shall not be disturbed until it has been released by the investigating official.

01.D.07 The Contractor is responsible for obtaining appropriate medical and emergency assistance and for notifying fire, law enforcement, and regulatory agencies. The Contractor shall assist and cooperate fully with the GDA conducting the Government investigation(s) of any mishap.

01.D.08 Records of all first aid treatments shall be maintained and submitted to the GDA upon request.

a. Records shall include, at a minimum, employee’s name, job title, date and type of mishap , causes and corrective actions taken (i.e., AHA review, process changes, establishment of controls, personnel qualifications and training, etc.).

b. This data shall be reviewed and analyzed by the SSHO and/or SOHO for corrective action as appropriate.

01.E Emergency Planning.

01.E.01 Emergency Plans to ensure employee safety in case of fire, inclement weather or other emergency shall be prepared, in writing, and reviewed with all affected employees. Emergency plans shall be tested to ensure their effectiveness.

a. Plans shall include escape procedures and routes, critical plant operations, employee accounting following an emergency evacuation, rescue and medical duties, means of reporting emergencies, and persons to be contacted for information or clarification.

b. On-site emergency planning shall be integrated with off-site emergency support. Documentation of specific on-site emergency services shall be made and may include written agreements, memoranda for record, telephone conversation logs, etc. The emergency services provider should be offered an on-site orientation of the project and associated hazards.

c. The SSHO or designated on-site personnel, shall be responsible for checking the weather conditions at a minimum of twice a day.

d. The employer's APP or Project SOH Plan shall include a discussion of:

(1) Severe weather triggers to alert the SSHO to monitor weather conditions continuously;

(2) Training on severe weather precautions and actions;

(3) Identified area of retreat, or other actions to be taken such as evacuation, work delay, etc.

(4) If lightning is observed, all Load Handling Equipment (LHE), drill rigs, work on elevated platforms or scaffolding, roofing activities, tree trimming activities, pole climbing activities, or work in open areas shall stop. A determination shall be made as to the proximity to the operation being performed. Once lightning is seen, count the number of seconds until you hear the thunder. Divide number of seconds by 5 to get the distance the lightning is away from you. If lightning is 10-miles away or less, work should stop until 30-minutes after the last audible thunder or visible flash of lightning.

(5) For floating plant, boats, and marine activities, the APP shall address securing the vessel and evacuation of personnel during severe weather. > See Sections 19.A.03 and 19.A.04.

01.E.02 Planning for any operation shall include the total system response capabilities to minimize the consequences of accidents or natural disaster and shall consider communications, rescue, first aid, medical, emergency response, emergency equipment, and training requirements.

01.E.03 The number of persons permitted in any location shall correspond to rescue and escape capabilities and limitations.

01.E.04 Emergency alert systems shall be developed, tested, and used to alert all persons likely to be affected by existing or imminent disaster conditions and to alert and summon emergency responders.

01.E.05 Emergency telephone numbers and reporting instructions for ambulance, physician, hospital, fire, and police shall be clearly communicated to all employees, conspicuously and clearly posted at the work site.

01.E.06 Employees working alone in a remote location or away from other workers shall be provided an effective means of emergency communications (i.e., cellular phone, two-way radios, land-line telephones or other acceptable means).

a. The selected communication shall be readily available (easily within the immediate reach) of the employee and shall be tested prior to the start of work to verify that it effectively operates in the area/environment.

b. An employee check-in/check-out communication procedure shall be developed to ensure employee safety.

01.F Emergency Operations. In addition to the other pertinent parts of this manual, Civil Disaster Emergency Operations for floods, earthquakes, hurricanes and other natural disasters shall be conducted in accordance with this manual, generally and with Appendix B specifically, for both USACE and Contractor activities.

01.G Explosives Activities and Operations.

a. The requirements for the safe use, storage and transportation of commercial explosives on non-military lands/installations are found in Section 29 of this manual.

b. The requirements for the safe use, storage and transportation of commercial explosives on military lands/installations, are found in EM 385-1-97, Explosives Safety and Health Requirements Manual.

c. For all work performed under USACE activities and operations dealing with ammunition and explosives (military munitions), refer to EM 385-1-97.

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Section 2
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Sanitation

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SECTION 2

Sanitation

02.A General. Employers shall establish and maintain hygienic sanitation provisions for all employees in all places of employment as specified in the following paragraphs.

02.B Housekeeping.

02.B.01 Places of employment shall be kept as clean as possible, taking into consideration the nature of the work. Regular cleaning shall be conducted in order to maintain safe and sanitary conditions in the workplace.

a. Periodic sanitation inspections of food preparation areas (kitchens and dining facilities) shall be conducted at least weekly and documented.

b. In workplaces where toxic dusts, fumes, or mists are generated, all surfaces in the work area and adjacent common use areas shall be cleaned in accordance with a written Housekeeping Plan based on the frequency and quantity of toxic material generation.

02.B.02 The floor of every workroom shall be kept as dry as possible. Drainage shall be maintained where wet processes are used, and false floors, platforms, mats, or other dry standing places shall be provided, when possible. Appropriate footwear shall also be provided.

02.B.03 To facilitate cleaning, every floor, working place, and passageway shall be kept free from protruding nails, splinters, loose boards, clutter and unnecessary holes and openings.

02.C Drinking Water.

02.C.01 An adequate supply of potable water shall be provided in all places of employment, for both drinking and personal cleansing.

a. Drinking water shall be provided, whenever possible, from a local municipal water supply that is in compliance with federal, state, and local drinking water standards.

b. When drinking water is obtained from an on-site well, the water shall be tested and the system supplied in accordance with the Safety Drinking Water Act, 40 CFR 141-143, and any state or local drinking water regulations.

c. If water is not available from a local municipal water supply or on-site well, a temporary potable water system shall be provided from a licensed drinking water source.

d. Outside the Continental Unites States (OCONUS), drinking water at military fixed facilities shall be provided in compliance with country-specific Final Governing Standards (FGS). In the absence of FGS, the National Primary Drinking Water Regulations (NPDWR) as outlined in the Overseas Environmental Baseline Guidance Document (OEBGD), Department of Defense Instruction (DODI) 4715.5-G shall be followed. In addition, sanitary control and surveillance of water supplies and chlorination and fluoridation shall be conducted according to applicable Department of Defense (DoD) Component guidelines, or if more stringent, the host nation requirements.

e. Drinking water on all Army floating vessels shall be provided according to 40 CFR 141 and Chapter 6 of Navy Medical (NAVMED) P-5010. Drinking water and water for washing on all Army floating vessels shall be provided from a potable water source which meets the federal and state requirements or, if generated on the vessel, shall be tested and shall meet the federal and state drinking water requirements.

(1) All hoses, pumps, and valves, shall be dedicated to potable drinking water only and shall be rinsed before each use.

(2) Before connecting at shore side, the supply water should be flushed for 30 seconds.

(3) After transfer is complete, the vessel hose shall be removed first, then the shore side hose removed, and the supply source shall be flushed again and capped.

(4) Drain all hoses, pumps, and valves after each use.

(5) Storage tanks on vessels shall be either chemically or mechanically disinfected when the water fails to meet two consecutive drinking water tests.

02.C.02 Cool drinking water shall be provided during hot weather.

02.C.03 Only approved potable water systems may be used for the distribution of drinking water. Construction trailers and other temporary or semi-permanent facilities shall be properly connected to the local municipal water supply unless the remoteness of the location makes this prohibitive. When unable to connect to the municipal supply, temporary potable water systems shall be utilized and the services provided by a licensed potable water contractor. “Reclaimed water” (treated wastewater) use in potable systems is strictly prohibited.

02.C.04 Drinking water shall be dispensed by means that prevent contamination between the consumer and the source.

02.C.05 Portable drinking water dispensers shall be designed, constructed, and serviced to ensure sanitary conditions, shall be capable of being closed and shall have a tap. Any container used to distribute drinking water shall be clearly marked “DRINKING WATER” and may not be used for other purposes.

02.C.06 Open containers (i.e., barrels, pails, or tanks) or any container (with or without a fitted cover) from which the water is dipped or poured are prohibited for drinking water. Lid shall remain on a container except when being sanitized, washed or filled.

02.C.07 Fountain dispensers shall have a guarded orifice.

02.C.08 Use of a common cup (a cup shared by more than one worker) and other common utensils is prohibited. Employees shall use cups when drinking from portable water coolers/containers. Unused disposable cups shall be kept in sanitary containers and a waste receptacle shall be provided for used cups.

02.C.09 Potable drinking water dispensers shall only contain drinking water and shall not be used to store or cool drinks or food or other items.

02.C.10 All potable wells intended for drinking water or human contact shall include appropriate wellhead protection to ensure sanitary quality. Wellhead protection shall include methods or accessories to prevent fecal contamination, insect infestation, and deliberate human actions that might jeopardize the quantity and quality of the water supply.

02.D Non-Potable Water.

02.D.01 Outlets dispensing non-potable water shall be conspicuously posted "CAUTION - WATER UNSAFE FOR DRINKING, WASHING, OR COOKING”. Outlets dispensing non-potable water at Corps Dumping Stations within campgrounds may, in lieu of this requirement, be posted in accordance with USACE’s Engineering Pamphlet (EP) 310-1-6A and EP 310-1-6B.

02.D.02 There shall not be any cross-connection, open or potential, between a system furnishing potable water and a system furnishing non-potable water.

02.D.03 Non-potable water may be used for cleaning work areas, except food processing and preparation areas and personal service rooms, provided this non-potable water does not contain concentrations of chemicals, fecal coliform or other substances which could create unsanitary conditions or be harmful to employees.

02.E Toilets.

02.E.01 General. Toilets shall be present in all places of employment and shall contain the following:

➢ Exception: The requirements below do not apply to mobile crews or to normally unattended work locations if employees working at these locations have transportation readily available to nearby toilet and/or washing facilities which meet the other requirements of this paragraph.

a. Separate toilet facilities, in toilet rooms provided for each sex shall be provided in all places of employment according to Table 2-1. Separate toilet rooms for each sex need not be provided if toilet rooms can only be occupied by one person at a time, can be locked from the inside and contain at least one toilet seat (where such single-occupancy rooms have more than one commode, only one commode in each toilet room may be counted);

b. Hot and cold running water, or tepid running water [tepid water is 60° F - 100° F (15.5° C - 37.8° C)];

c. Hand soap or similar cleansing agents shall be provided;

d. Individual disposable paper towels or warm air blowers designed for hand-drying, convenient to the lavatories;

e. An adequate supply of toilet paper and a holder for each seat;

f. Contained within an individual compartment and equipped with a door and separated from other toilet fixtures by walls or partitions sufficiently high to ensure privacy;

g. Adequate interior lighting;

h. Washing and toilet facilities shall be cleaned regularly and maintained in good order;

i. Each commode shall be equipped with a toilet seat and toilet seat cover. Each toilet facility - except those specifically designed and designated for females - shall be equipped with a metal, plastic or porcelain urinal trough; and

j. Adequate ventilation. All windows and vents shall be screened; seat boxes shall be vented to the outside [minimum vent size 4 in (10.1 cm)] with vent intake located 1 in (2.5 cm) below the seat.

02.E.02 Construction Sites. Toilet facilities on construction sites shall be provided as follows (the requirements of this subsection do not apply to mobile crews or to normally unattended work locations if employees working at these locations have transportation immediately available to nearby toilet facilities):

a. Where sanitary sewers are not available, job sites shall be provided with chemical toilets, re-circulating toilets, or combustion toilets unless prohibited by state/local codes;

b. Each toilet facility shall be equipped with a toilet seat and toilet seat cover. Each toilet facility - except those specifically designed and designated for females - shall be equipped with a metal, plastic, or porcelain urinal trough. All shall be provided with an adequate supply of toilet paper and a holder for each seat;

TABLE 2-1

Minimum Toilet Facilities
(Other than Construction Sites)

Number of employees	Minimum number of Toilets[1]
1 to 15	One (1)
16 to 35	Two (2)
36 to 55	Three (3)
56 to 80	Four (4)
81 to 110	Five (5)
111 to 150	Six (6)
Over 150	Refer to Note [2]

Note:
[1]Where toilet facilities will not be used by women, urinals may be provided instead of commodes, except that the number of commodes in such cases shall not be reduced to fewer than 2/3 of the minimum number specified.
[2] One additional toilet fixture for each additional 40 employees.

c. Toilets shall be provided for each sex according to Table 2-2. Separate toilet rooms for each sex need not be provided if toilet rooms can only be occupied by one person at a time, can be locked from the inside and contain at least one toilet seat;

d. Where it is not practical to provide running water, hand sanitizers may be used as a substitute for running water. Hand sanitizers must contain at least 60% ethyl alcohol as its active ingredient and workers shall be trained to properly use the sanitizer.

e. Toilet facilities shall be constructed so that the occupants are protected against weather and falling objects; all cracks shall be sealed; the door shall be tight-fitting, self-closing, and capable of being latched from the inside;

f. Adequate ventilation shall be provided; all windows and vents shall be screened; seat boxes shall be vented to the outside [minimum vent size 4 in (10.1 cm)] with vent intake located 1 in (2.5 cm) below the seat;

g. Toilet facilities shall be constructed so that the interior is lighted; and

h. Provisions for routinely servicing and cleaning all toilets and disposing of the sewage shall be established before placing toilet facilities into operation. The method of sewage disposal and the placement location selected shall be in accordance with Federal, state, and local health regulations.

TABLE 2-2

Minimum Toilet Facilities
(Construction Sites)

Number of employees	Minimum number of Toilets[1]
20 or fewer	One (1)
20 or greater	One (1) toilet seat and One (1) urinal per 40 workers.
200 or greater	One (1) toilet seat and One (1) urinal per 50 workers.

Note: [1]Where toilet facilities will not be used by women, urinals may be provided instead of commodes, except that the number of commodes in such cases shall not be reduced to fewer than 2/3 of the minimum number specified.

02.E.03 Employees working in temporary field conditions, in mobile crews or in normally unattended work locations shall be provided at least one toilet facility unless transportation to nearby toilet facilities is readily available.

02.F Washing Facilities.

02.F.01 Washing facilities shall be provided at toilet facilities and as needed to maintain healthful and sanitary conditions.

02.F.02 Each washing facility shall be maintained in a sanitary condition and provided with water from an approved potable water supply. Water shall be either hot and cold or tepid running water. Soap and either individual disposable paper towels or warm air blowers designed for hand-drying shall be provided. If impractical to provide running water, hand sanitizer and individual disposable paper towels may be used.

02.F.03 Washing facilities shall be in close proximity to the worksite.

02.G Showers.

02.G.01 Washing facilities for persons engaged in application of paints, coatings, herbicides, insecticides, or other operations where contaminants may be harmful shall be at or near the work site and shall be equipped to enable employees to remove such substances.

02.G.02 Whenever showers are required by a particular standard, the showers shall be provided in accordance with the following:

a. One shower shall be provided for every ten employees (or fraction thereof) of each sex, who are required to shower during the same shift;

b. Body soap or other appropriate cleansing agents for the showers shall be provided;

c. Showers shall be equipped with hot and cold water from an approved potable water supply feeding a common discharge line; and

d. Employees who use showers shall be provided with individual clean towels.

02.H Changing Rooms. Whenever employees are required by a particular standard to wear protective clothing, changing rooms shall be equipped with separate storage facilities for both street clothes and protective clothing.

02.I Laundry of Work Clothing. If non-disposable work clothing provided by the employer becomes contaminated, provisions shall be made to ensure clothing is laundered and decontaminated by the employee prior to reuse. Employees shall not wear contaminated clothing when leaving the worksite. If contaminated work clothing is taken to a commercial laundry, the laundry representative must be advised of the potential contaminants on the clothing.

02.J Food Service.

02.J.01 All USACE food service facilities and facilities operated under USACE contracts, including galleys aboard vessels, shall be compliant with the US Public Health Service (USPHS) Food and Drug Administration (FDA) Food Code.

02.J.02 All employee food service facilities and operations shall be conducted in accordance with sound hygienic principles.

02.J.03 In places of employment where all or part of the food service is provided, the food dispensed shall be wholesome, free from spoilage, and shall be processed, prepared, handled, and stored in such a manner as to be protected against contamination.

02.J.04 No employee may be allowed to consume food or beverages in a toilet room or in any area exposed to a toxic material.

02.J.05 No food or beverages may be stored in toilet rooms or in an area exposed to a toxic material.

02.J.06 Food handlers are not required to have a general medical exam, but must obtain a statement from a licensed physician, physician's assistant, or nurse practitioner attesting that they are free of communicable diseases. Food handlers shall complete at least 8 hours of food service sanitation training annually.

02.J.07 All USACE food service facilities and facilities operated under USACE contracts, including galleys aboard vessels, shall be inspected for compliance with the USPHS FDA Food Code at least semi-annually.

02.K Waste Disposal.

02.K.01 An adequate number of waste receptacles shall be provided in a food service area and used for the disposal of waste food. Receptacles shall be constructed of smooth, corrosion-resistant, easily cleanable, or disposable materials, provided with solid tight-fitting covers, emptied at least daily and maintained in a sanitary condition.

02.K.02 Receptacles used for putrescible solid or liquid waste or refuse shall be constructed in order to prevent leakage and to allow thorough cleaning and sanitary maintenance. Such receptacles shall be equipped with solid tight-fitting covers, unless they can be maintained in sanitary conditions without covers.

02.K.03 All sweepings, solid or liquid wastes, refuse, and garbage shall be removed in a manner which avoids creating a menace to health and should be discarded as often as necessary or appropriate to maintain sanitary conditions in the place of employment.

02.L Vermin Control.

02.L.01 Every enclosed workplace shall be constructed, equipped, and maintained, as practicable as possible, in order to prevent the entrance or harborage of rodents, insects, or other vermin.

02.L.02 A continuing and effective extermination program shall be instituted when the presence of vermin is detected. The use of licensed exterminators/pest control personnel is required.

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SECTION 3

Medical and First Aid

03.A General.

03.A.01 Prior to the start of work by a contractor and for all USACE locations, arrangements shall be made for medical facilities and personnel to provide prompt attention to injured employees. For work or tasks with a high or extremely high risk assessment code (RAC) on the Activity Hazard Analysis (AHA), the arrangements with the medical facility shall be confirmed in writing. > See Sections 01.A.14 and 01.A.15.

a. An effective means of communication (i.e., hard-wired or cellular telephone, two-way radio, etc.) with #911 access or other emergency response source, and transportation to effectively care for injured workers shall be provided. Communication devices shall be tested in the area of use to assure functionality.

b. The telephone numbers of physicians, hospitals, or ambulances shall be conspicuously posted, at a minimum, on the safety bulletin board and near the on-site project office telephones. Medical facilities and personnel expected to treat injured employees shall be informed of the nature of the work to be performed and the injuries/illnesses prevalent on such jobsites. Depending on the scope and size of the job, the GDA may require a formal written agreement.

c. A highly visible map delineating the best route to the nearest medical facility shall be prepared and posted on the safety bulletin board. For mobile field crews, it shall be readily available.

03.A.02 First aid and cardiopulmonary resuscitation (CPR) availability.

a. When emergency medical services are not accessible within 5 minutes of work location and there are 2 or more workers at the location, at least 2 employees on each shift shall be qualified to administer first aid and CPR. > Minimum qualifications are listed in Section 03.D.

b. For job sites with more than 100 employees on one shift, a list of qualified individuals shall be maintained by the site security personnel and in the site trailer. > Minimum qualifications are listed in Section 03.D.

c. Training and Retraining. First aid attendants shall hold current certification in first aid and CPR from the American Red Cross (ARC), the American Heart Association (AHA), or from an organization whose training adheres to the standards of the International Liaison Committee on Resuscitation (as stated in writing), or from a Licensed Physician.

(1) All classes shall contain a hands-on component that cannot be taken online.

(2) The certificate(s) shall state the date of issue and length of validity.

(3) All first aid and CPR attendants shall be retrained every 2 years.

d. Individuals who are required to work alone in remote areas shall be trained in first aid and shall be provided with an effective means of communication to call for assistance in the event of an emergency.

03.A.03 First aid and medical facility requirements.

a. All projects, activities, or contracts (USACE or contractor operated), for which fewer than 100 persons are employed (greatest total number of employees on a shift) at the site of the work, and where neither a first aid station nor a health clinic is available or the site is more than 5 minutes from a hospital, medical clinic, or doctors' office which has agreed to provide emergency medical support, shall be provided with a first aid kit complying with the criteria contained in ANSI Z308.1.

(1) There shall be one first aid kit for every 25 (or fewer) employees.

(2) In addition to the basic fill requirements of the first aid kit, the contractor or local USACE Safety and Occupational Health Office (SOHO), in consultation with a health care professional, shall evaluate the hazards found in the work environment to determine the necessity of optional fill contents.

b. All projects, activities, or contracts (USACE or contractor operated) for which more than 99 and fewer than 300 persons are employed (greatest total number of employees on a shift) at the site of the work, shall establish and equip a first aid station (per Section 03.C). In non-rural locations, the use of a medical clinic, hospital, or doctor's office, that has agreed to provide emergency medical support and is accessible within 5 minutes of the work location, may be approved instead of a first aid station, provided at least two employees per shift are CPR qualified as defined in 03.A.02.c and a first aid kit complying with the criteria contained in ANSI Z308.1 is available.

c. Where tunnels are being excavated, a first aid station and transportation facilities shall be provided so that treatment is available within 5 minutes of the occurrence of an injury.

d. All medium, high, or extremely high risk operations, projects, activities, or contracts (USACE or contractor operated) for which 300 or more persons are employed (greatest total number of employees on a shift) at the site of the work shall establish and equip, as directed by a licensed physician, a health clinic. Requirements for health clinics are in Section 03.C.

e. All locations where the work efforts are primarily administrative, such as a district or regulatory office, shall have either: an accessible, staffed infirmary in the building or a medical clinic, hospital, or doctors' office that has agreed to provide emergency medical support and is accessible within 5 minutes. If an outside emergency medical clinic, hospital, or doctor's office is used, the location shall also have a minimum of 2 employees on each shift qualified to administer first aid and CPR and are trained according to Section 03.A.02.c. The work location shall also have several first aid kits meeting the requirements of this document.

03.A.04 Should work activities present any potential exposure (of any part of the body) to toxic or corrosive materials, drenching and/or flushing facilities shall be provided in the work area for immediate emergency use. > See Section 06.B.

03.A.05 Blood-Borne Pathogen (BBP) Program. Employees designated as responsible for rendering first aid or medical assistance shall be included in their employer's BBP program in accordance with 29 CFR 1910.1030 and shall:

a. Be instructed in the sources, hazards, and avoidance of BBPs and be provided the training specified in 29 CFR 1910.1030;

b. Be provided with, and shall use and maintain, PPE (i.e., breathing barrier, latex-free gloves, gowns, masks, eye protectors, and/or resuscitation equipment) when appropriate for rendering first aid or other medical assistance to prevent contact with blood or other potentially infectious materials;

c. Institute a site-specific BBP program to include a site-specific Exposure Control Plan with provisions for engineering and administrative controls, Hepatitis B vaccination, PPE, training, recordkeeping, and a Post-Exposure Control Plan in the event of a blood-borne exposure. Post-exposure protocol shall include a plan to ensure immediate medical evaluation of exposed individual(s) per current recommendations of the Center for Disease Control (CDC) for human immunodeficiency virus (HIV), Hepatitis B virus (HBV), and Hepatitis C virus (HCV).

03.A.06 Prior to the start of work outside the employee's normal geographical area, the employer shall inform employees of parasitic, bacterial, viral and environmental diseases endemic to the geographical work location (i.e., Lyme Disease, West Nile Virus, Hantavirus, Histoplasmosis, Rocky-Mountain Spotted Fever, Dengue Fever, Malaria, etc.)

a. For guidance on the potential biological and environmental diseases in the work location, the employer shall consult the CDC Travel webpage, U.S. Army Public Health Command – Institute of Public Health web site, and the health department in the local area.

b. Information to be provided to the employee traveling in areas where such diseases are endemic shall include:

(1) Modes of disease transmission;

(2) Specific health risks associated with the disease;

(3) Preventive measures such as available vaccines and PPE (gloves, eye and skin protection, respirator);

(4) Appropriate work practices to prevent contact with infected agents (bird/rodent droppings, etc.), such as watering areas prior to dust-generating activities;

(5) Vaccine information, to include information on the effectiveness, risk, and availability;

(6) Safe removal of source where applicable;

(7) Symptom recognition and medical referral.

03.B First Aid Kits.

03.B.01 The performance requirements of the first aid kits shall be based on the storage area location of the first aid kit and shall conform to ANSI/ISEA Z308.1. Content of all first aid kits shall be to the level of training attained by the responders using the first aid kit.

a. Type I kits are intended for use in stationary, indoor settings where the potential for damage of kit supplies due to environmental factors and rough handling is minimal. Type I first aid kits are required to contain the minimum fill in Table 3-1.

b. Type II, Type III, and Type IV first aid kits shall, at a minimum, meet the requirements of the minimum fill in Table 3-1:

(1) Type II kits are for portable indoor settings where the potential for damage of kit supplies due to environmental factors and rough handling is minimal;

(2) Type III kits are for portable use in mobile, indoor and/or outdoor settings where the potential for damage of kit supplies due to environmental factors is not probable (includes general indoor, sheltered outdoor use).

(3) Type IV kits are intended for portable use in mobile industries (i.e., utilities, construction, transportation, armed forces) and/or outdoor settings where the potential for damage of kit supplies due to environmental factors and rough handling is significant.

c. The contents of the first aid kit shall, at a minimum, contain the items detailed in Table 3-1.

d. First aid kits shall be easily accessible to all workers and protected from the weather. The individual contents of the first aid kits shall be kept sterile. First aid kit locations shall be clearly marked and distributed throughout the site(s).

03.B.02 The contents of first aid kits shall be checked by the employer prior to their use on site and at least every 3 months when work is in progress to ensure that they are complete, in good condition, and have not expired.

03.B.03 All employees who work where there is a first aid kit shall receive a tool box training on the content and use of the kit supplies.

03.B.04 Automatic External Defibrillator (AED). The placement of AEDs is optional (except for health clinics, see 03.C.03.d) but highly recommended. The placement of AEDs on the worksite shall be preceded by an assessment of the time and distance to emergency medical services (EMS) and a justification for such equipment. For the ease of use and program maintenance, all AEDs in a location and/or Command should be the same manufacturer and model. For guidance, USACE facilities should refer to Guidelines for Public Access Defibrillation Programs in Federal Facilities (www.foh.dhhs.gov/whatwedo/aed/hhsaed.asp). An AED program shall include, at minimum:

a. Training and Retraining: Workers required to use an AED shall be trained per Section 03.A.02.c. All classes shall contain a hands-on component and cannot be taken online. Training shall be on the same model and manufacturer of AED available in the work area. The certificate(s) shall state the date of issue and length of validity;

b. Licensed Physician direction and oversight;

c. Documented weekly battery and functionality checks;

d. Standard Operating Procedures (SOPs) for placement, maintenance, inspections, and EMS activation;

e. Equipment Maintenance Program based on the manufacturer's recommendations that, at a minimum, shall include pad replacement (regular and after use) and battery replacement.

TABLE 3-1

Requirements for Basic First Aid Unit Package

Unit first aid item	Minimum Size or Volume (metric)	Minimum Size or Volume (US)	Item quantity per unit package	Unit package size
Absorbent Compress	206 cm^2	32 in^2	1	1
Adhesive Bandage	2.5 x 7.5 cm	1 x 3 in	16	1
Adhesive Tape	2.3 m	2.5 yd (total)	1 or 2	1 or 2
Antiseptic Wipe	2.5 x 2.5 cm	1 x 1 in.	10	1
Aspirin, Individually Wrapped	325 mg		2	2
Bandage Compress (2 in-4 in)	5 x 91 cm	2 x 36 in.	4	1
Burn Dressing	10 x 10 cm	4 x 4 in	1	1-2
Burn Treatment	0.9	1/32 fl. Oz.	6	1
Cold Pack	10 x 12.5 cm	4 x 5 in	1	1
*Combat style Tourniquet with Windlass	95.3 x 3.8	37.5 x 1.5 in. width	1	1
CPR Breathing Barrier			1	1
Eye Covering, with means of attachment	19 cm^2	2.9 in^2	2	1
Eye/Skin Wash	118 ml (total)	4 fl. oz total	1	2
First Aid Guide			1	1
Gloves, latex free	XL	XL	2 pair	1
Hand Sanitizer	0.9 g	1/32 oz.	6	
Occlusive Dressing	10.2 x 10.2	4 x 4	1	2
Roller Bandage (2 in.)	5 x 366 cm	2 in. x 4 yd.	2	1
Roller Bandage (4 in.)	10 x 366 cm	4 in. x 4 yd.	1	1
Sterile pad	7.5 x 7.5 cm	3 x 3 in.	4	1
Triangular Bandage	101 x 101 x 14 cm	40 x 40 x 56 in.	1	1

* Required when power tools in use.

03.C First Aid Stations and Health Clinics.

03.C.01 General.

a. For activities requiring a first aid station or a health clinic, the type of facilities and equipment provided shall be determined after consideration is given to the proximity and quality of available medical services. The facilities and equipment shall also be in accordance with the recommendation of a Licensed Physician, Board-Certified and Licensed, Physician's Assistant (PA-C), or Licensed Nurse Practitioner (LNP). Alternative facilities that provide the quantity and quality of services outlined in this section may be used if recommended by the consulting Licensed Physician, PA-C or LNP.

b. Identification and directional markers shall be used to readily denote the location of all first aid stations and health clinics.

c. Emergency lighting shall be provided for all first aid stations and health clinics.

03.C.02 A certified first aid provider shall be on duty in first aid stations at all hours when work is in progress (except when on emergency calls).

03.C.03 Health Clinics.

a. Health Clinics shall provide privacy, adequate lighting, climate control, adequate toilet facilities, hot and cold water, drainage, and electrical outlets. Walls and ceilings shall be finished with the equivalent of two coats of white paint; windows and doors shall be screened; floors shall be constructed with impervious materials.

b. In remote locations where medical care is not available within 5 minutes, a properly equipped emergency vehicle, helicopter, or mobile first aid unit shall be provided during work hours at sites requiring a health clinic. The emergency vehicle shall not be used for any other purpose, except in the case of a helicopter, which may be used for shift crew changes.

c. A Registered Nurse (RN), a certified Emergency Medical Technician (EMT), Intermediate/Paramedic, or a Licensed Practical Nurse (LPN), with physician oversight, shall be assigned on a full-time basis to each installation requiring a health clinic.

d. Health clinics shall be equipped with an AED.

03.D Personnel Requirements and Qualifications.

03.D.01 All projects, activities, or contracts (USACE or contractor) where work or tasks with a high or extremely high risk assessment code (RAC) exists and which 1,000 persons or more are employed (greatest total number of employees on a shift) shall have the full-time services of a Licensed Physician.

- Note: A certified Nationally Registered Emergency Medical Technician (NREMT) Intermediate/Paramedic, RN, LPN, LNP, or a PA-C having direct communication with a Licensed Physician, may be used when a full-time Licensed Physician is not available.

03.D.02 First aid attendants shall hold certification in first aid and CPR training as defined in Section 03.A.02. The certificate(s) shall state the date of issue and length of validity.

03.D.03 First aid attendants, RNs, LPNs, NREMT-Intermediates/Paramedics, LNP and PA-C shall be under the direction of a Licensed Physician.

03.D.04 Military personnel with equivalent qualifications and certifications may be used in lieu of the above personnel.

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SECTION 4

Temporary Facilities

04.A General.

04.A.01 Plans for the layout of temporary construction buildings, facilities, fencing, access routes and anchoring systems for temporary structures shall be submitted to and approved by the GDA. > See Section 09.A.18 for temporary building spacing requirements; Section 11 for temporary power distribution approval requirements; Section 24 for temporary ramp, trestle, scaffold, and platform approval requirements.

04.A.02 The design and construction of temporary structures shall consider the following loadings. > See American Society of Civil Engineers (ASCE) 7-10, Minimum Design Loads for Buildings and Other Structures:

a. Dead and live loads;

b. Soil and hydrostatic pressures;

c. Wind loads;

d. Rain and snow loads;

e. Flood and ice loads, and

f. Seismic forces.

04.A.03 Trailers and other temporary structures used as field offices, as personnel housing, or for storage shall be anchored with rods and cables or by steel straps to ground anchors. The anchor system shall be designed to withstand winds and must meet applicable state or local standards for anchoring mobile trailer homes.

04.A.04 Fencing and warning signs.

a. Temporary project fencing (or a substitute acceptable to the GDA and delineated in the APP) shall be provided on all projects located in areas of active use by members of the public, including those areas in close proximity to family housing areas and/or school facilities.

b. Fencing shall extend from grade to a minimum of 4 ft (1.2 m) above grade and shall have a maximum mesh size of 2 in (5 cm). Fencing shall remain rigid/taut with a minimum of 200 lbs (.9 kN) of force exerted on it from any direction with less than 4 in (10 cm) of deflection.

c. Signs warning of the presence of construction hazards and requiring unauthorized persons to keep out of the construction area shall be posted on the fencing. At minimum, signs shall be posted every 150 ft (45.7 m). Fenced sides of projects that are less than 150 ft shall, at minimum, have at least one warning sign. > See also Section 8.

d. Depending upon the nature and location of the project site, the GDA may determine that fencing is not required. This will be based on a risk analysis of public exposure and other project specific considerations, and will be included in the applicable AHA. In those locations where the GDA has determined fencing is not required, signs, warning of construction hazards, shall be conspicuously posted.

04.A.05 Temporary Work Camps (Floating plant excluded). The design and construction of work/labor camps shall be IAW 29 CFR 1910.142.

a. All sites used for temporary work camps shall be adequately drained. They shall not be subject to periodic flooding nor located within 200 ft (61 m) of swamps, pools, sink holes, or other surface collections of water unless adequate mosquito control methods have been implemented. The sites shall be graded, ditched, and rendered free from depressions in which water may become a nuisance.

b. Sites shall be sized to prevent overcrowding of necessary structures.

c. The grounds and open areas surrounding the shelters shall be maintained free of rubbish, debris, waste paper, garbage, or other refuse.

d. Shelters will provide protection from the elements, and each room used for sleeping purposes shall contain at least 55 ft^2 (5.06 m^2) of floor space for each occupant and at least 7 ft-6 in (2.3 m) ceilings. The floor space does not include areas occupied by closets or wall lockers.

e. Beds, cots, or bunks, and suitable storage facilities (such as wall lockers for clothing and personal articles) shall be provided in every room used for sleeping purposes. Beds shall be spaced not closer than 3 ft (1 m) both laterally and end-to-end and shall be elevated at least 1 ft (.3 m) from the floor. Double-decked bunk beds shall be spaced not fewer than 4 ft (1.2 m) both laterally and end-to-end with a minimum space of not fewer than 27 in (68.5 cm) between the upper and lower bunk. Triple deck bunks are prohibited.

f. Floors shall be constructed of wood, asphalt, or concrete. Wooden floors shall be of smooth and tight construction. Floors shall be kept in good repair.

g. All wooden floors shall be elevated not less than 1.5 ft (0.5 m) above the ground level at all points to prevent dampness and permit free circulation of air beneath, and for easier and safer maintenance.

h. Living quarters shall be provided with windows that may be opened for purposes of ventilation.

i. All exterior openings shall be effectively screened with 16-mesh material and screen doors shall be equipped with self-closing devices.

j. Temporary sleeping quarters shall be heated, cooled, ventilated, lighted, and maintained in a clean and safe condition.

k. Sleeping quarters must comply with applicable provisions of the National Fire Protection Agency (NFPA) 101, Life Safety Code.

04.A.06 Unless otherwise indicated, throughout this manual, lumber dimensions are given in nominal sizes.

04.A.07 Temporary Explosives Storage Areas. Temporary Explosives Storage Areas shall be IAW the EM 385-1-97, Explosives Safety and Health Requirements.

04.B Access and Haul Roads.

04.B.01 Prior to construction, the Contractor shall provide the GDA with a copy of an Access/Haul Road Plan for review and acceptance. Access/haul roads shall be designed in accordance with current engineering criteria. Work on the haul road shall not commence until the GDA has accepted the plan. The plan shall address the following items:

a. Equipment usage, traffic density and patterns, right-of-way rules, and hours of operation;

b. Road layout and widths, horizontal and vertical curve data, and sight distances;

c. Sign and signalperson requirements, road markings, and traffic control devices;

d. Drainage controls;

e. Points of contact between vehicles and the public, vehicles and pedestrians, and safety controls at these points;

f. Maintenance requirements, including roadway hardness and smoothness and dust control, and

g. Hazards adjacent to the road (e.g., bodies of water, steep embankments).

04.B.02 No employer shall move, or cause to be moved, any equipment or vehicle upon an access or haul road unless the roadway is constructed and maintained to safely accommodate the movement of the equipment or vehicle involved.

04.B.03 When road levels are above working levels, berms, barricades, or curbs shall be constructed to prevent vehicles overrunning the edge or end of embankment. Berms/curbs shall be constructed to one-half the diameter of the tires of the largest piece of equipment using the roadway.

04.B.04 Roadways shall have a crown and ditches for drainage. Water shall be intercepted before reaching a switch back or large fill and be led off.

04.B.05 Haul roads shall be constructed to widths suitable for safe operation of the equipment at the travel speeds proposed by the Contractor and accepted by the GDA.

04.B.06 All roads, including haul roads, shall be posted with maximum speed limits.

04.B.07 An adequate number of turn-outs shall be provided on single lane roads with two-way traffic. When turn-outs are not practical, the Contractor shall provide a traffic control system to prevent accidents.

04.B.08 Whenever possible, use a right-hand traffic pattern on two-way haul roads.

04.B.09 Curves.

a. All curves shall have open sight lines and as great a radius as practical.

b. Vehicle speed shall be limited on curves so that vehicles can be stopped within one-half the visible distance of the roadway.

c. The design of horizontal curves shall consider vehicle speed, roadway width and surfacing, and super elevation.

04.B.10 Grades.

a. When necessary, based on grade and machine and load weight, machines shall be equipped with retarders to assist in controlling downgrade descent.

b. Access/haul roads should be kept to less than a 10% grade. There should be no more than 400 ft (121.9 m) of grade exceeding 10%.

c. The maximum allowable grade shall not exceed 12% ppp.

04.B.11 Adequate lighting shall be provided. > See Section 7.

04.B.12 Traffic control lights, barricades, road markings, signs, and signalpersons for the safe movement of traffic shall be provided in accordance with the DOT Federal Highway Administration's “Manual on Uniform Traffic Control Devices” and this Section.

04.B.13 Roadway hardness, smoothness, and dust control shall be used to maintain the safety of the roadway.

04.B.14 All roads shall be maintained in a safe condition and eliminate or control dust, ice, and similar hazards.

04.B.15 The deposition of mud and or other debris on public roads shall be minimized to the extent possible and in accordance with local requirements.

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SECTION 5

Personal Protective and Safety Equipment

05.A General.

05.A.01 Responsibilities.

a. The use of personal protective and safety equipment (PPE) is a control measure that is to be used only after a hazard evaluation identifies hazards associated with a particular job or activity, and it is determined that the hazards cannot be eliminated and/or controlled to an acceptable level through engineering design or administrative actions. Utilize process and engineering controls before PPE to protect employees.

b. Based on hazard evaluations conducted by supervisors, employers shall identify and select, and each affected employee shall use PPE that will provide appropriate protection. > See 29 CFR 1910.132.

c. Employers shall communicate PPE decisions to each affected employee. Employees shall use all PPE that may be required to maintain their exposure within acceptable limits.

d. The employer will make all reasonable efforts to accommodate employees with religious beliefs that may conflict with determined PPE requirements. However, when reasonable efforts to accommodate employee's religious beliefs do not provide the necessary safe working environment (without PPE), then the employee must use the appropriate PPE or the employee will not be allowed to work in the area where the hazard requiring protection exists.

05.A.02 Employees shall be appropriately trained in the use, care, <u>and limitations</u> of all required PPE.

a. Employees must be trained in and shall demonstrate an understanding of the following aspects of PPE prior to use: selection (for specific hazard); donning, doffing and adjusting; limitations and useful life; inspection and testing; and proper care including maintenance, storage and disposal.

b. When the employer has reason to believe that any affected employee who has been trained does not have the understanding and skill required for the use of the PPE, the employer shall make certain that the employee receives the necessary re-training to acquire the appropriate skills.

c. The employer shall verify through written certification that each affected employee has received and understood the required training. The written certification shall identify the name of each employee trained, the date(s) of the training, and the subjects taught.

05.A.03 A copy of the manufacturer's use, inspection, testing, and maintenance instructions shall be maintained at the job site and be readily available to personnel using the PPE and safety equipment.

05.A.04 PPE shall be tested, inspected, and maintained in a serviceable and sanitary Condition as recommended by the manufacturer.

a. Defective or damaged equipment, or equipment that has exceeded its useful life, shall not be used. It shall be tagged as out of service and/or immediately removed from the work site to prevent use.

b. Previously used PPE must be cleaned, inspected, and repaired as necessary before issuing to another employee.

05.A.05 When employees provide their own PPE, the employer is responsible for assuring its adequacy in protecting against the hazard and its state of repair.

05.A.06 Minimum requirements.

a. Employees shall wear clothing suitable for the weather and work conditions. For fieldwork (e.g., construction sites, industrial operations and maintenance activities, emergency operations, regulatory inspections, etc.), at a minimum, this shall be:

(1) Short sleeve shirt;

(2) Long pants (excessively long or baggy pants are prohibited); and

(3) Leather or other protective work shoes or boots. Open-toed shoes are prohibited. > See Section 5.E.

b. Protective equipment shall be of heat, fire, chemical, and/or electrical-resistive material when conditions require protection against such hazards.

05.A.07 Persons involved in activities that subject the hands to injury (for example, cuts, abrasions, punctures, burns, chemical irritants, toxins, vibration, and forces that can restrict blood flow) shall select and use hand protection appropriate for the hazard in accordance with ANSI/International Safety Equipment Association (ISEA) 105. > See Section 5.H.

05.A.08 Protective leg chaps shall be worn by workers who operate chainsaws. Protective leg chaps must meet the specifications in American Society for Testing and Materials (ASTM) Standard F1897.

05.A.09 For personal fall arrest equipment, including lineman's equipment (electrically rated harnesses), see Section 21.I.05.

05.B Eye and Face Protection.

05.B.01 Persons shall be provided with eye and face protection for the specific jobsite hazards, as listed in Table 5-1, when machines or operations present potential eye or face injury.

a. Eye and face protection shall meet the requirements of ANSI/American Society of Safety Engineers (ASSE) Z87.1, and bear a legible and permanent "Z87" logo to indicate compliance with the standard.

b. Eye and face protection shall be distinctly marked to identify manufacturer.

05.B.02 When eye protection is required by this regulation, persons whose vision requires the use of corrective lenses, whether via the use of contact lenses or eyeglasses, shall be protected by one of the following:

a. Prescription safety glasses providing optical correction and equivalent protection;

b. Protective glasses with sideshields designed to fit over corrective lenses without disturbing the adjustment of the glasses;

c. Goggles that can be worn over corrective lenses without disturbing the adjustment of the glasses, or

d. Goggles that incorporate corrective lenses mounted behind the protective lenses.

05.B.03 Personnel who are considered blind in one eye and are working in other than administrative functions shall wear safety glasses with sideshields at all times.

05.B.04 Operations that require the use of, or exposure to, hot or molten substances (e.g., babbitting, soldering, pouring or casting of hot metals, handling of hot tar, oils, liquids, and molten substances) shall require eye protection, such as goggles with safety lenses and screens for side protection, or face masks, shields, and helmets giving equal protection. Lens mountings shall be able to retain in position all parts of a cracked lens.

05.B.05 Operations that require handling of harmful materials (e.g., acids, caustics, hot liquids, or creosoted materials) and operations where protection from gases, fumes, and liquids is necessary, shall require the wearing of goggles with cups of soft pliable rubber and suitable faceshields, masks, or hoods that cover the head and neck, and other protective clothing appropriate to the hazards involved.

05.B.06 Operations where protection from radiant energy with moderate reduction of visible light is necessary, including welding, cutting, brazing, and soldering, shall require eye and face protection suitable to the type of work, providing protection from all angles of direct exposure, and with lenses of the appropriate shade. > See Table 5.2.

05.B.07 Glare-resistant glasses that comply with ANSI Z80.3 with an ultraviolet A-region (UVA) and ultraviolet B-region (UVB) 99% filtration shall be worn when conditions require protection against glare. When conditions so warrant, polarized lenses shall also be considered.

05.B.08 Tinted or automatically darkening lenses should not be worn when work tasks require the employee to pass often from brightly to dimly lighted areas.

TABLE 5-1

Eye and Face Protector Selection Guide

A. Spectacle, No sideshield

E. Spectacle, Non-Removable Lens

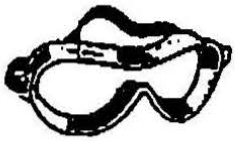
I. Cover Goggle, Direct Ventilatior

B. Spectacle, Half Sideshield

F. Spectacle, Lift Front

J. Cup Goggle, Direct Ventilatior

C. Spectacle, Full Sideshield



G. Cover Goggle, No Ventilation

K. Cup Goggle, Indirect Ventilatior

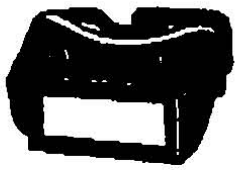
D. Spectacle, Detachable Sideshield

H. Cover Goggle, Indirect Ventilation

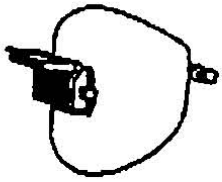
L. Spectacle, Headband Temple

TABLE 5-1 (Continued)

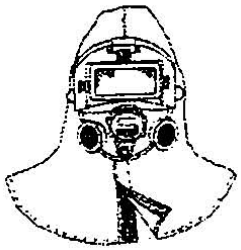
Eye and Face Protector Selection Guide



M. Cover Welding Goggle, Indirect Ventilation



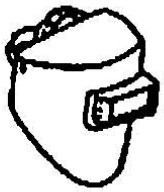
Q. Welding Helmet, Lift Front



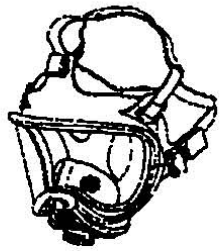
S. Respirator

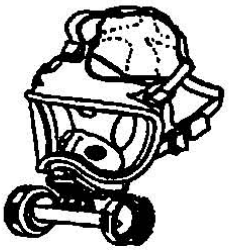
N. Faceshield

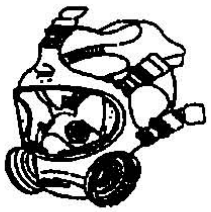
O. Welding Helmet, hand Hold



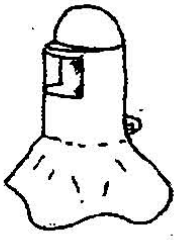
P. Welding Helmet, Stationary Window



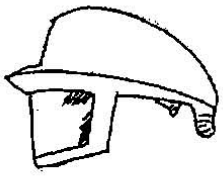




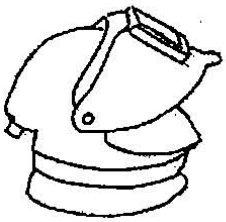
R. Respirator



T1. Respirator



T2. Respirator



U. Respirator

TABLE 5-1 (Continued)

Eye and Face Protector Selection Guide

IMPACT: Chipping, grinding, machining, masonry work, riveting and sanding				
Assessment See Note (1)	Protector Type	Protectors	Limitations	Not Recommended
Flying fragments, objects, large chips, particles, sand, dirt, etc.	B, C, D, E, F, G, H, I, J, K, L, N	Spectacles, goggles, faceshields See Notes (1)(3)(5)(6)(10) For severe exposures: add N	Protective devices do not provided unlimited protection. See Note (7)	Protectors that do not provide protection from side exposure See Note (10) Filter or tinted lenses that restrict light transmittance, unless it is determined that a glare hazard exists. Refer to Optical Radiation.
HEAT: Furnace operations, pouring, casting, hot dipping, gas cutting, and welding				
Assessment See Note (1)	Protector Type	Protectors	Limitations	Not Recommended
Hot sparks	B, C, D, E, F, G, H, I, J, K, L, N	Faceshields, goggles, spectacles For severe Exposure, add N See Notes (2)(3)	Spectacles, cup and cover-type goggles do not provide unlimited facial protection See Note (2)	Protectors that do not provide protection from side exposure
Splash from Molten Metals	N	Faceshields worn over goggles H,K See Notes (2)(3)		
High Temperature Exposure	N	Screen faceshields, reflective faceshields	See Note (3)	

TABLE 5-1 (Continued)

Eye and Face Protector Selection Guide

CHEMICAL: Acid and chemical handling, degreasing, plating				
Assessment See Note (1)	Protector Type	Protectors	Limitations	Not Recommended
Splash	G, H, K N	 For severe exposure add N	Ventilation should be adequate but protected from splash entry	Spectacles, welding helmets, hand shields
Irritating mists	G	Special purpose goggles	See Note (3)	
DUST: Woodworking, buffing, general industry conditions				
Assessment See Note (1)	Protector Type	Protectors	Limitations	Not Recommended
Nuisance dust	G, H, K	Goggles, eyecup and cover types	Atmospheric conditions and the restricted ventilation of the protector can cause lenses to fog. Frequent cleaning may be required.	
OPTICAL RADIATION: Welding: electric arc				
Assessment See Note (1)	Protector Type	Protectors	Limitations	Not Recommended
O, P, Q	Typical filter lens shade		Protection from optical radiation is directly related to filter lens density. See Note (4). Select the darkest shade that allows adequate task performance.	Protectors that do not provide protection from optical radiation.

NOTES:

(1) Care should be taken to recognize the possibility of multiple and simultaneous exposure to a variety of hazards. Adequate protection against the highest level of each of the hazards must be provided.
(2) Operations involving heat may also involve optical radiation. Protection from both hazards shall be provided.
(3) Faceshields shall only be worn over primary eye protection.
(4) Filter lenses shall meet the requirements for shade designations in Table 5-2.
(5) Persons whose vision requires the use of prescription (Rx) lenses shall wear either protective devices fitted with prescription (Rx) lenses with sideshields or protective devices designed to be worn over regular prescription (Rx) eyewear.
(6) Wearers of contact lenses shall also be required to wear appropriate covering eye and face protection devices in a hazardous environment. It should be recognized that dusty and/or chemical environments may represent an additional hazard to contact lens wearers.
(7) Caution should be exercised in the use of metal frame protective devices in electrical hazard areas.
(8) Refer to ANSI/ASSE Z87-1, Section 6.5, Special Purpose Lenses.
(9) Welding helmets or hand shields shall be used only over primary eye protection.
(10) Non-sideshield spectacles are available for frontal protection only.

TABLE 5-2

Required Shades for Filter Lenses/Glasses in Welding, Cutting, Brazing and Soldering

OPERATION	SHADE NUMBER
Soldering	2
Torch Brazing	3 or 4
Cutting (light) up to 1 in (2.5 cm)	3 or 4
Cutting (medium) 1 to 6 in (2.5 to 15.2 cm)	4 or 5
Cutting (heavy) 6 in (15.2 cm) or more	5 or 6
Gas welding (light) up to 1/8 in (0.3 cm)	4 or 5
Gas welding (medium) 1/8 to 1/2 in (0.3 to 1.2 cm)	5 or 6
Gas welding (heavy) 1/2 in (1.2 cm) or more	6 or 8
Atomic hydrogen welding	10 – 14
Inert-gas metal-arc welding (nonferrous): 1/16 in to 5/32 in (0.1 to 0.4 cm) electrodes	11
Inert-gas metal-arc welding (ferrous) - 1/16 to 5/32 in (0.1 to 0.4 cm) electrodes	12
Shielded metal-arc welding - 1/16 to 5/32 in (0.1 to 0.4 cm) electrodes	10
Shielded metal-arc welding - 3/16 to 1/4 in (0.4 to 0.6 cm) electrodes	12
Shielded metal-arc welding - 5/16 to 3/8 in (0.7 to 0.9 cm) electrodes	14
Carbon arc welding	14
Plasma arc cutting up to 100 amps	8
Plasma arc cutting 100 to 200 amps	10
Plasma arc cutting 200 to 400 amps	12
Plasma arc cutting greater than 400 amps	14

05.C Hearing Protection and Noise Control.

05.C.01 The employer shall evaluate the workplace for noise hazards initially and regularly during the course of work. When noise hazards are known or expected, the employer shall develop a Hearing Conservation Program that includes identification and assessment of noise hazards and the measures to be taken to protect personnel against them.

a. USACE workplace hearing conservation programs shall comply with the requirements of ER 385-1-89.

b. Contractors programs shall comply with American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) and this manual at a minimum.

05.C.02 Identification of noise hazards.

a. Noise measurements shall be made whenever there is difficulty in communicating at distances greater than 2 ft (0.6 m), upon worker complaint of excessive noise, or whenever hazardous noise levels are suspected.

b. Noise assessments and/or measurements shall be performed and documented when any new facility or new equipment is placed in service and when areas that in the past were not noise hazardous become noise hazardous for any reason.

05.C.03 Assessment of noise hazards.

a. Instruments used to measure noise shall meet or exceed the requirements listed below.

b. For continuous (steady-state) noise and impact (impulse) noise, the instrument settings shall be in accordance with Table 5-3.

c. Dosimeters shall measure the entire employee's work shift to be considered full-shift sampling.

d. Calibration of noise measuring equipment shall be in accordance with manufacturer’s instructions (USACE refer to ER 385-1-89).

e. Workplaces known or suspected to include hazardous noise will be surveyed initially, annually and whenever site conditions change impacting noise generation.

f. Exposure standards.

(1) For impact (impulse) noise, personnel exposures may not exceed 140 dBA (unweighted) without effective hearing protection devices.

(2) For continuous (steady-state) noise, personnel exposures may not exceed 85 dBA without effective hearing protection devices.

(3) Contractor personnel shall comply with the ACGIH, TLV continuous noise exposure standards, outlined in Table 5-4.

(4) USACE personnel shall refer to ER 385-1-89.

(5) When the daily noise exposure is composed of two or more periods of noise exposure of different levels, the combined effects must be considered. Exposure to different levels for various periods of time shall be computed according to the following formula:

$$C_n = T_1 / L_1 + T_2 / L_2 + . . . + T_x / L_x$$

Where:
C_n = combined noise exposure factor;
T = the total time of exposure at a specified sound-pressure level (in hours), and
L = the total time of exposure permitted at that level (in hours), from Tables 5-2 or 5-3, as appropriate
If the sum exceeds 1, the mixture of exposure periods exceeds the TLV.

05.C.04 Noise controls. Practical engineering or administrative controls shall be considered and implemented when personnel exposed to continuous (steady-state) sound-pressure levels exceeding the limits specified stated above.

a. Engineering controls are the primary means of controlling exposures to excessive noise in the workplace. These controls may include lubrication, isolation, damping, baffles, or other methods.

b. Administrative controls.

(1) Noise-hazardous areas include all areas where the noise values exceed the standards above and shall be posted to indicate the presence of hazardous noise levels and the requirement for hearing protection. Equipment identified as noise hazardous shall be labeled as a noise hazard requiring the use of hearing protection. If noise hazards impact personnel working in adjacent areas, the individuals in the adjacent areas shall be notified of the noise values and offered hearing protection.

(2) If noise exposure to employees cannot be reduced to below the required standard, operating time limits may be imposed.

TABLE 5-3

Settings for Noise Measuring Equipment

Feature	Dosimeter (ACGIH)	Dosimeter (DoD and USACE)*	Type 2 (or better) Sound Level Meter for Continuous Noise (USACE)*	Type 1 Sound Level Meter for Impulse Noise (USACE)*
Criterion Time	8 hours	8 hours	8 hours	8 hours
Criterion Level	85 dB	85 Db	85 dB	85 dB
Weighting	A	A	A	Unweighted, linear, or Z
Peak Weighting	Unweighted	Unweighted, linear, or Z	Unweighted, linear, or Z	Unweighted, linear, or Z
Threshold Level	80 dB	80 dB	80 dB	140 dB
Upper bound on integration	130 dB	None	None	None
Time Weighting	Slow	Slow	Slow	Impulse
Exchange Rate	5 dB	3 dB	3 dB	3 dB

NOTE: * When used for the purposes of delineating noise hazardous areas or evaluating noise exposures to personnel.

TABLE 5-4

Non-DoD Continuous Noise Exposures
(OSHA Standard)

Duration per day (hours)	Permissible sound-pressure level (dBA)
8	85
4	88
2	91
1	94
0.5 = 30 min	97
0.25 = 15 min	100

c. Personal Protective Equipment (PPE).

(1) Hearing protection devices shall provide for the attenuation of noise to acceptable levels (i.e., 85 dBA for continuous (steady-state) noise). If necessary to hear audible warnings, hearing protection devices should not attenuate hearing levels below an individual's hearing threshold.

(2) Dual hearing protection (earplugs and a second method such as ear muffs worn concurrently), shall be based on the attenuation of the specific hearing protection. Generally, double hearing protection should be used whenever employees are exposed to continuous noise greater than 115 dBA.

(3) The attenuation of the specific hearing protection, except custom ear mold hearing protection, shall be determined using the NIOSH de-rating scheme.

(4) Ear insert devices, to include disposable, pre-formed, or custom-molded earplugs, shall be fitted to the exposed individual by an individual trained in such fitting and able to recognize the difference between a good and poor fit. Plain cotton is not an acceptable hearing protection device.

05.C.05 Hearing Conservation Program (HCP) Requirements.

a. A HCP shall include all personnel who are exposed to hazardous noise or ototoxic chemicals (including arsenic, carbon disulfide, carbon monoxide, cyanide, lead and derivatives, manganese, mercury and derivatives, n-hexane, Stoddard solvent, styrene, trichloroethylene, toluene, and xylenes). The usage of these chemicals shall be considered in development of the HCP.

b. All contractors who expose employees to noise greater than the values listed above shall have a written HCP as part of their APP which includes:

(1) The identification, documentation, engineering controls, PPE and hearing testing for all employees;

(2) Employee training on the hazards of noise and the methods of protection provided;

(3) Labeling of all noise hazardous equipment and areas as required above, and

(4) Pre-employment and end-of-employment hearing testing of individuals who will be working in noise hazardous environments greater than 30 days a year for the contractor.

05.D Head Protection.

05.D.01 All persons working in or visiting hard hat areas shall be provided with and required to wear Type I or Type II, Class G (General – not to exceed 2,200 volts) or Class E (Electrical-not to exceed 20,000 volts) headgear as appropriate. The selection of the type of hardhat shall be based on the activity and identified in the AHA. For emergency response operations and other activities with greater need for side impact protection, Type II head protection is required. > See Appendix B.

a. Hard hat areas or activities are those areas with potential hazard of head injury; in general, all construction areas are considered hard hat areas. However, specific areas may be designated as non-hard hat areas, or activities may be considered non-hard hat activities, if identified and properly documented in the associated AHA. The identification and analysis of head hazards will be documented in an AHA or project safety and health plan, as appropriate.

b. Points of entry to a hard hat area shall have a sign warning of the requirement to wear hard hats.

05.D.02 All protective headgear shall meet the requirements of ANSI Z89.1.

a. No modification (i.e., paint) to the shell or suspension is allowed except when such changes are applied or approved by the manufacturer. Stickers are allowed on the hard hat provided they do not interfere with the ability to properly inspect it. > See 05.D.03.

b. Hard hats shall be worn with the bill facing forward unless the GDA has determined exceptions for certain trades in order to accommodate appropriate mission accomplishments. Headgear must be designed to accommodate these needs.

c. Protective headgear worn near electric lines and equipment shall be Class E.

d. No ball caps, knit caps, or other headdress shall be worn under the hard hat that could interfere with the fit or stability of the hard hat.

05.D.03 Protective headgear and components shall be visually inspected daily for signs of damage (dents, cracks, etc.) that might reduce the degree of safety integrity originally provided. Headgear will be periodically inspected for ultraviolet degradation as evidenced by cracking or flaking of the helmet.

05.D.04 Drilling holes or in any way changing the integrity of the hard hat is prohibited. Alterations that will reduce the dielectric or impact strength will not be made.

05.D.05 Protective headgear worn by USACE employees shall (in addition to complying with the preceding specifications) be:

a. White in color and marked with a 1 in (2.5 cm) band of red reflective material placed along the base of the crown with a 5 in (12.7 cm) break in front. A red Corps of Engineers castle insignia will be centered at the front of the hat with the base of the insignia approximately ¾ in (1.9 cm) above the base of the crown. Personnel may place their name above the insignia and their organization title below the insignia: the rank of military personnel should precede their name. An American Flag insignia may be worn on the back of the hard hat.

b. Requests for variations in color and marking to accommodate occupational specialties shall be submitted for consideration to HQUSACE Safety and Health Office.

c. Chin straps will be worn when wearers are subject to high wind conditions and/or working on elevated structures.

05.E Protective Footwear.

05.E.01 Protective footwear that is rated to protect against the hazard(s) identified in the PHA/AHA shall be provided and worn.

05.E.02 All protective footwear shall meet ASTM F2413 standards.

05.E.03 Add-on type devices, such as strap-on foot, toe or metatarsal guards, shall not be used as a substitute for protective footwear and must be demonstrated by the employer to be equally effective via independent testing data for these devices.

05.E.04 For activities in which USACE or contractor personnel or official visitors are potentially exposed to foot hazards, the applicable PHA/AHA, APP, or project safety and health plan shall include an analysis of, and prescribe specific protective measures to be taken for, reducing foot hazards.

05.E.05 Personnel shall, as a minimum, wear safety-toed boots meeting ASTM Standard F2413 while working on construction sites unless it can be demonstrated by a PHA/AHA to the GDA's satisfaction that a different type of foot protection is required.

05.E.06 Footwear providing protection against impact and compressive forces, conduction hazards, electrical hazards, and sole puncture shall comply with the applicable requirements of ASTM F2413. Footwear providing protection against impact and compression hazards shall be rated as I/75 and C/75.

a. Unexploded ordnance (UXO) personnel whose job tasks required protective footwear but require no metal parts in or on their footwear shall wear Conductive footwear (Cd) with protective toe cap/composite toe footwear.

b. Personnel participating in wild land fire management activities shall wear leather lace-up boots with slip-resistant soles, such as a hard rubber lug-type or tractor tread, a top height of 8 in (20.3 cm) or more with composite toes. Soles shall not be made of composition rubber or plastic, which have low melting points.

05.F High-Visibility Apparel.

05.F.01 High-visibility apparel meeting, at minimum, ANSI/ISEA 107, Performance Class 2 requirements, shall be worn by workers (i.e., signal persons, spotters, survey crews, inspectors, etc.) whenever:

a. There is limited visibility of workers exposed to mobile/heavy equipment operations, vehicles, load handling, or other hazardous activities;

b. Reduced visibility conditions exist due to weather conditions, illumination, or visually complex backgrounds where ambient visibility is at least 50 ft (15.2 m); OR

c. Workers are exposed to vehicular or equipment traffic at speeds up to 35 mph (56.3 kph).

05.F.02 If any or all of the following conditions exist, Class 3 high-visibility apparel meeting ANSI/ISEA 107 shall be worn for higher visibility (i.e., signal persons, spotters, survey crews, inspectors, etc.) whenever:

a. Reduced visibility conditions exist due to weather conditions, illumination, or visually complex backgrounds where ambient visibility is less than 50 ft (15.2 m);

b. Workers are exposed to vehicular or equipment traffic in excess of 35 mph (56.3 kph);

c. Workers are performing tasks which divert attention from approaching vehicular traffic, traveling in excess of 35 mph (56.3 kph), as posted; OR

d. Workers are involved in activities in close proximity to vehicular traffic with no protective barriers.

05.F.03 When working at night, on or near sites where vehicles are present, workers (i.e., signal persons, spotters, survey crews, inspectors, etc.) shall wear, at a minimum, a Class 3 high-visibility safety coverall/jumpsuit or a Class 3 high-visibility safety jacket and Class E high-visibility pants, or bib overalls.

05.F.04 If the use of high-visibility apparel proves to create a greater hazard due to moving machinery, pinch points, heat stress or other reasons, an AHA detailing rationale for infeasibility of use and alternate safety measures to be used to ensure same level of worker safety, shall be developed, signed and submitted by the responsible person and accepted by the GDA, supervisor or the command's local Safety and Occupational Health Office (SOHO). Work shall not commence until such acceptance has been obtained.

05.F.05 The apparel background material color shall be either fluorescent yellow-green, fluorescent orange-red, or fluorescent red (see ANSI/ISEA 107). When choosing color, optimization of color conspicuity between the wearer and work environment shall be considered.

05.F.06 The apparel shall be:

a. Free of roughness, sharp edges and projections that could cause irritation or injury;

b. Should fit correctly to ensure that the vest remains in place for the expected period of use, environmental conditions, and wearer movements;

c. Cleaned, laundered and/or dry-cleaned in accordance with the label located on the apparel; and

d. In useable condition with limited rips, tears or fading; and

e. Replaced if it fails to comply with and of the above or ANSI/ISEA 107.

05.G Respiratory Protection.

05.G.01 General. The use of respirators is required when occupational exposure levels exceed OSHA Permissible Exposure Limits (PELs) or ACGIH TLVs, and engineering or administrative exposure controls are not feasible to implement.

05.G.02 The employer may allow the voluntary use of respirators, such as a filtering face pieces (nuisance dust masks) in atmospheres that are not hazardous. Prior to use of the voluntary respirators, the respirator must be evaluated and approved by the respiratory program administrator to ensure that its use will in itself not create a hazard. The employee shall be instructed in the limitations of the respirator and the correct method of wearing and using the respirator.

05.G.03 Written respiratory protection program. A written respiratory protection program shall be developed and implemented when respirators are used.

a. All employees using respirators, with the exception of employees voluntarily using only filtering face pieces (NIOSH-approved dust masks), shall be included in the respiratory protection program.

b. A respiratory protection program administrator with the technical qualifications (training and experience) and administrative authority to develop, implement and update (as necessary) the respiratory protection program shall be identified and so designated in the program.

(1) The program administrator shall ensure that all respirator users comply with the requirements of the program.

(2) Program Administrator Qualifications. The program administrator shall have the documented knowledge and experience to understand OSHA's respiratory protection standard (29 CFR 1910.134), evaluate respiratory hazards at the facility/project or similar facility/project, select appropriate respirators based on similar hazards as the facility/project hazards or potential hazard, and train employees on the use of similar respirators.

c. Respiratory protection programs shall address each of the following topics:

(1) Methods used to identify and evaluate workplace respiratory hazards;

(2) Procedures for selecting respirators for use in the workplace;

(3) Medical evaluations of employees required to use respirators;

(4) Fit testing procedures for tight-fitting respirators;

(5) Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations;

(6) Procedures and schedules for cleaning, disinfecting, storing, inspecting, cartridge and canister change-out, repairing, discarding, and otherwise maintaining respirators;

(7) Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators;

(8) Training of employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations;

(9) Training of employees in the proper use of respirators, including putting on and removing (donning and doffing) the respirator, any limitations on their use of the respirator, pre-use testing procedures, and respirator maintenance;

(10) Procedures for regularly evaluating the effectiveness of the program; and

(11) Project/facility-specific voluntary use guidelines and a requirement for voluntary users to learn and understand the contents of 29 CFR 1910.134 Appendix D, Information for Employees Using Respirators When Not Required under the Standard.

05.G.04 Medical evaluation. All employees, with the exception of employees voluntarily using filtering face pieces, shall be medically evaluated to ensure they are fit enough to wear the selected respirators before being fit tested. Evaluation options for respirator use are as follows:

a. Completion of the respirator questionnaire from 29 CFR 1910.134, Appendix C which is reviewed by a medical professional and a follow-up of the recommended medical exam and testing if required by the reviewing medical professional. Medical clearances to wear respirators shall include the following:

(1) Telephone, e-mail, and physical address of the medical facility/provider;

(2) Printed name of the licensed, certified health care provider along with his/her signature;

(3) The statement of clearances or respiratory limitations only (no personal medical information shall be included. Employee identification shall not include the full social security number);

(4) Date of examination and date that clearance expires.

b. Respirator Medical Evaluation Service. An on-line, mail-in or in-person evaluation service for the purpose of clearing an employee to wear selected respirators may be used provided it is supervised by a Board-Certified or Board-Eligible Occupational Medicine Physician and based upon Appendix C to 29 CFR 1910.134, OSHA Respirator Medical Evaluation Questionnaire. Medical clearances to wear respirators shall include the information in (1) – (4) above.

c. Additional medical evaluations shall be provided when:

(1) An employee reports medical signs or symptoms that are related to the ability to use a respirator;

(2) A change occurs in workplace conditions (e.g., physical work effort, protective clothing, temperature, etc.,) that may result in a substantial increase in the physiological burden placed on an employee.

d. All USACE respirator users shall have a pre-placement history and targeted physical. The exam shall include a pulmonary function test, evaluation of the cardiovascular and respiratory systems, and any tests required by the Occupational Health Provider.

05.G.05 Respirator Selection. Respirator selection shall be completed by the Respirator Program Administrator (RPA).

a. The selection shall be based on objective industrial hygiene data for this or similar operations.

b. Before industrial hygiene data is obtained, the RPA shall use knowledge of the hazard and work methods to determine the highest potential exposure, which shall be used to select the respiratory protection.

c. To determine the change out schedule of the respirator cartridge or respirator canister, the respirator program administrator shall use manufacturer recommended change-out based on the operations or the objective industrial hygiene data or data from similar operations.

d. An air purifying respirator shall not be used in an atmosphere with less than 19% oxygen or an atmosphere that is immediately dangerous to life and health (IDLH).

05.G.06 Fit testing. Employees wearing respirators with tight-fitting face pieces [Supplied Air Respirators (SARs) and Self-Contained Breathing Apparatus (SCBAs) included] shall be fit tested to ensure that selected respirators achieve a proper face-to-facepiece seal. Fit testing shall be performed before initial use of the selected respirator, whenever respirator size, make or model is changed, and at least annually. Fit testing requirements shall comply with respiratory protection program requirements.

05.G.07 Airline Respirators (SARs and SCBAs). If airline respirators are used, the following apply (excludes underwater diving SCBAs, see Section 30):

a. All SARs or SCBA respirators shall meet the Grade D Breathing Air requirements from ANSI/Compressed Gas Association Commodity Specification for Air;

b. If an airline respirator is used in an environment that has the potential to become IDLH, the respirator shall have an alternate source of breathing air for escape from the environment;

c. If an airline respirator is used in an environment that has the potential to become IDLH, there shall be a respirator air attendant to prevent the lines from becoming tangled or tied, to change the air supply tanks, and/or to confirm the air source (compressor or air supply tank manifold) is adequately working. If the air supply is interrupted, the attendant shall notify the respirator users to leave the area where the respirators are required.

05.G.08 Training and information. The RPA or his designee shall provide respirator training annually (or earlier if the requirements change significantly due to process changes or changes in site specific operations) to personnel using respirators at the facility or project. Annual training shall ensure that each employee using a respirator can demonstrate knowledge of the following topics:

a. Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator;

b. Limitations and capabilities of the respirator;

c. How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions;

d. How to inspect, put on and remove, use, and check the seals of the respirator;

e. Procedures for maintenance and storage of the respirator;

f. How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators; and

g. The general requirements of the OSHA respirator standard at 29 CFR 1910.134.

05.G.09 Recordkeeping. Establish and retain written information regarding medical evaluations, fit testing, and the respirator program. The following shall be made available upon request:

a. Records of medical approval must be retained and made available, as needed;

b. Fit test records must be maintained for respirator users until the next fit test is administered. Establish a record of the Qualitative Fit Test (QLFT) and Quantitative Fit Test (QNFT) administered to an employee including:

(1) The name or identification of the employee tested;

(2) Type of fit test performed and name of the test administrator;

(3) Specific make, model, style, and size of respirator tested;

(4) Date of test; and

(5) The pass/fail results for QLFTs or the fit factor and strip chart recording or other recording of the test results for QNFTs.

c. Retain a written copy of the current respirator program.

05.H Hand Protection.

05.H.01 Employers shall select, and require employees to use, appropriate hand protection when employees' hands are exposed to hazards such as skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns, harmful temperature extremes, high hand vibration and sharp objects. > See Table 5-5.

05.H.02 Employers shall base the selection of the appropriate hand protection on an evaluation of the performance characteristics of the hand protection relative to the task(s) to be performed, conditions present, duration of use, and the hazards and potential hazards identified.

05.H.03 Employees shall be trained to recognize hand hazards, select appropriate gloves for all anticipated hazards and to inspect and properly store gloves.

05.H.04 Gloves should fit snugly. Workers shall wear the correct gloves for the hazard (e.g., heavy-duty rubber gloves for concrete work, welding gloves for welding, insulated gloves and sleeves when exposed to electrical hazards, etc.).

05.H.05 Gloves will be inspected thoroughly prior to use to assure they are in good condition and will provide the protection required.

05.I Electrical Protective Equipment.

05.I.01 Persons working on electrical distribution systems shall be provided with the appropriate electrical protective equipment. This equipment shall be inspected, tested, and maintained in safe conditions in accordance with Table 5-6.

05.I.02 Employees shall use rubber gloves, sleeves, blankets, covers and line hoses as required by special conditions for work on energized facilities. Rubber goods provided to protect employees who work on energized facilities must meet ASTM F18 standards. Electrical workers' rubber insulating protective equipment shall be visually inspected for damage and defects prior to each use.

05.I.03 Rubber protective equipment must be subjected to periodic electrical tests. Rubber insulating gloves shall be inspected before first issue and every 6 months thereafter; rubber insulating blankets and sleeves shall be inspected before their first issue and every 12 months thereafter. Rubber insulating covers shall be inspected upon indication that insulating value is suspect (per 29 CFR1910.137).

TABLE 5-5

Hand and Arm Protection

Metal Mesh, Leather, or Canvas Gloves	- Sturdy gloves made from metal mesh, leather, or canvas provide protection from cuts, burns, and sustained heat.
Leather Gloves	- Protection against sparks, moderate heat, blows, chips, and rough objects. - Welders in particular need the durability of higher-quality leather gloves.
Aluminized Gloves	- Provide reflective and insulating protection against heat. Usually used for welding, furnace, and foundry work. - Normally require an insert made of synthetic material that protect against heat and cold.
Aramid Fiber Gloves	- Aramid is a synthetic material that protects against heat and cold and is also used to make gloves that are cut- and abrasive-resistant and wear well.
Fabric and Coated Fabric Gloves	- Gloves made of cotton or other fabric protect against dirt, slivers, chafing, and abrasion but do not provide sufficient protection to be used with rough, sharp or heavy materials. - Cotton flannel gloves coated with plastic transform fabric gloves into general-purpose hand protection offering slip-resistant qualities. - Coated fabric gloves are used for tasks ranging from handling bricks and wire rope to handling chemical containers in laboratory operations. - For protection against chemical exposure hazards, always check with manufacturer to determine the gloves' effectiveness against the specific chemicals/conditions in the workplace.
Chemical and Liquid-Resistar Gloves	- Gloves made of rubber (latex, nitrile, or butyl), plastic, or synthetic rubber-like material such as neoprene protect workers from burns, irritation, and dermatitis caused by contact with oils, greases, solvents, and other chemicals. - Use of rubber gloves also reduces the risk of exposure to blood and other potentially infectious substances.
Butyl Rubber Gloves	- Protect against nitric acid, sulfuric acid, hydrofluoric acid, red fuming nitric acid, and peroxide. Resist oxidation, ozone corrosion, abrasion and remain flexible at low temperatures.

Natural Latex or Rubber Gloves	- Comfortable wear and pliability along with their protective qualities make them popular general purpose glove. - Resist abrasions caused by sandblasting, grinding, and polishing and protect workers' hands from most water solutions of acids, alkalis, salts and ketones. - Hypoallergenic gloves, glove liners, and powderless gloves possible alternatives for those allergic to latex.
Neoprene Gloves	- Good pliability, dexterity, high density, and tear resistance. - Provide protection from hydraulic fluids, gasoline, alcohols, organic acids, and alkalis.
Nitrile Rubber Gloves	- Provide protection from chlorinated solvents such as trichloroethylene and perchloroethylene. - Intended for jobs requiring dexterity and sensitivity, yet stand up to heavy use even after prolonged exposure that cause other gloves to deteriorate. - Resist abrasion, puncturing, snagging, and tearing.
Anti-vibration Gloves	-Gloves with gel insert and padding to absorb the tool vibration. For best effectiveness, gloves should meet the requirements of ANSI S2.73

05.I.04 Electric arc flash protection shall be provided for any person entering the flash protection boundary. > See Section 11.B.

a. Arc-rated clothing and PPE must be worn as determined by the incident exposure associated with the specific task. Refer to NFPA 70E for specific Hazard Risk Classifications and NFPA PPE Category Level Chart for Clothing/Equipment Requirements). > See Table 5-7.

b. Synthetic clothing such as acetate, nylon, polyester, rayon, either alone or in blends with cotton, may not be worn while in the flash protection boundary.

c. Employees must wear protective eye equipment whenever there is a danger from electric arcs, flashes, flying objects, or electrical explosion.

d. Employees must wear arc-rated clothing whenever they may be exposed to potentially energized electrical equipment.

(1) Arc-rated suits and their closure design must permit easy and rapid removal.

(2) The entire arc-rated suit, including the window, must have energy-absorbing characteristics suitable for arc flash exposure.

(3) Clothing and equipment required by the degree of electrical hazard exposure can be worn alone or be integrated with normal apparel.

(4) Protective clothing and equipment must cover associated parts of the body and all normal apparel that is not flame-resistant, while allowing movement and visibility.

e. Employees must wear rubber-insulating gloves where there is a danger of hand or arm injury from electric shock or arc flash burns due to contact with energized parts. Gloves made from layers of flame-resistant material provide the highest level of protection. Leather glove protectors should be worn over voltage-rated rubber gloves.

f. Dielectric overshoes are required where electrically insulated footwear is used for protection against step and touch potential.

05.I.05 An air test shall be performed on electrical workers' rubber insulating gloves before each use.

05.I.06 Protective equipment of material other than rubber shall provide equal or better electrical and mechanical protection.

05.I.07 Tools must be insulated and manufactured to meet ASTM F18. The insulating tool portion shall be made of fiberglass-reinforced plastic (FRP).

05.I.08 Only live-line tool poles having a manufacturer's certification to withstand at least the following test shall be used: 100 (kilovolts) kV AC per ft (305 mm) of length for 5 minutes or 75 kV AC per ft (305 mm) for FRP tools. Records shall be maintained for all live-line tools to demonstrate satisfactory accomplishment of laboratory and shop test.

05.I.09 Wooden tools are not authorized for use.

05.I.10 When using live-line tools, workers shall use voltage rated gloves and not place their hands closer than necessary to energized conductors or to the metal parts of the tool.

TABLE 5-6

Standards for Electrical Protective Equipment

SUBJECT	NUMBER AND TITLE
Head Protection	ISEA/ANSI Z89.1, Requirements for Protective Headwear for Industrial Workers
Eye and face Protection	ANSI Z87.1, Practice for Occupational and Educational Eye and Face Protection
Gloves	ASTM D120-02a, Standard Specification for Rubber Insulating Gloves
Sleeves	ASTM D1051, Standard Specification for Rubber Insulating Sleeves
Gloves and sleeves	ASTM F496, Standard Specification for In-Service Care of Insulating Gloves and Sleeves
Leather protectors	ASTM F696, Standard Specification for Leather Protectors for Rubber Insulating Gloves and Mittens
Footwear	ASTM F1117, Standard Specification for Dielectric Overshoe Footwear
	ASTM 2412, Standard Test Methods for Foot Protection ASTM 2413, Standard Specification for Performance Requirements for Foot Protection
Visual inspection	ASTM F1236, Standard Guide for Visual Inspection of Electrical Protective Rubber Products
Apparel	ASTM F1506, Standard Performance Specification for Flame Resistant Textile Materials for Wearing Apparel for Use by Electrical Workers When Exposed to Momentary Electric Arc and Related Thermal Hazards

TABLE 5-7

Arc Flash Protective Clothing and PPE

Hazard/Risk Category	Protective Clothing and PPE
0	Protective Clothing, Non-melting or Untreated Natural Fiber (i.e., untreated cotton, wool, rayon, or silk, or blends of these materials) with a fabric weight of at least 4.5 oz/yd² Shirt (long sleeve) Pants (long Protective Equipment: Hard hat; Safety glasses/ goggles (SR); Hearing Protection (ear canal inserts); Heavy-duty leather gloves (AN) (See Note 1); Leather work boots
1	Arc-Rated Clothing, Minimum Arc Rating of 4 cal/cm² (See Note 3) Arc-rated long-sleeve shirt and pants or arc-rated coverall Arc-rated faceshield (See Note 2) or arc flash suit hood Arc-rated jacket, parka, rainwear, or hard hat liner (AN) Protective Equipment: Hard hat; Safety glasses/goggles (SR); Hearing protection (ear canal inserts); Heavy-duty leather gloves (See Note 1); Leather work boots
2	Arc-Rated Clothing, Minimum Arc Rating of 8 cal/cm² (See Note 3) Arc-rated long-sleeve shirt and pants or arc-rated coverall Arc-rated flash suit hood or arc-rated faceshield (See Note 2) and arc-rated balaclava Arc-rated jacket, parka, rainwear, or hard hat liner (AN) Protective Equipment: Hard hat; Safety glasses/goggles (SR); Hearing protection (ear canal inserts); Heavy-duty leather gloves (See Note 1); Leather work boots
3	Arc-Rated Clothing selected so the System Arc Rating meets the required minimum arc rating of 25 cal/cm² (See Note 3) Arc-rated long-sleeve shirt (AR) Arc-rated pants (AR) Arc-rated coverall (AR) Arc-rated arc flash suit jacket (AR) Arc-rated arc flash suit pants (AR) Arc-rated arc flash suit hood Arc-rated gloves (See Note 1) Arc-rated jacket, parka, rainwear, or hard hat liner (AN) Protective Equipment: Hard hat; Safety glasses/goggles (SR); Hearing protection (ear canal inserts); Leather work boots

4	Arc-Rated Clothing selected so the System Arc Rating meets the required minimum Arc Rating of 40 cal/cm² (See Note 3) Arc-rated long-sleeve shirt (AR) Arc-rated pants (AR) Arc-rated coverall (AR) Arc-rated arc flash suit jacket (AR) Arc-rated arc flash suit pants (AR) Arc-rated arc flash suit hood Arc-rated gloves (See Note 1) Arc-rated jacket, parka, rainwear, or hard hat liner (AN) Protective Equipment: Hard hat; Safety glasses/goggles (SR); Hearing protection (ear canal inserts); Leather work boots

AN: as needed (optional). AR: as required. SR: selection required.

Notes:

(1) If rubber insulating gloves with leather protectors are required by NFPA 70E. Table 130.7(C)(9), additional leather or arc-rated gloves are not required.The combination of rubber insulating gloves with leather protectors satisfies the arc flash protection requirement.

(2) Face shields are to have wrap-around guarding to protect not only the face but also the forehead, ears, and neck, or, alternatively, an arc-rated arc flash suit hood is required to be worn.

(3) Arc rating is defined in Article 100 and can be either the arc thermal performance value (ATPV) or energy of break open threshold (EBT). ATPV is defined in ASTM F 1959, Standard Test Method for Determining the Arc Thermal Performance Value of Materials for Clothing, as the incident energy on a material, or a multilayer system of materials, that results in a 50 percent probability that sufficient heat transfer through the tested specimen is predicted to cause the onset of a second-degree skin burn injury based on the Stoll curve, in cal/cm2. EBT is defined in ASTM F 1959 as the incident energy on a material or material system that results in a 50 percent probability of breakopen. Arc rating is reported as either ATPV or EBT, whichever is the lower value.

05.I.11 Only tools and equipment intended for live-line bare hand work should be used on transmission lines. The tools shall be kept dry and clean and shall be visually inspected before use each day.

05.I.12 See Section 05.A.09 for requirements on lineman's personal fall protection equipment.

05.J Personal Flotation Devices.

05.J.01 Inherently buoyant Type III, Type V work vests, or better USCG-approved personal flotation devices (PFDs) shall be provided and properly worn in closed fashion (zipped, tied, latched, etc.) by all persons in the following circumstances: > See 05.J.02 and Figure 5-1.

a. On floating pipelines, pontoons, rafts, or stages;

b. On structures or equipment extending over or next to water except where guardrails, personal fall protection system, or safety nets are provided for employees;

c. Working alone at night where there are drowning hazards, regardless of other safeguards provided;

d. In skiffs, small boats, or launches, unless in an enclosed cabin or cockpit; or

e. Whenever there is a drowning hazard.

05.J.02 Automatic-Inflatable PFDs Type V or better, USCG-approved for Commercial Use, may be worn by workers in lieu of inherently buoyant PFDs (see conditions 05.J.01.a-e above), provided the following criteria is met:

a. PFDs are worn only by workers over 16 years of age and those who weigh 90 lb (40.8 kg) or more;

b. An AHA shall be developed for the intended activity and shall be used to select the most appropriate PFD for the activity;

c. PFDs must be inspected, maintained, stowed and used in accordance with the manufacturer's instructions. PFDs used in heavy construction or maintenance activities or where hot work (welding, brazing, cutting, soldering, etc.) is to be performed must be designed, tested and certified by the manufacturers for this type of work;

➢ Note: The standard commercial auto-inflatable PFD does not meet these requirements.

d. PFDs shall provide a 30-pound minimum buoyancy, post-deployment, and shall have a status indicator window;

e. Personnel shall be trained in the use, maintenance, restrictions, care, storage, inspection and post-deployment procedures per manufacturer's instructions;

f. The USCG-approval for auto-inflatable PFD's is contingent upon the PFD being worn, not stowed. All auto-inflatable PFDs must be worn at all times a drowning hazard exists.

g. In-water testing is required for all first time users so that wearers become familiar with the feel and performance of the PFD.

05.J.03 All wearable PFDs shall be of an international orange (or orange/red) or ANSI 107 yellow-green color.

a. Each inherently buoyant PFD shall have at least 31 in^2 (200 cm^2) of retroreflective material attached to its front side and at least 31 in^2 (200 cm^2) on its back side, per USCG requirements (46 CFR Part 25.25-15).

b. Each auto-inflatable PFD shall have at least 31 in^2 (200 cm^2) of retroreflective material attached to its front side and at least 31 in^2 on its bladder, to be visible when deployed (with the exception of Work Vests, which are allowed to have a total of 31 in^2 front and back, combined).

05.J.04 Each PFD shall be equipped with a USCG-approved automatically activated light. Lights are not required for PFDs on projects performed exclusively during daylight hours.

05.J.05 Before and after each use, the PFD shall be inspected for defects that would alter its strength or buoyancy.

05.J.06 Throwable devices (Type IV PFD).

a. On USCG-inspected vessels, ring buoys are required to have automatic floating electric water lights (46 CFR 160).

b. On all other floating plant and shore installations, lights on life rings are required only in locations where adequate general lighting (e.g., floodlights, light stanchions) is not provided. For these plant and installations, at least one life ring, and every third one thereafter, shall have an automatic floating electric water light attached.

c. All PFDs shall be equipped with retroreflective tape in accordance with USCG requirements.

d. Life rings (rope attachment not required) and ring buoys (rope attachment required) shall be USCG-approved; shall have at least 90 ft (27.4 m) of 3/8 in (0.9 cm) of attached solid braid polypropylene, or equivalent. Throw bags may be used in addition to life rings or ring buoys. These throwable devices and lifelines shall be inspected at a minimum, every 6 months and shall be stored in such a manner as to allow immediate deployment and will be protected from degradation from weather and sunlight. Life rings or ring buoys shall be readily available and shall be provided at the following places:

(1) At least one not less than 20 in (51 cm) on each safety skiff up to 26 ft (7.9 m) in length (46 CFR 117.70);

(2) At least one (1) 24 in (61 cm) in diameter on all motor boats longer than 26 ft (7.9 m) in length up to 65 ft (19.8 m) in length and for motor boats 65 ft (19.8 m) in length or longer, a minimum 3 life buoys of not less than 24 in (61 cm) and one additional for each increase in length of 100 ft (30.4 m) or fraction thereof; and

(3) At least one (1) at intervals of not more than 200 ft (60.9 m) on pipelines, walkways, wharves, piers, bulkheads, lock walls, scaffolds, platforms, and similar structures extending over or immediately next to water, unless the fall distance to the water is more than 45 ft (13.7 m), in which case a life ring shall be used. (The length of line for life rings at these locations shall be evaluated, but the length may not be less than 90 ft (27.4 m).

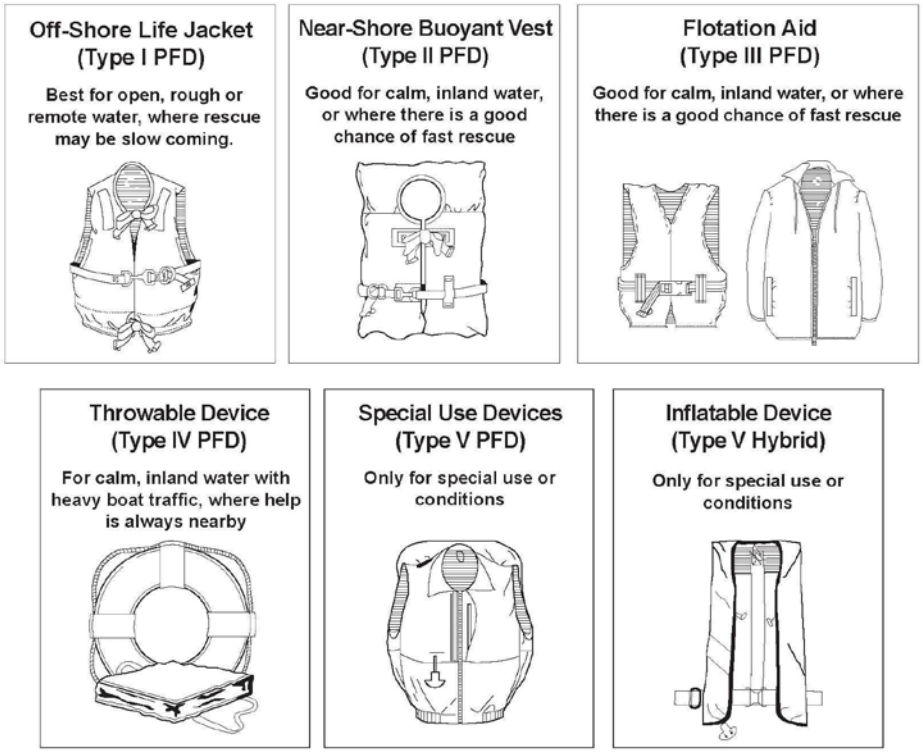
05.J.07 At navigation locks, an analysis of the benefits versus the hazards of using floating safety blocks (blocks that may be quickly pushed into the water to protect individuals who have fallen in the water from being crushed by vessels) shall be made.

a. This analysis shall be documented as an AHA.

b. If the use of blocks is found acceptable, consideration shall be given to the size and placement of the blocks, the appropriate means of securing and signing the blocks, etc. When the use of blocks is found unacceptable, alternative safety measures shall be developed.

FIGURE 5-1

Personal Flotation Devices



05.K Lifesaving and Safety Skiffs.

05.K.01 During construction activities, at least one skiff shall be immediately available at locations where employees work over or immediately next to water.

➢ Note: This requirement is applicable to any Operations and Maintenance activities that cause an employee to work outside the designed, permanently installed safety controls (i.e., guardrails).

05.K.02 Personnel trained in launching and operating the skiff shall be readily available during working hours. Lifesaving personnel shall perform a lifesaving drill, including the launching and recovery of the skiff, before the initiation of work at the site and periodically thereafter as specified by the GDA (but at least monthly or whenever new personnel are involved).

05.K.03 Skiffs shall be kept afloat or ready for instant launching.

05.K.04 Required equipment must be onboard and meet or exceed USCG requirements and the requirements of Section 19 of this manual. Skiffs shall be equipped as follows:

a. Four (4) oars (two (2) if the skiff is motor powered);

b. Oarlocks attached to gunwales or the oars;

c. One (1) ball-pointed boat hook;

d. One (1) ring buoy with 90 ft (21.3 m) of 3/8 in (0.9 cm) solid braid polypropylene, or equivalent, line attached; and

e. PFDs in number equaling the skiff rating for the maximum number of personnel allowed on board.

f. Fire Extinguisher.

05.K.05 In locations where waters are rough or swift, or where manually operated boats are not practical, a power boat suitable for the waters shall be provided and equipped for lifesaving.

05.K.06 Skiffs and power boats shall have buoyant material capable of floating the boat, its equipment, and the crew.

05.K.07 On vessels (such as skiffs) without permanently mounted navigation lights, portable battery-operated navigation lights will be available and used for night operations.

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SECTION 6

Hazardous or Toxic Agents and Environments

06.A General.

06.A.01 Exposure standards.

a. Exposure, through inhalation, ingestion, skin absorption, or physical contact, to any chemical or biological agent in excess of the acceptable limits specified in the current American Conference of Governmental Industrial Hygienist (ACGIH) guideline, "Threshold Limit Values and Biological Exposure Indices"," published Department of the Army (DA) or Department of Defense (DoD) Exposure Limits, or by OSHA shall be prohibited. For the purpose of this document, the applicable standard is the Occupational Exposure Limit (OEL). Physical agents are addressed individually in this section.

➢ Note: For Beryllium, the Department of Energy's exposure value of 0.2 ug/m^3 may be allowed with written permission from the HQUSACE-SO.

b. In case of conflicts between ACGIH, OSHA, DoD or DA standards or regulations referenced in this manual, the more stringent shall be used as the OEL.

c. The employer shall comply with all applicable standards and regulations to reduce contaminant concentration levels As Low As is Reasonably Achievable (ALARA).

d. Activities where occupational exposure to a chemical or biological warfare agent is possible, shall comply with current DA safety and occupational health requirements for chemical and biological agents.

e. Activities involving ammunition and explosives or their constituents or chemical warfare agents may have additional requirements as specified in EM 385-1-97, Explosives Safety and Health Requirements Manual.

06.A.02 Hazard evaluation.

a. Jobsite operations, materials, and equipment involving potential exposure to hazardous or toxic agents or environments shall be evaluated by a qualified Industrial Hygienist, or equivalent competent person in Industrial Hygiene operations, to formulate a hazard control program. A description of the methods to be used must be accepted by the GDA or local Safety and Occupational Health Office (SOHO) before the start of the specific operation. > This evaluation shall be performed at least annually for USACE operations.

b. Activity Hazard Analysis (AHA) and/or Position Hazard Analysis (PHA) shall be used to document the evaluation of the hazards and the controls present. The hazard evaluation shall identify all substances, agents, and environments that present a health, explosive or fire hazard to workers or visitors, the risk of the hazard, and recommend hazard control measures. Engineering and administrative controls shall be used to control hazards; in cases where engineering or administrative controls are not feasible, personal protective equipment (PPE) may be used.

c. The hazard evaluation shall document: the nature of the evaluation (air, biological or radiological samples, etc.); that it serves as certification of hazard evaluation; the workplace and activity evaluated; the name, position and credentials of the person certifying that the evaluation has been performed; any controls and training being utilized; and the date of the evaluation. This evaluation shall be documented in a written report and available for review by the GDA or SOHO for USACE operations.

06.A.03 Testing and monitoring.

a. Approved and calibrated testing devices shall be provided to measure hazardous or toxic agents and environments. Devices shall be labeled with calibration information (name of individual performing the calibration and date of the most current calibration). Calibration results shall be maintained in a calibration log.

b. Individuals performing testing and monitoring shall be trained in hazards and testing and monitoring procedures. Testing devices shall be used, inspected, and maintained in accordance with the manufacturer's instructions, a copy of which shall be maintained with the devices.

c. NIOSH, OSHA, Environmental Protection Agency (EPA) or DA sampling and analytical methods or other independently verified sampling and analytical methods shall be used. Laboratories used for analysis shall be accredited by nationally recognized bodies, such as the American Industrial Hygiene Association (AIHA), for the type of analysis performed.

d. Determination of the concentration of, and hazards from, hazardous or toxic agents and environments shall be made by a qualified industrial hygienist or other competent person during initial startup and as frequently as necessary to ensure the safety and health of the workers or other potentially exposed individuals.

e. Records of testing/monitoring shall be maintained on site and shall be available to the GDA or SOHO for USACE operations upon request.

06.A.04 The following methods shall be utilized for the control of exposure to hazardous or toxic agents and environments and shall be followed in the order below, unless infeasible:

a. Substitution: if the substitute process or product is determined to provide the same outcome and to be less of a hazard;

b. Engineering controls: (i.e., local/general ventilation), to limit exposure to hazardous or toxic agents and environments within acceptable limits;

c. Work practice controls: when engineering controls are not feasible or are not sufficient to limit exposure to hazardous or toxic agents and environments within acceptable limits;

d. Appropriate PPE (i.e., respirators, gloves, etc.) and associated programs: shall be instituted when engineering, work practice controls, or material substitution are not feasible or are not sufficient to limit exposure to hazardous or toxic agents;

e. Regular housecleaning (work and break area surface cleaning) and personal decontamination procedures: shall be instituted in areas where the operations generate toxic dust and fume hazards. The frequency of surface cleaning and of decontamination procedures is dependent on the nature of the hazard, and frequency and risk from the exposure and shall be documented in the Project Safety and Occupational Health (SOH) Plan or Accident Prevention Plan (APP).

06.B Hazardous or Toxic Agents Handling.

06. B.01 Chemical Hazard Communication (HazCom). A written HazCom Program shall be developed when hazardous or toxic agents (any chemical which is a physical/health hazard) are present or procured, stored or used at a project site (per 29 CFR 1910.1200). The written HazCom program shall address the following in project- specific detail:

a. Hazardous or Toxic Agent Inventory. A list of the hazardous or toxic agents with the following information:

(1) Explanation of how the agents are to be used at the project.

(2) For emergency response purposes, approximate quantities (e.g., liters, kilograms, gallons, pounds) that are onsite or will be on site at any given time shall be provided for each material. If the chemical name and/or quantity and/or location are classified information, it shall be maintained in a location so that it can be provided to emergency responders during an emergency. This could be in a secure area outside of the area the chemical is used or stored, or just outside the entrance to the location in a secure box.

(3) A site map will be attached to the inventory showing where inventoried substances are stored.

(4) The inventory and site map will be updated annually at a minimum, but as frequently as necessary to ensure it is current and accurately reflects those materials on site.

b. Hazardous or Toxic Agent Labeling. Procedures for assuring that containers used to store and transport hazardous or toxic agents around the project site are appropriately labeled to communicate the physical and health hazards associated with the agents in the containers. The pictorial labels required by the OSHA HazCom standard are acceptable labels.

c. Material Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) Management. Procedures to ensure MSDSs (SDSs) are maintained at project site for each chemical, combustible dust, or product. During the period of 2013 through 2016, the MSDS will be phased out and replaced with the SDS. The new SDSs content is mandated and allows for the toxicological hazard to be based on similar chemicals. For the purpose of this manual, either a MSDS or SDS meeting the criteria of the OSHA globally harmonized system standard is acceptable.

(1) Employees shall have access to the MSDSs (SDSs) and the safety and health protection procedures.

(2) Applicable information contained in the MSDS (SDS) shall be incorporated in the AHA/PHAs. If the chemical or toxic agent is used extensively in the operation, the applicable information shall be incorporated into the AHA and MSDS (SDS) shall be attached to the AHA.

(3) The information will be followed in the use, storage, and disposal of material and selection of hazard control and emergency response measures.

d. Employee Information and Training. Procedures to ensure employees are trained initially and periodically when use of hazardous or toxic agents is altered or modified to accommodate changing on-site work procedures. Training shall be provided to employees working with or in the area of use of any potentially hazardous chemical. Training shall cover the following topics:

(1) Requirements of the HazCom program on the project;

(2) The location of all hazardous or toxic agents at the project;

(3) Identification and recognition of hazardous or toxic agents on the project;

(4) Physical and health hazards of the hazardous or toxic agents pertinent to project activities;

(5) Protective measures employees can implement when working with project-specific hazardous or toxic agents.

(6) The location and content of the MSDS (SDS) for the chemicals. The content and meaning of the information provided on the MSDS.

(7) All workers in locations covered by the HazCom standard shall be briefed on the recent changes to the standard. These changes include MSDS to SDS, label content, the new pictographs on the labels, and an explanation of chemical banding.

06.B.02 When engineering and work practice controls or substitution are either infeasible or insufficient, appropriate PPE and chemical hygiene facilities shall be provided and used for the transportation, use, and storage of hazardous or toxic agents.

a. When irritants or hazardous substances may contact skin or clothing, chemical hygiene facilities and PPE shall be provided. PPE may include suitable gloves, face/eye protection and chemical protective suits.

(1) The qualified IH or other competent person shall determine the scope and type of PPE required.

(2) Special attention shall be given to selecting proper chemical protection when working with materials designated with a “skin” notation by OEL. Such materials may produce systemic toxic effects through absorption through unbroken skin. > See Section 5.

(3) Before commencing use of epoxy resins, concrete, or other dermatitis-producing substances, employees shall be made aware of the manufacturer’s skin protection recommendations. Barrier cream ointment or other skin protection measures recommended by the manufacturer for the specific exposure shall be available for use.

b. When eyes or body of any person may be exposed to hazardous or toxic agents, suitable facilities that comply with ANSI Z358.1, Emergency Eyewash and Shower Equipment, for quick drenching or flushing of the eyes and body shall be provided in the work area for immediate emergency use and shall be no more than 10 seconds from the hazardous material. > See ANSI Z358.1.

(1) Emergency eyewash equipment must be provided where there is the potential for an employee’s eyes to be exposed to corrosives, strong irritants, or toxic chemicals.

(2) The emergency eyewash equipment must irrigate and flush both eyes simultaneously while the operator holds the eyes open.

(3) The emergency eyewash equipment must deliver at least 0.4 gal (1.5 L) of water per minute for 15 minutes or more, providing a minimum of 6 gal (22.7 L) of water).

(4) Water used in emergency eyewashes and showers shall meet drinking water standards. When these items are exposed to the elements, steps will be taken to ensure the water does not freeze or become stagnate.

(5) Personal eyewash equipment may be used to supplement emergency washing facilities. They must not be used as a substitute. Personal eyewash fluids shall be visually inspected monthly to ensure they remain sanitary with no visible sediments.

(6) All plumbed emergency eyewash facilities and hand-held drench hoses shall be connected to an approved potable water supply and activated weekly and inspected annually to ensure that they function correctly and that the quality and quantity of water is satisfactory for emergency washing purposes.

c. When personal protective clothing is required:

(1) An area shall be established for the removal of the personal protective clothing which limits the spread of any chemical waste, dust, or fume;

(2) Workers shall be trained in the removal of personal protective clothing and equipment to prevent further spread or contamination.

06.B.03 Storage prior to transportation of hazardous chemicals, materials, substances and wastes shall be under the supervision of a qualified person.

a. Transportation, use, and storage of hazardous or toxic agents shall be planned and controlled to prevent contamination of people, animals, food, water, equipment, materials, and environment.

b. All storage of hazardous or toxic agents shall be in accordance with the recommendations of the manufacturer, OSHA and NFPA requirements and accessible only to authorized personnel.

c. Disposal of surplus or excess hazardous or toxic agents shall occur in a manner that will not contaminate or pollute any water supply, ground water, or streams; and will comply with Federal, State, and local regulations and guidelines.

d. Containers used to hold hazardous or toxic agents should not be used to hold other materials unless they have been managed or cleaned under hazardous waste and DOT regulatory requirements.

e. Every hazardous or toxic agent being transported for disposal shall be transported with a copy of the substance's MSDS (SDS) whenever applicable.

f. Persons who prepare shipments of hazardous chemicals, materials, substances and/or wastes that are defined as hazardous material under DOT regulations are required to be DOT trained, certified and issued an appointment letter in accordance with Defense Transportation Regulation 4500.9-R, Chapter 204.

06.B.04 A Process Safety Management (PSM) Program of highly hazardous chemicals shall be employed in accordance with 29 CFR 1910.119 or 29 CFR 1926.64 whenever a work activity involves:

a. A process that involves a chemical at or above the threshold quantities listed in Appendix A of the above-cited CFRs; or

b. A process that involves a flammable liquid or gas on site in one location in a quantity of 10,000 lb (4,535.9 kg) or more as defined in 29 CFR 1926.59(c), except:

(1) Hydrocarbon fuels used solely for workplace consumption as a fuel if such fuels are not part of a process containing another highly hazardous chemical covered by the standards cited above; or

(2) Flammable liquids stored in atmospheric tanks or transferred that are kept below their normal boiling point without benefit of chilling or refrigeration.

06.C Lead and Asbestos Hazard Control.

06.C.01 General.

a. No asbestos-containing materials (ACMs) shall be used or brought onto any USACE projects. Lead-based paints (LBP) shall only be used with written approval of the GDA or USACE SOHO and shall never be used inside a residence, child care facility, or medical treatment facility.

b. All construction or maintenance projects will be evaluated for the potential to contact ACM and LBP.

(1) Lead and asbestos sources are to be labeled as a lead or asbestos hazard that should not be disturbed without proper protection. If infeasible to label each source, a site map may be posted which points out the location of the lead and asbestos hazards.

(2) If the evaluation shows the potential for activities to generate unacceptable occupational exposure to LBP, a written lead compliance plan shall be written. The lead compliance plan shall be in accordance with 29 CFR 1910.1025 and 29 CFR 1926.62.

(3) If the evaluation shows the potential for activities to disturb ACM, an asbestos abatement plan shall be developed. The plan shall be in accordance with 29 CFR 1910.1001; 29 CFR 1926.1101; and 40 CFR 61, Subpart M.

(4) These plan(s) shall be developed as an appendix to the APP or, for USACE operations, the Project SOH Plan. The written plan(s) shall be submitted for acceptance by the GDA or local SOHO before beginning work.

06.C.02 Lead Compliance Plan. A lead compliance plan shall describe the procedures to be followed to protect employees from lead hazards while performing lead hazard control activities. The Plan shall address the following:

a. A description of each work activity in which lead is emitted, to include equipment and materials used, controls in place, crew size, job responsibilities, operating procedures, and maintenance practices, work activity locations and lead-containing components keyed to the project drawings;

b. Description of means to be used to achieve exposure compliance, including any engineering controls;

c. Employee exposure assessment procedures to monitor and document employee lead exposure. Exposure monitoring shall include two types:

(1) Initial determination (may be omitted if there is sufficient objective/historical data showing action level compliance according to the requirements); and

(2) Continued exposure monitoring required as a result of initial exposure determinations.

d. Protective clothing, housekeeping procedures to prevent spread of lead contamination both in and beyond the lead hazard control area, and hygiene facilities and practices to prevent employees from inadvertent ingestion of lead;

e. Administrative controls to limit employee exposure to lead, including employee rotation schedule to be employed, if engineering controls or PPE fail to eliminate exposures exceeding the PEL;

f. Medical surveillance procedures to monitor employee exposures and ensure fitness for wearing respiratory protection;

g. Competent person (CP) and employee training required;

h. Detailed sketches identifying lead hazard control areas, including decontamination areas and facilities, critical barriers, and physical and air distribution boundaries;

i. Perimeter or other area air monitoring outside or adjacent to the regulated area;

j. Security required for each lead hazard control area; and

k. Waste generation, characterization, transportation, and disposal (including recordkeeping).

06.C.03 Asbestos Abatement Plan. An asbestos abatement plan shall describe procedures to be followed to protect employees from asbestos hazards while performing work that will disturb ACM. It shall address the following:

a. A description of each activity where asbestos will be disturbed, including OSHA class of work, equipment required, controls to be used, crew size, job responsibilities, maintenance practices, and locations keyed to the project drawings;

b. The method of notification of other employers at the worksite;

c. A description of regulated areas, types of containment, decontamination unit plan, and engineering controls;

d. Air monitoring plan - personal, environmental and clearance. Employee exposure assessment procedures shall address monitoring and documenting employee exposures.

(1) An initial determination (may be omitted if there is sufficient objective/historical data showing compliance with the requirements);

(2) Continued exposure monitoring may be required as a result of initial exposure determinations;

(3) Environmental monitoring shall demonstrate the absence of asbestos fiber migration outside the regulated area; and

(4) Clearance monitoring to document that the area has met specified clearance criteria.

e. PPE, including respirators and clothing;

f. Housekeeping procedures that address prevention of spread of contamination both in and beyond the regulated area;

g. Hygiene facilities and practices;

h. CP and employee training required;

i. Medical surveillance, as required, to assess exposure and to monitor employee fitness to perform work tasks while wearing PPE to include respiratory protection devices;

j. Waste generation, containerization, transportation, and disposal (including recordkeeping); and

k. Security, fire, and medical emergency response procedures.

06.D Hot Substances.

➢ Note: For heating devices and melting kettles, see Section 09.E.

06.D.01 Protection from Hot Substances. Hazards from hot substances include increased inhalation and skin hazards and burns from the heat. When working with hot substances the following shall be considered:

a. PPE (respirators, gloves, etc.) shall be evaluated for efficiency in hot atmospheres and protectiveness from heat as well as the chemical hazard;

b. Heat stress precautions and measurements shall be taken as required by Section 06.I;

c. Location where hot substances are heated shall be located away from any ventilation intake air vents. If hot substances are being applied to a roof, the ventilation intake air vents shall be temporarily relocated so as to prevent the uptake of the fumes into the building or the work shall be completed at a time when the building is not occupied.

06.D.02 Transporting and handling hot substances.

a. Runways or passageways, clear of obstructions, shall be provided for all persons carrying hot substances.

b. Hot substances shall not be carried up or down ladders.

c. When hoists are used to raise or lower hot substances, attention shall be given to assuring that the hoisting mechanism is adequate for the loads imposed and is securely braced and anchored.

d. All persons handling hot substances shall be provided protection against contact with, or exposure to radiant heat, glare, fumes, and vapors of the substances. At a minimum, roofers handling roofing materials shall be fully clothed including long sleeved shirts, shoes secured and at least 6 in (15 cm) in height, and gloves up to the wrist. > See Section 5.

e. Containers for handling and transporting hot substances shall be of substantial construction (minimum 24-gauge sheet steel), free from any soldered joints or attachments, and shall not be filled higher than 4 in (10.1 cm) from the top.

f. Piping used to transport hot substances shall have an entry and exit shut off valve and shall be made of flexible metallic hoses fitted with insulated handles. In cold climates, piping shall be insulated to prevent material from solidifying on the inside of the pipe.

06.E Harmful Plants, Animals and Insects.

06.E.01 Protection against hazards from insects and/or animals harboring fleas or disease-carrying insects shall include, as applicable, the following:

a. PPE such as netted hoods, leather work gloves, and high-top work boots worn in conjunction with trousers and long-sleeved shirts;

b. Clothing treated at the factory with DEET or Permethrin are recommended in areas of high insect population;

c. Drainage or spraying of breeding areas;

d. Destroying or flagging (marking as hazard) of nests;

e. Smudge pots and aerosols for protecting workers and small areas;

f. Elimination of actions or conditions that propagate insects or vermin;

g. Extermination measures by a certified pesticide applicator or, for over the counter items, following the instructions on the label;

h. Approved first aid procedures for employees; employees allergic to bee stings shall be encouraged to self identify to the supervisor and to carry an EpiPen;

i. Inoculation against diseases known to be a local hazard; and

j. Instruction in recognition of the animals and insects and their common nesting habits, aggressiveness, etc.

06.E.02 In areas where there is exposure to poisonous snakes or lizards, employees shall be required to:

a. Wear snake chaps or knee-high snake boots worn in conjunction with trousers and long-sleeved shirts;

b. Be trained in recognition of the snakes and their common nesting habits, aggressiveness, etc.; and

c. Be trained in the proper first aid procedures for bites.

06.E.03 In areas where employees are exposed to poisonous plants, the following protective measures, as applicable, shall be provided:

a. Removal or destruction of plants, where practical;

b. Appropriate protective clothing such as gloves;

c. Protective ointments;

d. Soap and water for washing exposed parts; and

e. Instruction in recognition and identification of the plants.

06.E.04 When burning poisonous plants, controls shall be instituted to prevent contact with or inhalation of toxic elements contained in the smoke.

06.F Ionizing Radiation.

06.F.01 Anyone who procures, uses, possesses, transports, transfers, or disposes of radioactive materials or radiation generating devices shall:

a. Notify, in writing, the GDA or USACE Command Radiation Safety Officer (RSO) of the nature of the material or device, a description of intended use, the location of use and storage, and all transportation and disposal requirements;

b. Secure appropriate authorization or permit if any radioactive material or a radiation generating device is to be used on a DoD installation (a lead time of at least 45 days should be allowed for obtaining a DoD authorization or permit);

c. Provide to the GDA or USACE Command RSO a copy of all US Nuclear Regulatory Commission (NRC) or Agreement State licenses, the Army Radiation Authorization (ARA), Army Radiation Permit, and reciprocity forms (to include NRC Form 241), as applicable.

d. When a USACE Radiation Safety Program exists at a location/facility that has potential Radon-222 emissions from radioactive material use, the more restrictive of the specific limits, the specific license condition or the NRC requirements in 10 CFR 20 for Radon-222 shall apply. If USACE employees work in a building, structure, or tunnel that has naturally occurring Radon-222, then OSHA requirements in 29 CFR 1910.1096 are applicable as specified in Section 06.F.14, Radon.

➢ Note: See OSHA Directive CPL 02–00–086, Memorandum of Understanding between OSHA and the U.S. Nuclear Regulatory Commission, 22 December 1989, for a delineation of radiation sources regulated by each agency.

06.F.02 Qualified Personnel.

a. Operations involving radiation hazards or use of radioactive material or radiation generating devices shall be performed under the direct supervision of a RSO, who is qualified and responsible for radiological safety.

b. The RSO will be technically qualified and will meet the experience, training, and education requirements listed below:

(1) Formally trained in radiation protection topics including the following: physics of radiation; radiation's interaction with matter; mathematics necessary for the subject matter; biological effects of radiation; type and use of instruments for detection, monitoring and surveying radiation; radiation safety techniques and procedures; and use of time, distance, shielding, engineering controls, and PPE to reduce radiation exposure;

(2) Hands-on training in the uses of equipment, instrumentation, procedures, and theory used in their unit;

(3) Knowledge of applicable regulations including those of the NRC, EPA, DOE, OSHA, DOT and DoD, to include all applicable DoD Components, pertaining to radioactive materials, radiation generating devices, and radioactive and mixed waste; and

(4) Knowledge of the USACE Radiation Safety Program, and recordkeeping requirements for work with radioactive materials and radiation generating devices.

06.F.03 Radiation Safety Program.

a. Operations involving radiation hazards, and users of radioactive material or radiation generating devices, shall develop and implement a Radiation Safety Program.

(1) The program shall be managed by the RSO and based on sound radiation safety principles that shall keep occupational doses and doses to the public ALARA.

(2) The RSO is responsible for performing or ensuring the performance of an annual review of the program. Documentation of the review shall be retained for two (2) years.

(3) A Radiation Safety Committee (RSC) shall be established in accordance with 10 CFR 20 and DA PAM 385-24 as part of the Radiation Safety Program.

b. All personnel entering an area where radioactive material or radiation generating devices are used, and where there is a potential for an individual to receive a Total Effective Dose Equivalent (TEDE) of 100 mrem or more in one (1) year, shall receive instruction in:

(1) The presence of the material or device;

(2) Health and safety problems associated with exposure to radiation, including the potential effects of radiation on a pregnant female, the fetus, or embryo;

(3) Precautions and controls used to control exposure;

(4) Proper use of instrumentation and dosimetry in the area;

(5) The Radiation Safety Program required in 06.F.03.a; and

(6) Their rights and responsibilities.

c. Users of radioactive material or radiation generating devices without a potential to receive a TEDE of 100 mrem or more in one (1) year and visitors to a site shall coordinate with the RSO for appropriate training.

d. The Radiation Safety Program will include plans and procedures for handling credible emergencies involving radiation and radioactive materials. This will include coordination with civilian and/or military emergency response organizations as necessary.

06.F.04 Dose Limits.

a. Occupational dose limits shall be based on the TEDE. > See Table 6-1.

(1) An annual (calendar year) limit that is the more limiting of: 5 rem [0.05 sieverts (Sv)] TEDE, or the sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue of 50 rem (0.5 Sv), or 15 rem (0.15 Sv) to the lens of the eye, or 50 rem (0.05 Sv) shallow dose equivalent to the skin or any extremity.

(2) Without the written approval of the USACE Radiation Safety Staff Officer (RSSO), the annual occupational dose shall not exceed the more limiting of: 0.5 rem (0.005 Sv) TEDE, or the sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue of 5 rem (0.05 Sv), or 1.5 rem (0.015 Sv) to the lens of the eye, or 5 rem (0.05 Sv) shallow dose equivalent to the skin, or any extremity.

TABLE 6-1

Occupational Dose Limits

Body part	Annual limits with RSSO approval	Annual limits without RSSO approval	Suggested ALARA limits
Whole body	5 rem (0.05 Sv)	0.5 rem (0.005 Sv)	0.1 rem (0.001 Sv)
Individual organ	50 rem (0.5 Sv)	5 rem (0.05 Sv)	0.5 rem (0.005 Sv)
Lens of eye	15 rem (0.15 Sv)	1.5 rem (0.015 Sv)	0.15 rem (0.0015 Sv)
Skin or extremity	50 rem (0.5 Sv)	5 rem (0.05 Sv)	0.5 rem (0.005 Sv)

(3) To keep doses ALARA, the user shall set administrative action levels below the annual dose limits. These action levels shall be realistic and attainable. Suggested action levels are the more limiting of: 0.1 rem (0.001 Sv) TEDE, or the sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue of 0.5 rem (0.005 Sv), or 0.15 rem (0.0015 Sv) to the lens of the eye, or 0.5 rem (0.005 Sv) shallow dose equivalent to the skin or any extremity.

(4) Any exposure in excess of an ALARA limit requires investigation by the RSO.

b. In accordance with DA PAM 385-24, planned special exposures shall not be performed.

c. No employee under 18 years of age shall receive occupational exposure to ionizing radiation (excluding exposure to Radon-222).

d. The dose to a declared pregnant employee shall not exceed 0.5 rem (0.005 Sv) during the entire gestation period and efforts shall be made to avoid variations in a uniform monthly exposure rate. If the dose to the embryo/fetus is between 0.05 rem and 0.5 rem at the time of declaration, then dose to the embryo/fetus is limited to 0.05 rem for the remainder of gestation.

06.F.05 Radiation Monitoring, Surveys, and Dosimetry.

a. Users of radioactive material or radiation generating devices shall conduct surveys and monitoring to ensure occupational dose limits are not exceeded.

b. Instruments used for radiation monitoring and surveying shall be:

(1) Available and used whenever radioactive material or radiation generating devices are used;

(2) Properly calibrated at least annually to a National Institute of Standards and Technology (NIST) traceable source;

(3) Appropriate for the type and intensity of the radiation surveyed;

(4) Operationally checked against a dedicated check source before each use; and

(5) The RSO must maintain at least two survey instruments to accommodate maintenance and calibration downtime.

c. Users of radioactive material or radiation generating devices and visitors or personnel performing work tasks in the area shall coordinate with the RSO for appropriate dosimetry use whenever any of the following situations exist:

(1) An individual enters a Radiation Area (> 5 mrem [50 microsieverts (μSv)] in any one (1) hour at 1 ft (30 cm) from the radiation source), or a High Radiation Area (> 100 mrem [1 mSv] in any one (1) hour at 1 ft (30 cm) from the radiation source), or a Very High Radiation Area (>500 rad [5 Gray (Gy)] in 1 hour at 3.3 ft (1 m) from the radiation source);

(2) An individual has the potential to receive greater than the ALARA limits established pursuant to Section 06.F.04.a.(3) in 1 year.

d. All external dosimetry shall be processed by a National Voluntary Laboratory Accreditation Program (NVLAP) certified laboratory. USACE personnel shall use dosimetry provided by the Army Dosimetry Center.

e. Users of unsealed radioactive material sources shall institute an internal dosimetry program:

(1) When there is a potential for an employee to receive an internal dose of greater than 0.5 rem (5 mSv) per year;

(2) That is reviewed and approved by a qualified health physicist, and

(3) That contains provisions for a pre-exposure bioassay, a bioassay method capable of detecting internal radioactive materials, at a level below 10% of the annual limits of intake (ALI) listed in Appendix B of 10 CFR 20 for each radionuclide used, appropriate action levels for requiring additional bioassay, actions for individuals found to have internally deposited radioactive materials, and provisions for post-exposure bioassay.

06.F.06 Access, Storage, and Control.

a. All radiological devices and radioactive materials shall be designed, constructed, installed, used, stored, transported, and disposed of in such a manner to ensure personnel exposures are kept ALARA.

b. Users of radioactive materials or radiation generating devices shall post signs and control access to radiation areas in accordance with Section 06.F.08.

c. Where radiation levels exceed 2 mrem (20 μSv) in any 1 hour period, users shall use engineering controls, shielding, access time limitation, and/or physical separation to keep doses to the public ALARA.

d. Users shall secure radioactive material and radiation generating devices against theft or unauthorized use.

e. Storage shall be in accordance with any license or permit requirements.

f. Radioactive material and radiation generating devices, not in storage, shall be under constant control and surveillance.

g. Operations involving regulated radiation hazards or users of regulated radioactive material or radiation generating devices shall conduct surveys to ensure that the public dose limit of 0.01 rem (0.0001 Sv) is not exceeded.

06.F.07 Respiratory Protection and other Controls.

a. Users of radioactive material shall, to the extent practicable, institute process or engineering controls to limit concentrations of radioactive materials in air.

b. Where process or engineering controls are unable to control airborne radioactive material concentrations, users shall increase monitoring and limit intakes of radioactive materials through control of access, limitation of exposure times, use of respiratory protection equipment, or other controls.

c. The use of respiratory protection equipment shall be in compliance with Section 05.G of this manual, and shall be limited by the protection factors listed in Appendix A of 10 CFR 20.

06.F.08 Signs, Labels, and Posting Requirements.

a. The RSO shall post in a conspicuous location a sign or signs bearing the standard radiation symbol shown in Figure 8-7 and the following words:

(1) "Caution, Radiation Area" - areas where radiation field is equal to or greater than 5 mrem (0.05 mSv) in any 1 hour and less than 100 mrem (1 mSv) in any 1 hour at 30 cm from the radiation source;

(2) "Caution, High Radiation Area" - areas where radiation field is equal to or greater than 100 mrem (1 mSv) in any 1 hour at 12 in (30 cm) from the radiation source and less than 500 rads (5 Gy) in any 1 hour at 3.3 ft (1 m) from the radiation source;

(3) "Grave Danger, Very High Radiation Area" - areas where the radiation field is equal to or greater than 500 rads (5 Gy) in any 1 hour;

(4) "Caution, Airborne Radioactivity Area" – rooms, enclosures, or areas where airborne radioactive material concentrations are greater than the derived air concentration (DAC) limits listed in 10 CFR 20, Appendix B or where concentrations (excluding Radon-222) exist to such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6% of the annual limit on intake (ALI) or 12 DAC-hours; or

(5) "Caution, Radioactive Material" – areas or rooms where quantities of radioactive materials in excess of ten times the 10 CFR 20, Appendix C quantities are used or stored.

b. Users who receive or expect to receive a package containing radioactive material shall follow the package receipt procedures listed in 10 CFR 20.1906.

c. When a site has an NRC license, the RSO shall post an NRC Form 3 in a location visible to all employees who work with or around radioactive materials

06.F.09 Radioactive Waste Disposal

a. Radioactive sealed sources (and gauges) when no longer needed may be returned (transferred) to the manufacturer. The local USACE RSO must be notified and any applicable licenses or permits amended or terminated.

b. Radioactive waste disposal shall be coordinated with the GDA. For disposal actions specific to USACE operations and activities the GDA or Project Manager shall coordinate with the USACE Command RSO and the USACE Environmental and Munitions Center of Expertise.

c. Tritium (H-3) and Carbon-14 used in liquid scintillation counting, at concentrations below 0.05 microcuries per gram (μCi/g), may be disposed without regard to its radioactivity. (Note: Many liquid scintillation fluids are hazardous wastes and must be disposed of as such.)

06.F.10 Records.

a. All users of radioactive material or radiation generating devices shall prepare and maintain records of the Radiation Safety Program for three (3) years after termination of the license or permit.

b. For any individual for whom monitoring was required by Section 06.F.05, the RSO shall prepare and maintain documentation of that person's occupational dose during the current year. The RSO shall also attempt to obtain records of cumulative occupational radiation dose.

c. All users of radioactive material or radiation generating devices shall prepare and maintain records of all calculated or monitored radiation dose to individual members of the public so as to document compliance with Section 06.F.05.

06.F.11 Reports.

a. Any loss, theft, damage, or overexposure shall immediately upon discovery be reported to the RSO who will then file a report (if required) with NRC in accordance with the requirements of 10 CFR 20.

b. Mishaps involving radioactive material or radiation generating devices shall be reported immediately to the RSO and the USACE RSSO.

c. Annual reports shall be issued by the RSO for each individual USACE radiation employee with the recorded or calculated dose assigned to the USACE individual for the year or specific work project. These shall be maintained in such a manner that accumulated exposure can be determined at a future date.

06.F.12 Transportation.

a. Users of radioactive material shall comply with the requirements of the DOT for inter- and intra-state transport contained in 49 CFR.

b. Persons who prepare shipments of radioactive materials that are defined as hazardous material under DOT regulations are required to be trained (49 CFR 173.1(b)), certified, and issued an appointment letter in accordance with DoD 4500.9-R, Chapter 204.

06.F.13 Medical surveillance. > See Section 33 for requirements specific to work conducted under the provisions of 29 CFR 1910.120 and 29 CFR 1926.65.

a. Medical examinations are not routinely required before occupational exposure to ionizing radiation. For USACE personnel, a medical examination shall be conducted in accordance with DA PAM 40-501, when deemed necessary, by a physician, the RSO, or other regulations. The RSO will coordinate with supporting medical personnel to help ensure that personnel receive appropriate occupational health surveillance.

b. All cases of overexposure and suspected ingestion or inhalation of radioactive materials shall be referred to a physician for examination.

06.F.14 Radon-222.

a. If a work area is occupied for 40-hours per week or more by an individual 18 years of age or older, and average natural occurring radon-222 concentration is greater than 100 pCi/L, then number of hours worked in the area by the individual shall be reduced or engineering controls introduced to reduce the radon-222 concentration. If the exposure is due to a regulated radiation source, the requirements of the NRC license shall apply. > See 29 CFR 1910.1096(c)(1) which references 10 CFR 20 Appendix B Table 1 and Table 2.

b. Any work area in a structure, building, or tunnel, wherein workers may be reasonably expected to be exposed to naturally occurring radon-222 exceeding 25 pCi/L averaged over a 40-hour work week, is an Airborne Radioactivity Area and shall be posted in accordance with 29 CFR 1910.1096(e)(4)(ii).

c. All individuals working in or frequenting any portion of an area posted per Section 06.F.14.b shall receive instruction regarding exposure to radiation as per 29 CFR 1910.1096(i).

06.G Non-ionizing Radiation, Magnetic and Electric Fields.

06.G.01 Lasers.

a. Only qualified and trained employees may be assigned to install, adjust, and operate laser equipment. Proof of qualification of the laser equipment operator shall be in the operator's possession during operation. A qualified employee shall design or review for adequacy all radiation safety Standard Operating Procedure (SOP).

b. Laser equipment shall bear a label to indicate make, maximum output, and beam spread.

c. Areas in which lasers are used shall be posted with standard laser warning signs. > See Figures 8-5 and 8-6

d. Employees whose work requires exposure to laser beams shall be provided with appropriate laser safety goggles that will protect for the specific wavelength of the laser and be of optical density adequate for the energy involved, as specified in Table 6-2. Protective goggles shall bear a label identifying the following data: the laser wavelengths for which use is intended, the optical density of those wavelengths, and the visible light transmission.

TABLE 6-2

Laser Safety Goggle Optical Density Requirements

Intensity, continuous wave maximum power density (watts/cm^2)	Attenuation	
	Optical density	Attenuation factor
0.01	5	10,000
0.1	6	100,000
1.0	7	1,000,000
10.0	8	10,000,000

e. Beam shutters or caps shall be used, or the laser turned off, when laser transmission is not required. When the laser is left unattended for a period of time (e.g., during lunch hour, overnight, or at change of shifts) the laser shall be turned off.

f. Only mechanical or electronic means shall be used as a detector for guiding the internal alignment of the laser.

g. The laser beam shall not be directed at employees: whenever possible, laser units in operation shall be set above the heads of employees.

h. When it is raining or snowing or when there is dust or fog in the air, the operation of laser systems shall be prohibited (as practical); during such weather conditions employees shall be kept out of range of the areas of source and target.

i. Employee exposure to laser power densities shall be within the TLVs as specified by the ACGIH in "Threshold Limit Values and Biological Exposure Indices."

j. Only Class 1, 2, or 3a lasers may be used as hand-held pointing devices. Lasers used as pointing devices (e.g., during briefings) shall not be directed toward employees and shall be handled and stored in accordance with the manufacturer's recommendations.

k. Suspected LASER eye injuries: Immediately evacuate personnel suspected of experiencing potentially damaging eye exposure from LASER radiation to the nearest medical facility for an eye examination. LASER eye injuries require immediate specialized ophthalmologic care to minimize long-term visual acuity loss. Medical personnel should obtain medical guidance for LASER injuries from the Tri-Service LASER Incident Hotline, (800) 473-3549 (24-hour phone line).

06.G.02 Radio frequency and electromagnetic radiation.

a. Ensure that no employee is exposed to electric or magnetic fields, radio frequency (RF) including infrared, ultraviolet, and microwave radiation levels exceeding the values listed in the ACGIH Threshold Limit Values and Biological Exposure Indices.

b. Routine use of RF protective clothing to protect personnel is prohibited.

(1) Protective equipment, such as electrically insulated gloves and shoes for protection against RF shock and burn, or for insulation from the ground plane, is permissible when engineering controls or procedures cannot eliminate exposure hazards.

(2) Users will identify, attenuate, or control potentially hazardous RF electromagnetic fields and other radiation hazards associated with electronic equipment by engineering design, administrative actions, or protective equipment, (in that order), or a combination thereof. Use process and engineering controls before PPE to protect employees.

c. All personnel routinely working with RF emitting equipment where exposures may exceed TLVs will receive training in RF hazards, procedures for minimizing these hazards, and their responsibility to limit potential overexposures. Operator's manuals, Training Orders, Equipment SOPs, etc. will be available for all RF generating equipment and safety guidance will be followed.

d. Whenever personnel are potentially exposed to RF fields exceeding PELs, the fields will be measured and evaluated using Institute of Electrical and Electronics Engineers (IEEE) guidance. District and/or project safety personnel will use this information and document RF environments. Where multiple RF electromagnetic radiation emitters are located in fixed arrangements, RF evaluation data will include a determination of weighted contributions from expected simultaneously operated emitters.

0.6.H Ventilation and Exhaust Systems.

06.H.01 Portable and Temporary Ventilation Systems.

a. All portable or temporary ventilation systems shall remove dusts, fumes, mists, vapors and gases away from the worker and the work environment or provide air to prevent an oxygen deficient atmosphere.

b. Portable or temporary ventilation systems shall be used as designed by the manufacturer. All hoses shall be only as long as the maximum allowed by the manufacturer to provide the required air flow at the supply or exhaust point. If adding or changing hoses, only hoses and/or connectors shall be used that are comparable and compatible with the hoses and connectors provided by the manufacturer.

c. Make-up air for air supply ventilation systems shall draw air free of contaminants and away from any potential contaminant source.

d. Any portable or temporary ventilation system and the locations where the systems are to be used shall be approved by the GDA or SOHO before use. Manufacturer information or design criteria shall be provided with the request for approval.

e. Airborne contaminants created by portable or temporary ventilation systems (such as drills, saws, and grinding machines) in concentrations exceeding acceptable safe limits shall be effectively controlled at the source. > See Section 06.A.03.

f. The use of high efficiency, filtered, recirculated ventilation units shall be allowed when:

(1) The filtration system lowers the levels of any of the toxic fumes or dust from the operation to less than half of the OEL. This shall be documented by an IH or CP through sampling for the contaminants.

➢ Note: Welding, carbon monoxide, ozone, and carbon dioxide are common contaminants that are not filtered out by most filtration devices.

(2) The unit and filtration are regularly maintained and the maintenance procedure and schedule is written and documented when maintenance is completed.

(3) The air is not recirculated into a confined space.

(4) The contaminant is not beryllium or chromium. Fumes or particulate from beryllium or chromium are not to be filtered and recirculated.

06.H.02 Ventilation systems shall be operated and maintained in such a manner to ensure the maintenance of a volume and velocity of exhaust air sufficient to gather contaminants and safely transport them to suitable points for removal.

06.H.03 Duration of operation.

a. Ventilation systems shall be operated continuously during operations when persons are exposed to airborne contaminants or explosive gases at or above acceptable safe limits as defined in Section 06.A.01 or as otherwise specified by this manual, referenced standards, or regulations.

b. Ventilation systems shall remain in operation for a period of time after the work process or equipment has ceased to ensure the removal of any contaminants in suspension or vaporizing into the air.

06.H.04 Local exhaust ventilation systems shall be periodically evaluated to ensure that proper contaminant capture, movement through the system and filtration or exhaust to the outside.

06.H.05 Dusts and refuse materials removed by exhaust systems or other methods shall be disposed of in a manner that will not create a hazard to employees or the public and in accordance with Federal, State, and local requirements.

06.H.06 Ventilation systems used to remove hazardous dusts, fumes, gases, or substances shall be evaluated annually to determine if the system requires cleaning. The cleaning of the ventilation system shall be part of the written housekeeping program section of the Project SOH Plan or APP.

06.I Abrasive Blasting.

06.I.01 General. Silica sand shall NOT be used as an abrasive blasting media. Alternative abrasive blasting materials are available and listed in Table 6-3. Depending on the application, one of these alternative materials is suggested for use as an abrasive blasting media.

a. Abrasive blasting operations shall be evaluated to determine composition and toxicity of the abrasive and the dust or fume generated by the blasted material, including surface coatings. This determination shall be documented on the AHA (Activity Hazard Analysis) developed for the abrasive blasting activity.

b. Written operating procedures shall be developed and implemented for abrasive blasting operations, including pressurized pot procedures (filling, pressurizing, depressurizing, and maintenance and inspection). The procedures should be added as an appendix to the APP.

c. The concentration of respirable dust and fume in the breathing zone of individuals exposed to the blasting operation shall be maintained below any OEL for the material being blasted and the blasting agents or its byproducts.

d. No employee will be allowed to work in abrasive blasting operations unless he has met the medical surveillance and training and experience requirements, and has been provided the appropriate PPE.

e. All production and control systems used in a stationary abrasive-blasting process shall be designed or maintained to prevent escape of airborne dust or aerosols in the work environment and to ensure control of the abrasive agents.

f. Pressurized systems and components shall be inspected, tested, certified and maintained in accordance with the requirements of Section 20.

g. Engineering controls for noise and dust shall be used even if they cannot reduce the exposures to below OEL (significantly reduces noise and dust exposure to the employees).

TABLE 6-3

Abrasive Blasting Media: Silica Substitutes

Applications	Media	Advantages
Cleaning Hard Metals (Titanium); Removing Metal Etch Glass; Carve Granite	Aluminum Oxide	Recyclable
General Paint Removal Stripping Aircraft Skins Cleaning Surfaces in Food Processing Plants Removing Paint from Glass	Baking Soda (Sodium Bicarbonate)	Less Material Used/Less Cleanup Low Nozzle Pressures (35-90 PSI) Non-Sparking Water Soluble
General Paint, Rust, & Scale Removal from Steel Paint Removal from Wood Exposure of Aggregates	Coal Slag	Less than 1% Free Silica Inert, Fast Cutting Creates Anchor Profile
General Paint, Rust & Scale Removal from Steel Paint Removal from Wood	Copper Slag	Rapid Cutting
Deburring Paint & Rust Removal from Wood & Metal	Corn Cob Granules	Low Consumption Low Dust Levels Biodegradable
Cleaning Aircraft Parts Cleaning Exotic Metals	Dry Ice (Carbon Dioxide)	No Residue Remains Minimal Cleanup
General Paint, Rust & Scale Removal from Steel	Garnet	Lower Nozzle Pressure (60-70 PSI) Low Dust Levels Fast Cleaning Rates Can be Recycled 6-7 Times Low Free Silica
Cleaning & Polishing Deburring	Glass Beads	Uniform Size and Shape Recyclable Provide High Luster Polished Surface
General Paint, Rust & Scale Removal from Steel	Nickel Slag	Rapid Cutting
Cleaning Soft Materials (e.g. Aluminum, Plastic, Wood) Cleaning Surfaces in the Petroleum Industry	Nut Shells	High Removal Speed Non-Sparking Low Consumption
Clean Light Mill Scale/Rust from Steel 2.5 MIL Profile & Finer	Olivine	Low Chloride Ion Level Low Conductivity

06.I.02 Blast Cleaning Enclosures and Rooms.

a. The ventilation in all blast enclosures shall be measured annually to confirm the flow is adequate and the system does not require cleaning or maintenance. Exhaust systems shall be part of a regular cleaning and maintenance program.

b. All air inlets and access openings shall be baffled to prevent the escape of abrasive agent and contaminant and the recommended continuous airflow into the air inlets is a minimum of 250 fpm (4.6 kph).

c. Negative pressure shall be maintained inside during blasting.

d. The rate of exhaust shall be sufficient to provide prompt clearance of the dust-laden air within the enclosure after cessation of the blasting.

e. If abrasive blasting is automated, the blast shall be turned off before the enclosure is opened. The exhaust system shall be run for a sufficient period of time to remove the dusty air within the enclosure to minimize the escape of dust into the workroom and prevent any health hazard.

f. In the room, a cleanup method other than broom sweeping or compressed air blowing shall be used to collect the abrasive agent after blasting (e.g., vacuum cleaning). If the blasting agent is removed manually, appropriate personal protective equipment, including respiratory protection shall be worn and not removed until outside the blasting room.

06.I.03 Blasting without Enclosures.

a. If abrasive blasting must be performed inside a building without enclosures, respiratory protection shall be provided for all employees in the area. Portable engineering control devices shall be used at the location to collect the entire used abrasive agent as it is applied.

b. When airborne abrasive-blasting dust becomes sufficiently heavy in an area to cause a temporary safety hazard by reduced visibility, or discomfort to the unprotected employees not engaged in abrasive blasting, such operations in the affected area shall be discontinued until the airborne dust is removed by exhaust ventilation and the settled dust has been removed from the horizontal surfaces in the area. If such operations have to continue, appropriate respiratory protection shall be provided to those employees remaining in the area.

c. Abrasive materials shall not be allowed to accumulate on aisles and walkways to create a slipping hazard.

d. If wet abrasive blasting is employed to reduce dust exposures, the aerosols produced and the dried residues that become airborne might be potential hazards and shall be considered.

06.I.04 Confined spaces. Abrasive blasting work conducted in a confined space shall be performed in accordance with Section 34. If the space is mechanically ventilated, means shall be provided to collect dust before release to the open atmosphere.

06.I.05 Blasting Outdoors.

a. Work completed outside has been shown to create exposures to health hazards for the worker and other trades in the area. Air and noise samples shall be taken to document the level of exposure to the worker and the workers in the area, unless similar operations documented no exposure. Blasters shall be protected in a manner equivalent to Section 05 and/or 29 CFR 1910.94(a)(5), whichever is more stringent.

b. Engineering controls and work practices, such as wet blasting methods, shall be used to prevent the dust cloud from spreading to other work areas. Check with Local and State requirements which may add restrictions to outdoor abrasive blasting. If the surface to be blasted is painted or contains high levels of silica and/or heavy metals, such as lead, chromium, or cadmium, an enclosure may be required to prevent disbursement of the hazard.

c. Hearing protection and respiratory protection shall be available to all employees in the area unless noise and air sampling documents the workers are not exposed to the blasting agent or contaminants from the blasted surface.

06.I.06 Personal Protective Equipment (PPE).

a. Selection and use of PPE shall be in accordance with Section 05. If reusable coveralls are used, they shall be vacuumed before all breaks and removed at the end of the shift. Clothes shall not be taken home to be cleaned by the worker or family, but shall be laundered by the employer.

b. Air-supplied helmets, blast helmets/hoods, dust respirators, ear muffs, safety boots or toe guards, durable coveralls, closeable at wrists, ankles, and other openings, and safety glasses should be an individual issue item, identified with and used by only one employee. Such equipment may be reissued to another employee only after complete cleaning, repair, and decontamination.

c. Means shall be provided to clean and store air-supplied respiratory equipment after each shift of use. Storage shall be in a clean enclosure such as locker, footlocker, plastic container or zip-lock type bag. Employees shall be trained to maintain issued equipment in clean and good working condition.

d. Replacement of prescription or plano safety glasses shall be made if multiple pitting or etching is visible in the center of the lenses.

e. Replacement of faceplates in air-supplied helmets and blast helmets/hoods shall take place when a side-on light source produces obscuring visible reflections and glare from the etched spots and pit holes in the faceplate. Mylar coating, or similar transparent plastic material, is recommended to protect the glass or plastic faceplate.

f. Length of air hose may not be altered from the manufacturer's specifications.

g. Daily checks shall be performed by the wearer of PPE to maintain it in good working condition. Rips, tears, and openings of PPE that expose skin to abrasive agents shall be mended or replaced. Functional tests for leaks, proper respiration, and good connections shall be performed on the complete air-supply system.

h. Air supply - portable.

(1) The breathable air supplied to the blast helmet or hood shall be drawn from an oil and carbon monoxide free air compressor. The compressor used for blasting cannot be used for breathing air. Breathable air-supply system should be equipped, if possible, with audible alarm at the helmet or hood to warn the user of low air pressure.

(2) Hearing protection. Suitable hearing protection, capable of attenuating employee noise exposure as discussed in Section 05.C, shall be worn inside the blast helmet or hood unless hearing protection is an integral part of such helmet or hood.

(3) Heat stress. Cooling of breathable air, supplied to the blast helmets/hoods, should be considered depending on season and employee exposure to heat sources.

6.J Heat/Cold Stress Management.

06.J. General. Employer's APP or Project SOH plans shall include control of heat and/or cold stress hazards, as appropriate for the season and work location. Heat/Cold Stress sections in the APP or Project SOH plans, shall take into consideration the influence of environmental conditions, workload, and personal factors.

06.J.01 Heat Stress: The APP or Project SOH Plan and individual AHAs shall address heat stress under the following working conditions:

a. CONUS and OCONUS locations when hot/dry or hot/humid environments are forecasted;

b. Work in conducted in semi-permeable or impermeable clothing and/or heavy clothing such as arc-rated suits;

c. Work in confined work environment with minimal air movement;

d. Work when heat index is greater than 75° F (24° C) or dry temperature is 75° F with 55% humidity or Wet-Bulb-Glove Temperature (WBGT) exceeds the action level for various exertion levels in Table 2 of the TLV and Action Limit for Heat Stress Exposure in the current ACGIH TLV/ BEI booklet;

e. Work around heat-producing equipment, furnaces, boilers, asphalt pots, engines, compressors, etc.

06.J.02 Heat Stress Monitoring Plan (HSMP). The written HSMP shall be incorporated into the APP or Project SOH Plan and shall cover the following topics relative to the on-site conditions expected:

a. Training on heat-related illnesses and how it can be prevented and the control measures to be taken;

b. Method used to monitor for heat stress, including standards being utilized and the responsible party for monitoring heat stress;

c. Signs and symptoms of heat-related illnesses and first aid procedures for each condition;

d. Exacerbation of heat related injury and illness based on various types of clothing, including general work clothing, semi-permeable and non-permeable clothing, arc flash clothing, and other protective clothing which reduces the evaporation rate;

e. The dangers of using drugs and alcohol in hot work environments.

06.J.03 In hot environments as defined above, the following shall be required:

a. Potable drinking water shall be available to employees and employees are encouraged to frequently drink small amounts, (e.g., 1/2 cup every 15-20 minutes). The water shall be kept reasonably cool 50-60° F (10-15° C) to encourage consumption.
> See Section 02.C.

b. Tool box training which addresses the requirements in the HSMP, anticipated weather conditions for the day, any heat-related incidents, etc.

c. When possible, work should be scheduled for cooler periods during the day.

d. Implement a buddy system. Workers should not only monitor themselves, but also be alert to changes and the symptoms of their co-workers.

e. Workers who have not previously worked in a hot environment or have had a previous heat-related injury, or are known to be on medication, shall acclimatize with a regimen of increasing exposure each day of work.

f. Provide recovery areas where possible, such as air-conditioned enclosures, or shaded areas, with intermittent breaks and water breaks.

g. If a worker is required to wear semi-impermeable or impermeable clothing, then physiological monitoring shall include:

(1) Heart rate monitoring with a standard of a sustained heart rate in excess of 180 beats per minute (bpm) minus the age of the worker in years, recovery heart rate at one minute after a peak work effort is greater than 120 bpm, or

(2) Monitoring of the core body temperature with a standard of greater than 100.4°F (38.0°C) for unacclimatized workers, and 101.3°F (38.5°C) for acclimated workers.

(3) Workers exceeding the above standards are required to have work/rest regimens and fluid replacement schedules.

h. If a worker is wearing permeable clothing:

(1) Environmental monitoring or physiological monitoring shall be conducted and work/rest regimens established.

(2) Monitoring shall be conducted when temperature exceeds 75°F (24º C) and 55% humidity.

(3) Use of a WBGT instrument is preferred, however, if a WBGT instrument is not available, and the WBGT cannot be obtained from local weather stations, then Figure 6-1. the Approximate WBGT Temperature Chart, should be used to approximate the WBGT.

(4) If Figure 6-1 is used, direct radiant sun exposure, air velocity, temperature, and humidity and adjustment factors for various work clothing should be taken into consideration.

i. Employees exposed to solar radiation with the potential for sunburn, should be encouraged to use sun screen with a sun protection factor (SPF) of 30 or greater, and should wear hats, long sleeve shirts, sunglasses, and other protective attire.

j. Workers who experience heat stress shall seek medical attention. Workers who have more than one heat-related episode within a month shall have a doctor's written release prior to returning to exposures in a potential heat stress environment.

06.J.04 Cold Stress Management Plan (CSMP). A CSMP shall be incorporated into the APP or Project SOH Plan for the following work activities:

a. Extended work duration in refrigerated rooms;

b. Work in cold environments taking into consideration heat loss from wind speeds (e.g., when air temperature or wind chill could drop below 40°F (4.4°C);

c. Extended bare-hand work in cold weather;

d. Working with hands or parts of the body in cold water for periods greater than 10-12 minutes or potential cold water emersion;

e. Working in snow or ice.

06.J.05 The CSMP shall address:

a. Training on the signs, symptoms, and first aid for hypothermia, frostbite, and trench foot;

b. Control and prevention measures to include PPE, engineering and administrative controls, eating, drinking, and safe work practices;

c. Conditions and limitations in which bare hand work can be performed;

d. Frequency. Air temperature and wind speed shall be taken should be taken at least every 4 hours when the temperature drops below 20°F (-6°C) and wind speed exceeds 5 mph (8 kmph) or broadcasted wind chill factors may be used if the reading is within 10 miles of the location.

Figure 6-1

Approximate Wet-Bulb Globe Temperature (WBGT) Chart

Degrees F

Relative Humidity (%)	68	70	72	73	75	77	79	81	82	84	86	88	90	91	93	95	97	99	100	102	104	106	108
0	59	61	61	63	64	64	66	66	68	68	70	72	72	73	73	75	75	77	77	79	81	81	82
5	61	61	63	64	63	66	66	68	70	70	72	72	73	75	75	77	79	79	81	81	82	84	84
10	61	63	63	64	66	66	68	70	70	72	73	73	75	77	77	79	81	81	82	84	86	86	88
15	63	63	64	66	66	68	70	70	72	73	73	75	77	79	79	81	82	84	84	86	88	90	91
20	63	64	64	66	68	70	70	72	73	75	75	77	79	81	81	82	84	86	88	90	90	91	95
25	64	64	66	68	68	70	72	73	75	75	77	79	81	82	82	84	86	88	90	91	93	95	97
30	64	66	68	68	70	72	73	73	75	77	79	81	82	84	84	86	88	90	91	93	95	97	99
35	64	66	68	70	72	72	73	75	77	79	81	82	84	86	88	90	91	93	95	97	99	100	102
40	66	68	70	70	72	73	75	77	79	81	82	84	86	88	90	91	93	95	97	99	100	102	
45	66	68	70	72	73	75	77	79	81	81	82	84	86	90	91	93	95	97	99	100			
50	68	70	72	73	73	75	77	79	81	82	84	86	88	91	93	95	97	99	102				
55	68	70	72	73	75	77	79	81	82	84	86	88	90	93	95	97	99	100					
60	70	72	73	75	77	79	81	82	84	86	88	90	91	95	97	99	100						
65	70	72	73	75	77	79	81	82	84	88	90	91	93	97	99	100							
70	72	73	75	77	79	81	82	84	86	88	91	93	95	97	100	102							
75	72	73	75	77	79	81	84	86	88	90	91	95	97	99	102								
80	73	75	77	79	81	82	84	86	90	91	93	97	99	100									
85	73	75	77	79	82	84	86	88	90	93	95	99	100	102									
90	75	77	79	81	82	84	88	90	91	95	97	99	102										
95	75	77	79	81	84	86	88	91	93	95	99	100											
100	75	79	81	82	84	88	90	91	95	100	100	102											

Chart assumes full sunshine and light wind. Using this chart on a cloudy or windy day will result in an overestimation of heat stress

06.J.06 In cold environments the following guidelines shall be followed to prevent cold-related injury.

a. Warming shelters should be made available nearby when the wind chill drops below 10°F (-12°C).

b. A change of clothing shall be available if there is an opportunity for a worker to become wet.

c. When the wind chill drops below 0°F (-17°C), the following work practices shall apply.

(1) Workers shall use the buddy system to watch for signs and symptoms of cold related injuries or illnesses.

(2) The work rate shall be moderated to prevent sweating.

(3) Heat shelters shall be provided.

(4) New workers shall be given time to acclimate.

d. Workers exposed to -15°F (-26°C) shall use the work/warm-up schedule specified in the ACGIH TLVs/BEIs booklet.

e. If any extremity or body part is immersed in water where the air temperature is below 40°F (4°C), the employee shall be required to change any clothing that became wet and to dry off in a warm area.

f. Environmental monitoring. As the wind chill drops below 20°F (-7°C), the air temperature and wind speed (wind chill index) shall be monitored a minimum of every 4 hours or as warranted.

g. When the wind chill falls below 0°F (-17°C), the air temperature and wind speed shall be monitored every 2 hours or more frequently if it drops below this level.

06.K Cumulative Trauma Disorder Prevention.

06.K.01 Work activities that require employees to conduct lifting, handling, or carrying; rapid and frequent application of high grasping forces; repetitive hand/arm manipulations; tasks that include continuous, intermittent, impulsive, or impact hand-arm vibration or whole body vibration; and other physical activities that stress the body's capabilities shall be evaluated by a competent person to ensure the activities are designed to match the capabilities of the employees.

06.K.02 When work activities that stress the body's capabilities are identified, the employer shall identify it as a hazard in the APP or Project SOH Plan. The plan shall incorporate processes that recognize cumulative trauma hazards, isolate causative factors, inform and train employees, provide and implement PPE and engineering controls, if appropriate.

06.K.03 Control measures to minimize hand-arm vibration (HAV) shall include: use of anti-vibration tools and/or gloves; implementation of work practices that keep the employee's hands and body warm/minimize vibration coupling between employee and the vibration tool; application of specialized medical surveillance to identify personnel susceptible to vibration, and adherence to TLV guidelines as specified by ACGIH in "Threshold Limit Values and Biological Exposure Indices". For USACE only, the evaluation shall include:

a. Acceleration measurements made according to ANSI S2.70 or acceleration data from the manufacturer (ISO 8662) or an online HAV database that has collected tool specific data via ISO 5349. If using manufacturer’s data, a safety factor of 2.0 should be incorporated and if using an online database, a safety factor of 1.25 is warranted.

b. Using an estimate or measurement for each individual piece of equipment used by an operator, a time weighted average of the vibration exposure shall be determined. Detailed description of the proper method of completing the vibration evaluations is found in ANSI S2.70.

c. If the estimate or monitored HAV exposure is greater than 2.5 m/s^2, then controls shall be implemented in the following order: changing the process to use lower vibrating equipment; using anti-vibration handles, mounts, tension chains; limited tool usage; providing training or techniques such as tool speed and proper shut off times; and the use of anti-vibration gloves that meet ANSI S2.73.

06.L Indoor Air Quality (IAQ) Management.

06.L.01 Investigations. Supervisors shall report employee concerns or complaints of IAQ problems to the facility manager/owner or other designated representative. That individual will be responsible for investigating and resolving the IAQ complaint in a timely manner and reporting back to the supervisor. For leased facilities, procedures for resolving IAQ issues should ultimately be investigated and resolved by the lessor. An IH or other qualified and competent person shall initiate an IAQ investigation using appropriate guidelines published by ACGIH; AIHA; ANSI; American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE); EPA; OSHA; NIOSH; or other Federal, DOD, State, local, and host nation requirements. At a minimum the following shall be investigated:

a. Ensure building activities, such as painting, roof repairs, carpet installation and repair and other activities likely to involve usage of chemicals or solvents, are conducted after normal working hours where possible or in a manner that will prevent exposure to occupants.

b. Evaluate condition of the air-handling system for proper operation, make-up air supply, blocked dampers or diffusers, cleanliness of ducts and filters, and standing water or wet areas.

c. Educate employees and supervisors concerning measures they can take to help maintain acceptable IAQ in their work areas. Employees shall be instructed not to make unauthorized modifications to the heating, ventilation, and air conditioning (HVAC) systems (i.e., blocking off vents, removing ceiling tiles).

06.L.02 Environmental tobacco smoke (ETS). Employees shall be protected from involuntary exposure to ETS in working and public living environments.

a. Smoking, to include the use of smokeless cigarettes or cigars, shall be prohibited inside all DoD vehicles, aircraft, vessels, and work buildings.

b. Designated smoking areas only in outdoor locations that are not commonly used or accessed by nonsmokers shall be provided. In accordance with Executive Order 13058, all outside smoking areas shall be a minimum of 25 ft (7.6 m) from building entrances. Before establishing outside smoking area, local ordinances shall be reviewed and most stringent shall apply. Receptacles shall be provided in designated smoking areas for the containment of cigarette butts and other smoking by-products.

c. Designated smoking areas shall be located away from supplied-air intakes and building entryways/egresses to prevent ETS from entering occupied buildings and structures.

06.L.03 Mold Evaluation. Because mold can contribute to health problems ranging from minor irritation to serious debilitation if found in high quantities or improper locations, a mold assessment shall be performed when need is indicated.

a. Assessments/remediation shall be overseen by a competent mold inspector with a minimum of 5 years experience in evaluation of indoor air problems and an understanding both the properties of mold behaviors and building design or construction. This person shall be an IH, microbiologist, or a qualified indoor air specialist or mold inspector who has been certified by an independent IAQ certifying agency and/or who can demonstrate training and experience in the IAQ investigative field. Some states, local authorities and host nations also require this person to be licensed.

b. A visual assessment of potential mold hazards shall be performed, based on criteria in the, U.S. Army Public Health Command TG 278, Industrial Hygiene Preventive Medicine Mold Assessment Guide, the EPA Indoor Air Quality Checklists, and guidance from AIHA. Bulk and/or air samples are generally not necessary to evaluate mold hazardous environments.

c. A mold assessment shall be written and shall contain the following:

(1) Description of the area assessed including size (footprint), ventilation, and occupancy;

(2) Name and qualifications of the individual completing the assessment;

(3) Any sample results taken, including location of the sample result, date and time of the sample, temperature and humidity at the time of the sample; and laboratory procedure used to analyze the sample;

(4) Drawing of the area showing location of samples, location of visible mold or mildew and the type of substrate it is growing on, ventilation sources in the room, and other information thought to be important;

(5) Potential sources of the moisture which has caused the mold growth;

(6) Recommendations for controlling the problem and remediating the mold.

d. Causes of mold (i.e., water leakages, seepages, drainage, HVAC/ insulation repaired, etc.) shall be addressed before completing mold remediation.

06.L.04 Mold Remediation. If the assessment reveals mold remediation is required, then USAPHC TG 277, Army Facilities Management Information Document on Mold Remediation Issues, and any local, state, or host nation guidelines or regulations shall be used.

a. A Mold Remediation Plan shall be written by a competent mold expert and shall include: location and extent of the mold, description of conditions found (i.e. wet or dry), type of materials or 'substrate' that the mold is growing on, whether the substrate will be cleaned or removed, source or problem which created the mold, repair of building structure or component that is the source, and whether the mold contaminated area will be isolated from the remainder of the building and or its occupants. The plan shall also include the steps involved in remediation, identified hazards, recommended controls, equipment and materials (i.e., fungicide used for removal), inspection requirements and worker and occupant training requirements.

b. Mold remediation should not be performed by the same entity that performed the mold assessment.

c. Employees in the immediate area of the mold contamination shall be informed of the remediation, results of any testing, and symptoms of the hazard. The employees shall not be in the area during the remediation.

d. Post-remediation air sampling shall be done in the immediate area and in any areas in the mold spore or vegetative air-pathway and compared to outside air samples. Mold in areas above drop ceilings with combined air plenums shall have air samples taken within the plenum as well as in air-serviced areas. Air samples should be taken in the immediate area of remediation and analyzed by a laboratory in the AIHA Environmental Microbiology Laboratory Accreditation Program

06.M Control of Chromium (VI) Exposure.

06.M.01 General. All activities which could generate chromium (VI) fumes, mists, or dusts shall be evaluated by an IH to determine potential personnel exposure over the OSHA Chromium (VI) standards. Typical operations where chromium exposures are high include: cutting or breaking up of cement surfaces made from Portland cement with a high chromium content, painting or paint removal operations, welding using rods or wire with a chromium coating, heating or welding on stainless steel, and handling or applying anti-corrosive substances or coatings.

a. The evaluation shall include a risk assessment of the type and frequency of exposure and breathing zone air samples and swipe sampling on surfaces in the work and surrounding area as described in 29 CFR 1910.1026.

b. The evaluation shall be added as an appendix to the APP or the Project SOH Plan. Individual sample results shall be provided to the employee and add to their official occupational health record and a summary of the sample results should be posted in the work area.

06.M.02 To prevent exposure to chromium (VI), the use of paints with chromium pigments, Portland cement with greater than 20 ppm chromium, or chromium/arsenic treated lumber shall be avoided when possible. Should chromium (VI) containing products be required, a justification and similar non-chromium (VI) product evaluation shall be conducted and submitted for review by the GDA or the USACE SOHO.

06.M.03 If chromium containing compounds are used and the objective determination is inconclusive, before air sampling confirms the level of exposure, the employer shall comply with the requirements of 1910.1026, 1915.1026, or 1926.1126, whichever is applicable. At a minimum, employers shall provide appropriate PPE, respirators, decontamination facilities, and a lunch room/area clean from chromium dust and/or fume.

06.M.04 If air sampling confirms chromium (VI) exposure over the OEL, and there is no adequate substitute or work practice change (i.e., use of argon instead of carbon dioxide when arc welding), then the employer shall provide appropriate engineering controls, i.e., local HEPA filtered ventilation systems, medical surveillance, housekeeping, and air sampling as required by the applicable chromium (VI) standard. If adequate engineering controls are not feasible or appropriate due to the length of the task, then PPE shall be provided.

06.M.05 In areas where chromium (VI) is generated or used, there shall be a housekeeping and decontamination program instituted.

a. Employees shall clean all surfaces a minimum of once a day or at the end of the shift that the chromium (VI) dust or fume was generated.

b. At a minimum all exhaust and ventilation systems shall be cleaned and filters changed annually.

c. At a minimum, workers shall remove outer work clothing before eating, drinking, or smoking.

06.N Crystalline Silica.

06.N.01 Occupational Standards.

a. Employee airborne exposure to crystalline silica shall not exceed the 8-hour time weighted average (TWA) OEL.

b. Mandatory requirements.

(1) Employee exposure shall be eliminated through the implementation of feasible engineering controls.

(2) After all such controls are implemented and they do not control to the OEL, each employer must rotate its employees to the extent possible in order to reduce exposure.

(3) When all engineering or administrative controls have been implemented, and the level of respirable silica still exceeds OEL, respirators may be used in accordance with mandatory requirements of Section 5 E. and 29 CFR 1910.134.

(4) Employees shall be trained on the hazards of silica, the controls required to control the potential exposure, any sampling results and work practices to lower their exposure.

06.N.02 Monitoring.

a. Each employer who has workplaces where silica is occupationally produced, reacted, released, transported, stored, handled, or used shall inspect each workplace and work operation to determine if any employee may be exposed to silica at or above the OEL. This evaluation shall be documented in the AHA for the job/task to be completed or PHA for government worker.

b. Air monitoring and analysis. Sampling and analytical methods shall be in accordance with those specified in Section 06.A.

06.N.03 Medical Surveillance. Each employer shall institute a medical surveillance program for all employees who are exposed to airborne concentrations of silica above the OEL for more than 30 days a year. The employer shall provide each employee a medical examination performed by or under the supervision of a licensed physician and shall provide the examination during the employee's normal working hours without cost to the employee. The content of the medical exam shall be determined by the physician based on the exposure records of the employee and guidance provided by NIOSH Standard DHS pub. No 92-102 Aug 1992 or OSHA Instruction CPL 2-2.7 Oct 30, 1972.

a. Medical examinations shall also be made available:

(1) At least annually for each employee exposed to airborne concentrations of silica above the OEL for more than 30 days during the last year; and

(2) Upon notification by the employee that he/she has developed signs or symptoms commonly associated with chronic exposure to silica.

b. Where medical examinations are performed, the employer shall provide the examining physician with the following information:

(1) The reason for the medical examination requested;

(2) A description of the affected employee's duties as they relate to the employee's exposure;

(3) A description of any PPE used or to be used;

(4) The results of the employee's exposure measurements, if available; and

(5) Upon request of the physician, information concerning previous medical examination of the affected employee.

c. Physician's written opinion. The employer shall obtain and furnish the employee with a written opinion from the examining physician containing the following:

(1) The signs or symptoms of silica exposure manifested by the employee, if any;

(2) A report on the findings of any medical tests completed.

(3) The physician's opinion as to whether the employee has any detected medical condition that would place the employee at increased risk of material impairment to the employee's health from exposure to silica or would directly or indirectly aggravate any detected medical condition;

(4) Any recommended limitation upon the employee's exposure to silica or the use of PPE; and

(5) A statement that the employee has been informed by the physician of any medical condition that requires further examination or treatment.

06.N.04 Training. Each employee who may be potentially exposed to silica shall be instructed at the beginning of his/her employment or assignment of potential silica exposure in the following:

a. Relevant symptoms; appropriate emergency procedures; and proper conditions and precautions for safe use or exposure;

b. To advise the employer of the development of the signs and symptoms of prolonged exposure to silica;

c. Specific nature of operations that could result in exposure to silica above the OEL, as well as safe work practices for the release of the silica and the types and function of engineering controls;

d. Proper housekeeping practices;

e. The purpose, proper use, and limitations of respirators;

f. A description of, and explain the purposes for, the medical surveillance program; and

g. The increased risk of impaired health due to the combination of smoking and silica dust exposure.

06.N.05 Respiratory Protection.

a. When the exposure to silica cannot be lowered below the OEL by engineering and administrative controls, an employer shall use respiratory protection.

b. Properly fitted particulate-filter respirators may be used for short, intermittent, or occasional dust exposures such as cleanup, dumping of dust collectors, or unloading shipments of sand at a receiving point when it is not feasible to control the dust by enclosure, exhaust ventilation, wetting, or other means.

06.N.06 Protective Clothing. Where exposure to airborne silica or other substances is above the OEL, work clothing shall be HEPA vacuumed before removal unless it is wet. Clothes shall not be cleaned by blowing or shaking.

06.N.07 Housekeeping.

a. To prevent the dispersal of silica dust, all exposed surfaces shall be maintained free of accumulation of silica dust.

b. Dry sweeping and the use of compressed air for the cleaning of floors and other surfaces shall be prohibited. If vacuuming is used the exhaust air shall be HEPA filtered to prevent generation of airborne respirable silica concentrations. Gentle wash down of surfaces is preferred.

c. Emphasis shall be placed upon preventive maintenance and repair of equipment, proper storage of dust producing materials, and collection of dusts containing silica. Sanitation shall meet the requirements of 29 CFR 1910.141.

06.N.08 Personal Hygiene Facilities and Practices. All food, beverages, tobacco products, nonfood chewing products, and unapplied cosmetics shall be discouraged in work areas.

06.N.09 Engineering Controls.

a. Dust suppression. Moisture, mists, fogs, etc., shall be added where such addition can substantially reduce the exposure to airborne respirable silica dust.

b. Ventilation. Where a local exhaust ventilation and collection system is used in a building, it shall be designed and maintained to prevent the accumulation or recirculation of airborne silica dust into the workplace. The system shall be inspected periodically. Adequate measures shall be taken to ensure that any discharge will not produce health hazards to the outside environment.

c. Additional control measures. When mobile equipment is operated in areas of potential silica exposure, engineering controls shall be provided to protect the operator from such exposure.

06.N.10 Itinerant Work. When employees are exposed to airborne silica at temporary work sites away from the primary worksite, emphasis shall be placed on respiratory protection, protective clothing, portable engineering controls, and provisions for personal hygiene and sanitation. Training of employees shall be provided to protect them as well as others from airborne silica dust exposure.

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SECTION 7

Lighting

07.A General. Proper illumination of work spaces, project sites, roadways and vessels is imperative to a safe working environment. It is of significant importance in safe vehicular operation and the prevention of slips and falls. The lighting standards provided in this section are minimal standards. This section is applicable to both contractor and government operations.

07.A.01 A review of the lighting requirements for specific tasks or operations shall be evaluated as part of the activity hazard analysis (AHA).

07.A.02 Lamps and fixtures will be guarded and secured to preclude injury to personnel. Open fluorescent fixtures will be provided with wire guards, lenses, tube guards and locks, or safety sockets that require force in the horizontal axis to remove the lamp.

07.A.03 Lamps for general illumination shall be protected from accidental contact or breakage.

a. Protection shall be provided by elevation of at least 7 ft (2.1 m) from normal working surface, suitable fixture or lamp holder with a guard.

b. Fixtures may be no closer than 18 in (0.5 m) to overhead sprinkler systems, if the building is so equipped, per NFPA Standards.

c. Open fluorescent fixtures will be provided with wire guards, lenses, tube guards or other means to prevent damage to the bulb.

07.A.04 Generator-powered portable lighting units shall be grounded in accordance with manufacturer's instructions. In addition, a survey of the area to be lighted will be conducted and documented to ensure overhead power lines do not pose a hazard.

07.A.05 For temporary lighting, see Section 11.E.06.

07.B Lighting Levels.

07.B.01 While work is in progress, offices, facilities, accessways, working areas, construction roads, etc., shall be lighted by at least the minimum light intensities specified in Table 7-1. Illumination readings shall be taken and recorded whenever proper lighting of an area is in question. A calibrated light meter shall be provided, maintained and used as necessary to provide illumination readings.

07.B.02 Office lighting shall be a minimum of 50 foot-candles (lm/ft^2) or 540 luminance (lx) at the working surface, in accordance with the Illuminating Engineering Society of North America (IESNA) Handbook, RP-1. In office areas, attention shall be paid to the control of glare.

07.B.03 Roadway lighting shall be in accordance with IESNA RP-8.

07.B.04 Marine lighting shall be in accordance with American Bureau of Shipping, Guide for Crew Habitability on Ships.

07.B.05 Means of egress.

a. Means of egress shall be illuminated, with emergency and non-emergency lighting, to provide a minimum of 5 lm/ft^2, (55 lx), measured at the floor. > Reference IESNA Handbook.

b. The illumination shall be arranged so that the failure of any single lighting unit, including the burning out of an electric bulb, will not leave any area darkened to the point of impeding the means of egress.

07.B.06 If work is to be performed at night, a night operations lighting plan shall be developed to ensure that all activities, areas and operations are adequately illuminated to perform work safely. On-task lighting shall be in conformance with Table 7-1. Lighting near roadways and other public transportation areas shall be positioned as to avoid creating a glare hazard.

TABLE 7-1

Minimum Lighting Requirements

Facility or Function	Lux	Foot-candles (lm/ft^2)
Accessways - general indoor - general outdoor - exitways, walkways, ladders, stairs	 55 33 110	 5 3 10
Administrative areas (offices, drafting and meeting rooms, etc.)	540	50
Chemical laboratories	540	50
Construction areas - general indoor - general outdoor - tunnels and general underground work areas (min 110 lux required at tunnel/shaft heading during drilling, mucking, and scaling)	 55 33 55	 5 3 5
Conveyor routes	110	10
Dam Operating Areas (Interior) -Tunnels and underground work areas -Control Stations	 55 150	 5 15
Docks and loading platforms	33	3
Elevators, freight and passenger	50	5
Temporary Electrical Panels (Interior)	300	30
Temporary Electrical Panels (Exterior)	50	10
First-aid stations and infirmaries	300	30
Maintenance/operating areas/shops - vehicle maintenance shop - carpentry shop - refueling area, outdoors - shops, fine - medium detail work - welding shop	 300 110 55 540-325 300	 30 10 5 50-30 30
Mechanical/electrical equipment rooms	110	10
Outdoor parking areas	33	3
Toilets, wash, and dressing rooms	110	10
Visitor areas	215	20
Warehouses and storage rooms/areas - indoor rack storage - outdoor storage	 270 33	 25 3
Work areas – general (not listed above)	325	30

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SECTION 8

Accident Prevention Signs, Tags, Labels, Signals, Piping System Identification and Traffic Control

08.A Signs, Tags, Labels and Piping Systems.

08.A.01 Signs, tags, and labels shall be provided to give adequate warning and caution of hazards. They are provided to instruct and direct workers and the public.

08.A.02 All warning systems such as signs, tags, and labels shall be visible at all times when the hazard or problem exists, and shall be removed or covered when the hazard or problem no longer exists.

08.A.03 All employees shall be informed as to the meaning of the various signs, tags, and labels used throughout the workplace and any special precautions that may be required.

08.A.04 The safety and occupational health (SOH) related signs in the USACE Sign Standards Manual (EP 310-1-6a) have been determined to meet or exceed ANSI and/or OSHA requirements. USACE facilities shall use signs based upon the specifications in the USACE Sign Manual at permanent USACE-owned and USACE-operated sites. USACE employees and contractors may opt to use signs meeting either the OSHA or ANSI standards for temporary use during the life of a project.

08.A.05 Signs, Tags, Placards, Labels, and Piping Systems shall meet or exceed the following standards:

a. USACE Graphic Standards Manual, EP 310-1-6;

b. USACE Sign Standards Manual, Volume 1, EP 310-1-6a;

c. 29 CFR 1910.145; Specifications for Accident Prevention Signs and Tags;

d. 29 CFR 1926.200; Accident Prevention Signs and Tags;

e. ANSI/IEEE C95.2;

f. ANSI Z136.1;

g. ANSI Z535.1;

h. ANSI Z535.2;

i. ANSI Z535.5;

j. ANSI/ASME A13.1; and

k. DOT Federal Highway Administration, Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD).

08.A.06 The type of sign or tag used in a particular situation shall be appropriate for the degree of hazard or intent of message. The workplace safety signs with Danger and Caution headings have standard legends that must be used exactly as shown in the USACE Sign Standards Manual. If a sign with a unique legend not appearing on pages 11-4 to 11-7 or in the UNICOR catalog is needed, the procedures detailed on page 1-13 should be followed. The sign legend shall be concise, easy to read and should contain enough information to be easily understood. > See Figure 8-1 for Sign and Tag Signal Word Headings, Figure 8-2 for Example Tag Layout, Figure 8-3 for Example Sign Layout, Table 8-1 for Accident Prevention Sign Requirements.

a. Danger Signs. Danger signs must conform to the following requirements:

(1) Danger signs will be used only when the circumstances indicate an imminently hazardous situation that, if not avoided, will result in death or serious injury.

(2) Signal word.

(a) USACE Standard: The signal word “Danger” is white on a red background at the top of the sign.

(b) ANSI Alternate Standard: Danger signs must have the signal word “DANGER” in white letters placed at the top of a rectangular safety red background placed at the top of the sign. The safety alert symbol shall precede the signal word. The base of symbol shall be on the same horizontal level as the base of the letters of the signal word - the height equaling or exceeding the signal word height. > See Figure 8-1**.**

(c) OSHA Alternate Standard: As an alternative, Danger Signs may have “DANGER” in white letters on a safety red oval background with a white border on a black rectangular field. This distinctive panel shall appear in the uppermost portion of the sign. No other signal word or symbol shall be used within this distinctive shape and color arrangement.

(3) The message panel.

(a) USACE Standard: For workplace safety signs the lettering describing the specific danger is black letters on a white background. On other approved Danger Signs, the message is white lettering on a red background.

(b) OSHA or ANSI Alternate Standard: The lettering shall be black letters on a white background or white letters on a black background and the symbol/pictorial panel, if used, shall be square with a black safety red, or black and safety red symbol on a white background.

b. Warning Signs. Warning signs must conform to the following requirements:

(1) Warning signs may be used only when the circumstances indicate a potentially hazardous situation that, if not avoided, could result in death or serious injury. The hazards may be the same as those associated with Danger signs but are of significantly less magnitude.

(2) Signal Word.

(a) USACE Standard: On approved Warning Safety signs the signal word "Warning" appears in black lettering on an orange background under a black top border. There are no Warning workplace safety signs in the Corps system.

(b) ANSI Standard: Warning signs must have the signal word "WARNING" in black letters on a rectangular orange background placed at the top of the sign. The safety alert symbol shall precede the signal word. The base of symbol shall be on the same horizontal level as the base of the letters of the signal word – the height equaling or exceeding the signal word height. > See Figure 8-1**.**

(c) OSHA Standard Alternative: As an alternative, Warning Signs may have the signal word "WARNING" in black lettering within a safety orange truncated diamond on a black rectangular background. The distinctive panel shall be located at the uppermost portion of the sign. No other word or symbol shall be used within this distinctive shape or color arrangement.

(3) The message panel.

(a) USACE Standard: On approved Warning signs the message panel shall be in black lettering on an orange background.

(b) OSHA or ANSI Alternate Standard: The message panel shall be in black lettering on a white background or white lettering on a black background. The message may, as an alternative, be in black letters on a safety orange background. The symbol/pictorial panel, if used, shall be square with a black symbol on a white background. The symbol panel used as an alternative may be square with a black symbol on an orange background.

c. Caution Signs. Caution signs must conform to the following requirements:

(1) Caution signs may be used only when circumstances indicate a potentially hazardous situation that, if not avoided, may result in a minor or moderate injury. It may also be used to alert against unsafe practices that may result in property damage. The hazards may be the same as those associated with Danger signs but are of significantly less magnitude.

(2) Signal Word.

(a) USACE Standard: On Workplace Safety Signs the word “Caution” appears in yellow lettering on black bar at the top of the yellow message panel. On other approved Caution Safety Signs the signal word “Caution” appears in black lettering on a yellow background under a black top border.

(c) Alternate ANSI Standard: Caution signs must have the signal word “CAUTION” in black lettering on a rectangular yellow background placed at the top of the sign. The safety alert symbol shall precede the signal word if the hazard is a potential personal injury hazard. (The alert symbol is not used when the situation is used to indicate property damage hazards.) The base of the symbol shall be on the same horizontal level as the base of the letters of the signal word – the height shall equal or exceed the signal word height. > See Figure 8-1.

(d) Alternate OSHA Standard: As an alternative, caution signs may have the signal word “CAUTION” in safety yellow letters within a black rectangular background, and this distinctive panel shall be located in the uppermost portion of the sign. No other signal word or symbol shall be used with this distinctive color or signal shape arrangement.

(3) Message Panel.

(a) USACE Standard: The descriptive legend appears in black lettering on a yellow panel.

(b) OSHA or ANSI Alternate Standard: The message panel shall be in black lettering on a white background or white lettering on a black background. The message may, as an alternative, be in black lettering on a safety yellow background. The symbol/pictorial panel, if used, shall be square with a black symbol on a white background. As an alternative, it may be square with a black symbol on a safety yellow background.

d. Notice Signs. Notice signs should conform to the following requirements:

(1) Notice signs may be used to indicate a statement of company policy directly or indirectly related to the safety of personnel or protection of property. The signal word should not be associated directly with a hazard or hazardous situation, and shall not be used in place of “DANGER”, “WARNING”, or “CAUTION.” These signs are used to control or define access and circulation. They are used primarily for information and are not placed to identify a hazard.

(2) Notice signs shall have the signal word “NOTICE” in white lettering on a safety blue background on a rectangular field, and this distinctive panel shall be located in the uppermost portion of the visual alerting device. No other signal word or symbol shall be used within this distinctive shape and color arrangement.

(3) Message panel.

(a) General Standards for Workplace: The message shall be in safety blue or black letters on a white background. The symbol/pictorial panel, if used, shall be square with a safety blue or black symbol on a white background.

(b) USACE Alternative for Outdoor Use: Notice signs posted on USACE managed property for public viewing in areas accessible to the public, including recreation areas, may have white letters on blue background. Text for these custom signs shall be approved by the District Sign Manager. Other signs used to define access and use may include prohibition symbol signs or Restricted Area signs.

e. General Safety Signs: General safety signs should conform to the following requirements:

(1) General safety signs may be used to indicate general instructions relative to safe work practices, remind of proper safety procedures or indicate the location of safety equipment. These signs identify rules and facilities relating to health, first aid, medical equipment, sanitation, housekeeping practice and general safety information.

(2) Legend Panel: White signal word “SAFETY” on safety green header with black text on white panel.

f. Fire Safety Signs. Fire safety signs shall conform to the following requirements:

(1) Fire safety signs may be used to indicate the location of emergency firefighting equipment. Fire extinguisher signs shall be placed where fire extinguishers are not visible from designated exit pathways. > See NFPA 10 D2.2.2.

(2) These signs do not have a signal word.

(3) The message panel shall be in safety red letters on a white background in either a square or rectangular field. The symbol/pictorial panel, if used, shall be safety red on white or white on safety red.

g. Directional Arrow Signs: Directional arrow flow signs should conform to the following requirements:

(1) Directional arrow signs may be used to indicate the direction to emergency equipment, safety equipment, and other locations important to safety.

(2) Directional signs that relate to accident prevention use a format similar to all other Workplace Safety signs. The header shall have white lettering on a black rectangular background. The arrow symbol shall be in black lettering on a white background.

h. Colors. Color coding shall be in accordance with Table 8-2 of this manual. Color specifications for Corps safety signs are found in the USACE Sign Standards Manual.

i. Piping systems shall be identified. The identification of piping systems (including pipes, fittings, valves, and pipe coverings) shall be in accordance with Table 8-3 of this manual and comply with ANSI/ASME A13.1 color scheme and directional flow requirements.

j. The RF radiation hazard-warning symbol specified in Figure 8-4 of this manual shall be used in the identification of RF radiation hazards.

k. Laser caution and warning signs shall be in accordance with ANSI Z136.1. > See Figures 8-5 and 8-6.

l. Ionizing radiation warning signs, labels, and signals shall contain the symbol shown in Figure 8-7 of this manual. > See Section 06.F for posting requirements.

m. Vehicles or equipment that, by design, move at 25 mph (40 km/h) or less on public roads shall display the slow-moving vehicle emblem. > See Figure 8-8.

08.A.07 Safety sign finishes shall be of durable materials with colors in accordance with the USACE Signs Standards Manual, or ANSI Z535.1.

08.A.08 Safety signs shall be placed to alert and inform the viewer in sufficient time to take appropriate evasive actions to avoid potential harm from the hazard. They shall be legible, non-distracting, and not hazardous in themselves. They shall be fabricated with retro-reflective sheeting as appropriate for adequate visibility under normal and emergency operating conditions.

08.A.09 Each container of hazardous material shall be labeled, tagged or marked with the identity of the material(s), appropriate hazard warnings, potential health effects and the name and address of the manufacturer, importer or other responsible party. > See 06.B.01.

a. Signs, placards, process sheets, batch tickets, operating procedures, or other written means may be used in lieu of affixing labels to stationary process containers if the alternative method identifies the containers to which it is applicable and conveys the information required above. The written information shall be readily available to employees in their work area throughout each work shift.

b. Portable containers into which hazardous material(s) are transferred from labeled containers and which are intended only for the immediate use by the employee who performs the transfer are not required to be labeled. However, there shall be a means of indicating that the hazardous material has been used in the container.

08.A.10 Signs, tags and labels shall be located as close as safely possible to their respective hazards. Tags will be affixed by a positive means (such as wire, string, or adhesive) that prevents their loss or unintentional removal.

08.A.11 Signs, tags, and labels shall be legible and in English.

a. In areas where a significant percentage of the workforce or the visiting population speaks primarily in a foreign language, the use of symbol signs is strongly encouraged. > See USACE Sign Standards Manual, Section 8.

b. When no symbols exist or where words are essential, two signs - one in English and one in the foreign language - should be placed side by side.

c. These signs will follow the same format: same overall size, letter size and style, color, and mounting.

d. Because of variations in dialect, the legends on non-English signs shall be developed at the local level.

e. Two languages should never appear on the same sign. > See 01.A.05.

08.A.12 Signs shall be furnished with rounded or blunt corners and shall be free from sharp edges, burrs, splinters, or other sharp projections. The ends or heads of bolts or other fastening devices shall be located so that they are not a hazard.

08.A.13 Construction areas shall be posted with legible traffic signs at points of hazard in accordance with the MUTCD.

08.A.14 Signs required to be seen at night shall be reflectorized.

08.A.15 Accident prevention tags shall be used only as a temporary means of warning employees of an existing hazard (i.e., defective tools, equipment, caution orders and tags for hazardous energy control). > See Figure 8-9; See Section 12 for lockout/tagout requirements.

08.A.16 Tags shall contain a signal word (either "DANGER" or "CAUTION") and a major message (presented in either pictographs, written text, or both) to indicate the specific hazardous condition or the instruction to be communicated to the employee. The signal word shall be readable at a minimum distance of 5 ft (1.5 m) or such greater distance as warranted by the hazard. The signal word and major message shall be understandable to all employees who may be exposed to the hazard. > See 08.A.06 for basic design criteria.

08.A.17 Accident prevention tags shall be rectangular in shape and shall be no smaller than 3 in x 5 in (8 cm x 13 cm). The corners may be square cut, chamfered, or rounded.

08.A.18 Kerosene lamps and open flame pots shall not be used for, or with, warning signs or devices.

08.A.19 Warning signs shall be placed on unattended government-owned floating plant and land-based heavy equipment accessible to the public and shall read “No Trespassing – U.S. Government Property”.

08.B Signal Systems, Personnel and Procedures.

08.B.01 A standard signal system shall be used on all operations.

a. Hand signals for crane operations shall conform to ANSI/ASME B30 series. > See Figure 16-1.

b. Traffic flagging procedures shall be in accordance with the DOT Federal Highway Administration's MUTCD.

c. For Marine signals, see Section 19 of this manual.

d. For helicopter hand signals, see Section 16.P of this manual.

08.B.02 Standard hand signals shall be posted at the operator's position, signal control points and other points as necessary to inform those concerned.

08.B.03 Manual (hand) signals may be used when the distance between the operator and signal person is not more than 100 ft (30.5 m). Radio, telephone, or a visual and audible electrically-operated system shall be used when the distance between operator and signal person is more than 100 ft or when they cannot see each other.

08.B.04 A signal person shall be provided when the point of operation (includes area of load travel and area immediately surrounding the load placement) is not in full view of the vehicle, machine, or equipment operator; when vehicles are backed more than 100 ft (30.5 m); when terrain is hazardous; or when two or more vehicles are backing up in the same area.

- Note: This applies to all equipment operations covered in Section 18.

08.B.05 A flag person or other controls shall be provided when operations or equipment on or next to a highway create a traffic hazard. An exception shall be made only when an adequate mechanical signaling or control device is provided for safe direction of the operation.

08.B.06 Where manual (hand) signals are used, only one person shall be designated to give signals to the operator. This signal person shall be located to see the load and be clearly visible to the operator at all times.

08.B.07 Flag signaling shall be accomplished by use of red flags at least 18 in (45.7 cm) square or sign paddles. In periods of darkness, red lights shall be used.

08.B.08 High visibility apparel shall be worn by flag and signal persons. > See Section 05.F.

08.B.09 Signal systems shall be protected against unauthorized use, breakage, weather, or interference; any malfunction shall be cause to stop all work.

08.B.10 Only persons who are competent and qualified by experience and/or training with the operations being directed shall be used as signal persons.

08.B.11 Signal persons shall back one vehicle at a time. While under control of a signal person, the driver shall not back or maneuver until directed and the driver shall stop when visual contact with the signal person is lost.

- Note: This applies to operations covered in Section 18.

08.B.12 The signal person shall have a warning device of clear range and penetrating sound to warn persons when the load is coming in so they have time to get in the clear.

- Note: This applies to operations covered in Section 18.

08.C Traffic Control.

08.C.01 Traffic control shall be accomplished in accordance with DOT Federal Highway Administration's MUTCD.

08.C.02 The Contractor shall conduct his operations in such a manner as to offer the least possible obstruction to the safe and satisfactory movement of traffic over the existing roads during the life of the contract.

08.C.03 The Contractor shall be responsible for providing, erecting, maintaining, and removing all traffic signs, barricades, and other traffic control devices necessary for maintenance of traffic.

08.C.04 All barricades, warning signs, lights, temporary signals, other devices, flagmen, and signaling devices shall meet or exceed the minimum requirements of the local DOT requirements.

08.C.05 Prior to the commencement of contract operations, the Contractor shall submit for acceptance the complete details of the proposed traffic control plan for the maintenance of traffic and access through the contract work area.

08.C.06 The Contractor shall coordinate with the GDA and obtain approval and any required permits from local authorities prior to closing or restricting any roads.

08.C.07 Barricades, danger, warning and detour signs, as required, shall be erected before any roads are closed.

a. When roads are temporarily closed to public access, barricades or gates shall be used that are highly visible in day or night conditions. At a minimum, barriers shall be coated with reflective paint or be applied with highly reflective tape on both sides, and be signed as “ROAD CLOSED”.

b. Affected roads shall also be posted with appropriate warning signs a minimum of 100 ft (30.5 m) before the barrier per W20-3, DNG-11, WRN-24, or other appropriate signs from the MUTCD or USACE Sign Standards Manual. Size and placement of signs depends on viewing distance and speed limit of roadway.

Figure 8-1

Sign and Tag Signal Word Headings

USACE	ANSI	OSHA
WARNING Warning	WARNING Warning	WARNING Warning
DANGER Danger	DANGER Danger	DANGER Danger
CAUTION Caution – Workplac Safety	CAUTION Caution	CAUTION Caution
CAUTION Caution – Undesignated Safet		
SAFETY Safety		
NOTICE Notice		

.

FIGURE 8-2

Example Tag Layout

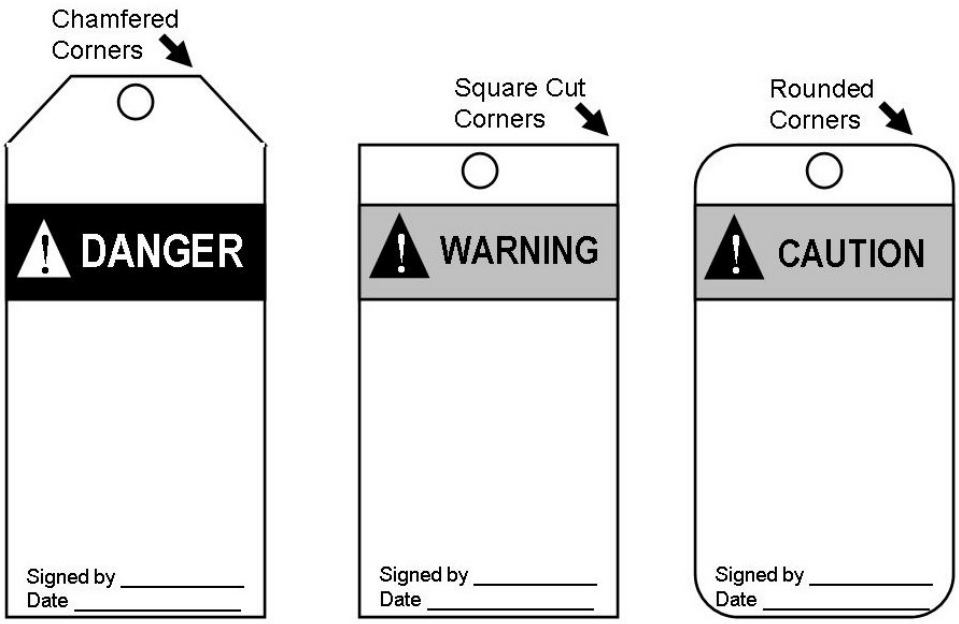


TABLE 8-1

Accident Prevention Sign Requirements

TYPE	PURPOSE	DESIGN
DANGER	Indicates a specific immediate and grave danger, a hazard capable of producing irreversible damage or injury, and prohibition against harmful activity.	Layout as shown in Fig 8-1. Shall have “DANGER” in white letters at top of rectangular safety red background placed at top of sign. Safety alert symbol shall precede signal word. Base of symbol shall be on same horizontal level as base of letters of signal word- height equaling or exceeding signal word height. Alternate OSHA or ANSI requirement calls for lettering to be black letters on white background or white letters on black background and symbol/pictorial panel, if used, shall be square with black safety red, or black and safety red symbol on a white background. The USACE standard requires that the specific danger be described in black letters on a white background. On other approved Danger signs, the message is white lettering on a red background.
CAUTION	Call attention to a specific potential hazard capable of resulting in severe, but not irreversible, injury or damage.	Layout as shown in Fig 8-1. Shall have “CAUTION” in yellow on black background and lower panel for additional sign wording in black on a yellow background.

TABLE 8-1 (Continued)

Accident Prevention Sign Requirements

TYPE	PURPOSE	DESIGN
GENERAL SAFETY	Includes notices of general practice and rules relating to health, first aid, medical equipment, sanitation, housekeeping, and general safety.	Layout as shown in Fig 8-1 or consisting of single panel. Shall have appropriate keyword as signal word in white on a green background in the upper panel and a lower panel for additional sign wording or symbols in black or green on a white background. Alternatively, the entire sign may be white letters on a green background.
FIRE AND EMERGENCY	Used only to label or points the way to fire extinguishing equipment, fires escapes and exits, gas shutoff valves, sprinkler drains, and emergency procedures.	Layout as shown in Fig 8-1 or consisting of a single red panel. Shall have the appropriate keyword as the signal word in white on a red background in the upper panel and a lower panel for additional sign wording or symbols in red on a white background. Alternatively, the entire sign may be white letters on a red background.
INFORMATION	Provide information of a general nature, such as designation of facilities or services, in order to avoid confusion or misunderstanding.	Layout as shown in Fig 8-1 or consisting of a single panel. Should have signal word “NOTICE” in white on blue background in upper panel and lower panel for additional wording or symbols in blue or black on a white background OR entire sign may be white letters on blue background.
EXIT	Used to indicate exits.	Lettered in legible letters, not less than 6 in (15.2 cm) high, on white field. The principal stroke of letters shall be at least 3/4 in (5.1 cm) in width.

TABLE 8-2

Accident Prevention Color Coding

COLOR	PURPOSE
Red	Red shall be the color used for identifying dangerous conditions, emergency controls, fire detection equipment and fire suppression systems, and containers of flammable liquids.
Orange	Orange shall be the color used for designating dangerous parts of machines and energized equipment. Orange shall also be used for temporary traffic control signs in construction zones.
Yellow	Yellow shall be the color for designating conditions requiring caution, marking dangerous chemicals, marking physical hazards, and markings for ionizing radiation.
Green	Green shall be the color for designating safety equipment and operator devices and the location of first-aid and safety equipment (other than firefighting equipment).
Blue	Blue shall be the color used for designating information of a non-safety nature.
Purple	Purple shall be the color used to designate ionizing radiation hazards.

FIGURE 8-3

Example Sign Layout

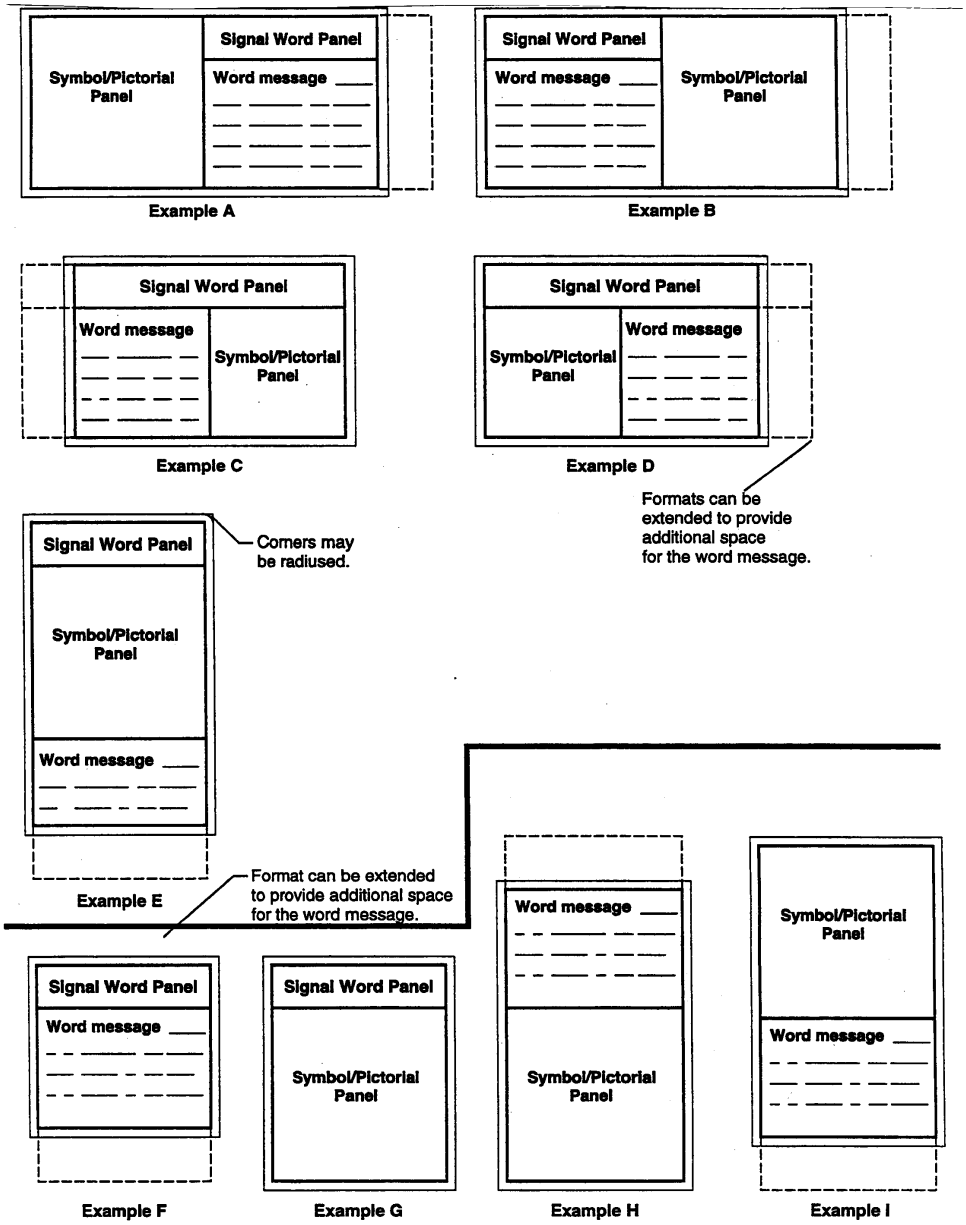


TABLE 8-3

Identification of Piping Systems

Outside diameter of pipe or covering	Length of color field “A”	Size of letters “B”
3/4 to 1 1/4 inches	8 inches	1/2 inch
1 1/2 to 2 inches	8 inches	3/4 inch
2 1/2 to 6 inches	12 inches	1 1/4 inch
8 to 10 inches	24 inches	2 1/2 inch
over 10 inches	32 inches	2 1/2 inch

FIGURE 8-4

Radio Frequency Warning Symbol

D = scaling unit
Lettering: ratio of letter height to thickness of letter lines
Upper triangle: 5 to 1 = large
6 to 1 = medium
Lower triangle: 4 to 1 = small
6 to 1 = medium
Symbol is square; triangles are right-angle isosceles.

FIGURE 8-5

Laser Caution Sign

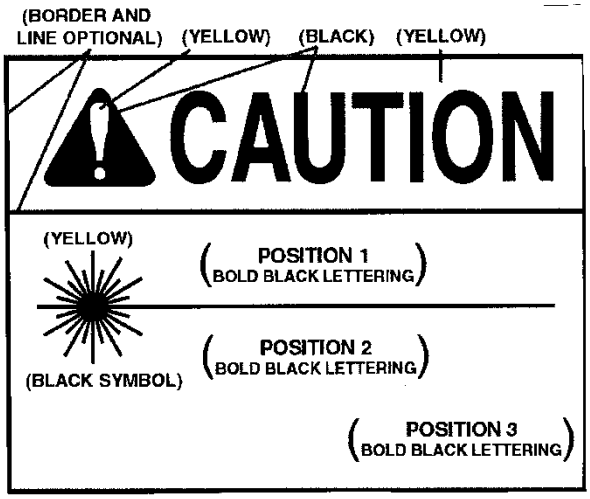


FIGURE 8-6

Laser Warning Sign

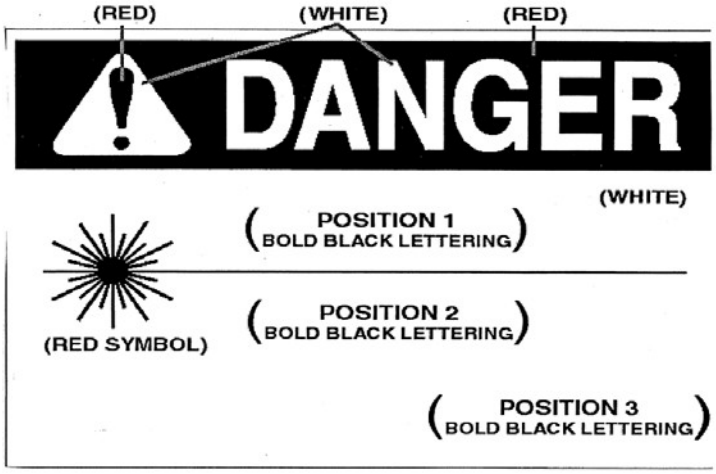
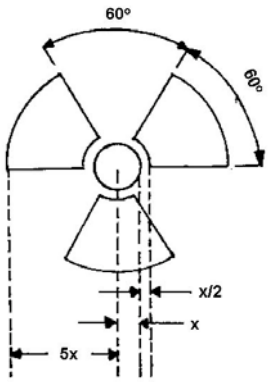


FIGURE 8-7

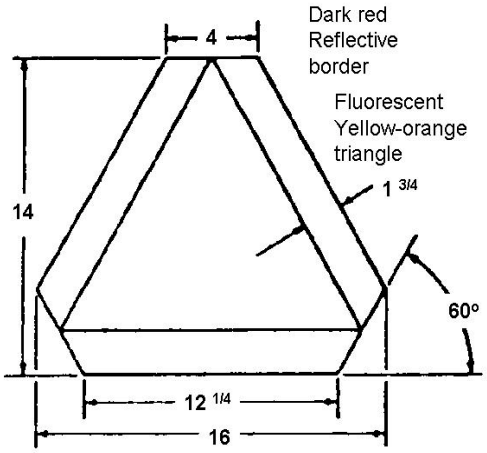
Radiological Warning Symbol



1. Cross-hatched area is to be magenta or purple.
2. Background is to be yellow.

FIGURE 8-8

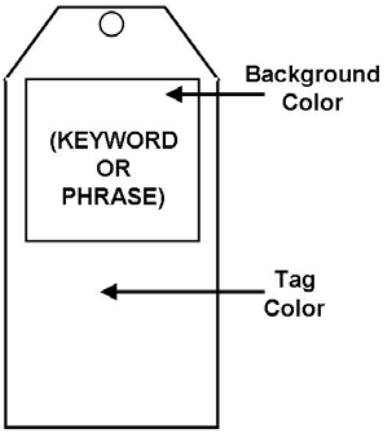
Slow-Moving Vehicle Emblem



NOTE: All dimensions are in inches

FIGURE 8-9

Accident Prevention Tags



Keyword/Phrase	Keyword/Phrase Print Color	Background Color	Tag Color
“DANGER”	White in red oval	Black	White
“CAUTION”	Yellow	Black	Yellow
“DO NOT OPERATE	White	Red	White
“OUT OF ORDER”	White	Black	White
“DO NOT USE”			
Informational message or inspection	Black or green	N/A	Green & white OR White & black

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Section 9
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SECTION 9

Fire Prevention and Protection

09.A General.

09.A.01 A fire prevention plan shall be developed for all USACE facilities and project sites. > For Construction operations see NFPA 241; for Marine operations see Section 19.A.04.

a. It shall include, as a minimum: A list of the major workplace fire hazards; potential ignition sources; the types of fire suppression equipment or systems appropriate to the control of fire; assignments of responsibilities for maintaining the equipment and systems; personnel responsible for controlling the fuel source hazards; and housekeeping procedures, including the removal of waste materials.

b. It shall be used to brief employees and emergency first responders on the fire hazards, the materials and processes to which they are exposed, and the emergency evacuation procedures.

09.A.02 An annual survey of the suitability and effectiveness of fire prevention and protection measures and facilities at each project or installation shall be made by a qualified person. Records of the survey findings and recommendations shall be retained on file at the project or installation.

09.A.03 When unusual fire hazards exist or fire emergencies develop, additional protection shall be provided as required by the GDA.

09.A.04 The GDA shall survey all activities and determine which require a hot work permit. All hot work and hot work permits shall conform to local policy, when present.

a. Hot work permits shall be required when performing activities which generate or have the potential to generate, heat, sparks, or open flames, such as abrasive blasting, burning, brazing, cutting, grinding, powder-actuated tools, hot riveting, soldering, thawing activities, welding, or any similar operation capable of initiating fires or explosions.

b. Areas shall be surveyed prior to performing any hot work to ensure they are free of fire hazards and to determine if a fire watch is required.

c. Fire watches shall be conducted in accordance with Sections 09.K.01 and 09.K.03.

d. A fully charged fire extinguisher, minimum 10 lbs, shall be readily available in the immediate area of the hot work.

e. Hot work permits shall include date(s) authorized for hot work and identify the objects on which the hot work is to be performed. The permit shall be kept on file until the completion of the hot work.

f. Hot work is prohibited in the following areas:

(1) In areas not authorized by GDA;

(2) In sprinklered buildings while such protection is impaired, unless equivalent protection is provided for the hot work and approved by the GDA;

(3) In the presence of explosive atmospheres, areas where an explosive atmosphere may develop, or where there is an accumulation of combustible dust;

(4) In area near the storage of large quantities of exposed, readily ignitable materials such as bulk sulfur, baled paper, or cotton.

g. See NFPA 51B, Fire Prevention During Welding, Cutting, and Other Hot Work for a sample hot work permit and further information. See also Sections 09.E and 10.D.

09.A.05 Fires and open flame devices shall not be left unattended.

09.A.06 All sources of ignition shall be prohibited within 50 ft (15.2 m) of operations with a potential fire hazard. The area shall be conspicuously and legibly posted “NO SMOKING, MATCHES, or OPEN FLAME.”

09.A.07 Smoking shall be prohibited in all areas where flammable, combustible, or oxidizing materials are stored. “NO SMOKING, MATCHES, or OPEN FLAME” signs will be posted in all prohibited areas.

09.A.08 Areas where there is danger of underground fire shall not be used for the storage of flammable or combustible materials.

09.A.09 A barrier having a fire resistance rating equivalent to a listing of at least 1 hour shall segregate DOT-identified noncompatible materials that may create a fire hazard. > See Section 20.D for compressed gas cylinders.

09.A.10 A good housekeeping program that provides for prompt removal and disposal of accumulations of combustible scrap and debris shall be implemented on the site. Self-closing containers shall be used to collect waste saturated with flammable liquids. Only non-combustible or UL labeled nonmetallic containers may be used to dispose of waste and rubbish.

09.A.11 Measures must be taken to control the growth of tall grass, brush, and weeds adjacent to facilities. A break of at least 3 ft (0.9 m) shall be maintained around all facilities.

09.A.12 Paint-soiled clothing and drop cloths, when not in use, shall be stored in well-ventilated steel cabinets or containers.

09.A.13 Disposal of combustible waste materials shall be in compliance with applicable fire and environmental laws and regulations.

09.A.14 Burning operations.

a. Burning areas shall be established in coordination with the GDA and with the agency responsible for monitoring fire potential at the location of the proposed burning area.

b. Burning operations shall be in compliance with Federal, State, and local regulations and guidelines.

c. A sufficient force to control and patrol the burning operations shall be maintained until the last embers have been extinguished.

d. Bump blocks shall be provided where trucks back to a fire or burning pit.

e. Prescribed burning activities for natural resource management shall be conducted in accordance with guidelines set forth in Section 09.K.

09.A.15 Low-density fiberboard, combustible insulation, or vapor barriers with a flame spread rating greater than 25 shall not be installed in permanent buildings.

09.A.16 Temporary enclosures shall be covered with flame- resistant tarpaulins or material of equivalent fire-resistant characteristics.

09.A.17 When outside help is relied upon for fire protection, a written agreement shall be made, or a memorandum of record, stating the terms of the arrangement and the details for fire protection services, and shall be provided to the GDA.

09.A.18 Temporary building spacing shall be in accordance with the International Building Code (IBC).

09.A.19 Fire lanes providing access to all areas shall be established and maintained free of obstruction.

09.A.20 Vehicles, equipment, materials, and supplies shall not be placed so that access to fire hydrants and other firefighting equipment is obstructed.

09.A.21 Hazardous locations.

a. Electrical lighting shall be the only means of artificial illumination in areas where flammable liquids, vapors, fumes, dust, or gases are present.

b. All electrical equipment and installations in hazardous locations shall be in accordance with the National Electrical Code (NEC) for hazardous locations.

c. Globes or lamps shall not be removed or replaced nor shall repairs be made on the electrical circuit until it has been de-energized.

d. Miners' lights and flashlights used around explosives, and in atmospheres likely to contain explosive vapors, dusts, or gases shall be approved by a private sector organization recognized by OSHA under the Nationally Recognized Testing Laboratory Program.

09.A.22 Sufficient clearance shall be maintained around lights and heating units to prevent ignition of combustible materials.

09.A.23 All combustibles shall be shielded from the flames of torches used to cut or sweat pipe.

09.A.24 Precautions shall be taken to protect formwork and scaffolding from exposure to, and spread of, fire.

09.A.25 Fire protection in the construction process.

a. Fire cut-offs shall be retained in buildings undergoing alterations or demolition until operations require their removal.

b. Where a water distribution system is required for the protection of buildings or other structures, water mains and hydrants shall be installed before or concurrent with the construction of facilities. Until the permanent system is in operation, an equivalent temporary system shall be provided.

c. Permanent (fixed) extinguishing equipment and water supply for fire protection shall be installed and in operable condition as soon as possible. The scheduling of sprinkler installation shall closely follow the building construction and, following completion of each story, shall be placed in service as soon as possible.

d. During demolition or alterations, existing automatic sprinkler systems shall be retained in service as long as reasonable. Modification of sprinkler systems to permit alterations or additional demolition should be expedited so that the system may be returned to service as quickly as possible. Sprinkler control valves shall be checked daily at close of work to ascertain that the protection is in service. The operation of sprinkler control valves is permitted only when approved by the GDA.

e. During the construction process, the construction of fire walls and exit stairways required for completed buildings shall have priority; fire doors, with automatic closing devices, shall be hung on openings as soon as practical.

09.A.26 Water supply and distribution facilities for fire fighting shall be provided and maintained in accordance with NFPA recommendations.

09.A.27 Recommendations of the NFPA shall be complied with in situations not covered in this section. Where local building codes are established, the more stringent requirements shall apply.

09.B Flammable Liquids.

09.B.01 All storage, handling, and use of flammable liquids shall be in accordance with NFPA 30, NFPA 30A, or other applicable standards under the supervision of a qualified person.

09.B.02 All sources of ignition shall be prohibited in areas where flammable liquids are stored, handled, and processed. Suitable “NO SMOKING, MATCHES, or OPEN FLAME” signs shall be posted in all such areas.

09.B.03 Fire protection requirements.

a. At least one portable fire extinguisher rated 20-B:C shall be provided on all tank trucks or other vehicles used for transporting and/or dispensing flammable liquids.

b. Each service or refueling area shall be provided with at least one fire extinguisher rated not less than 40-B:C and located so that an extinguisher shall be within 100 ft (30.4 m) of each pump, dispenser, underground fill pipe opening, and lubrication or service area.

09.B.04 Category 1 or 2 flammable liquids or Category 3 flammable liquids with a flashpoint below 100°F (37.8^{o}C) shall be kept in closed containers or tanks when not in use.

09.B.05 Workers shall guard carefully against any part of their clothing becoming contaminated with flammable fluids. They shall not be allowed to continue work if their clothing becomes contaminated, and they must remove or wet down the clothing as soon as possible.

09.B.06 No flammable liquid with a flash point (closed cup test) below 100°F (37.8°C) shall be used for cleaning purposes or to start or rekindle fires.

09.B.07 Ventilation adequate to prevent the accumulation of flammable vapors to hazardous levels shall be provided in all areas where flammable liquids are handled or used.

09.B.08 Only labeled/listed (by a nationally-recognized testing laboratory) containers and portable tanks shall be used for the storage of flammable liquids.

a. Metal containers and portable tanks less than 660 gal (2.5 m^3) individual capacity meeting the requirements of, and containing products authorized by, Chapter I, 49 CFR (U.S. DOT Hazardous Materials Regulations), Chapter 9 of the United Nations' "Recommendations on the Transport of Dangerous Goods," or NFPA 386 shall be acceptable.

b. Plastic containers meeting the requirements of, and used for petroleum products within the scope of, one or more of the following specifications shall be acceptable: ASTM F852, ASTM F976, and ANSI/UL 1313.

c. Plastic drums meeting the requirements of and containing products authorized by 49 CFR or by Chapter 9 of the United Nations' "Recommendations on the Transport of Dangerous Goods" shall be acceptable.

d. Fiber drums that meet the requirements of Item 296 of the National Motor Freight Classification (NMFC) or Rule 51 of the Uniform Freight Classification (UFC) for Types 2A, 3A, 3B-H, 3B-L, or 4A and meet the requirements of and contain liquid products authorized either by Chapter I, 49 CFR (U.S. DOT Hazardous Materials Regulations) or by DOT exemption shall be acceptable.

09.B.09 Portable tanks less than 660 gal (2.4 m^3) individual capacity shall be provided with one or more devices installed in the top with sufficient emergency venting capacity to limit internal pressure under fire exposure conditions to 10 pounds per square inch (psi) [68.9 kilopascal (kPa)] gauge or 30% of the bursting pressure of the portable tank, whichever is greater.

a. At least one pressure-actuated vent having a minimum capacity of 6000 ft^3 (170 m^3) of free air per hour shall be used. It shall be set to open at not more than 5 psi (35 kPa) gauge.

b. If fusible vents are used, they shall be actuated by elements that operate at a temperature not exceeding 300°F (148.8°C).

c. Where plugging of a pressure-actuated vent can occur, fusible plugs or venting devices that soften to failure at a maximum of 300°F (148.8°C) under fire exposure shall be permitted to be used for the entire emergency venting requirement.

09.B.10 The design, construction, and use of storage tanks containing flammable liquids shall be as specified in NFPA 30. Tanks greater than 660 gal (2.5 m^3) capacity shall be in accordance with NFPA 30, Chapter 22 and NFPA 30A.

09.B.11 The maximum allowable size for a container or metal portable tank less than 660 gal (2.5 m^3) individual capacities shall not exceed those shown in Table 9-1.

09.B.12 The design, construction, and use of storage cabinets, indoor storage areas, outdoor storage areas, hazardous materials storage lockers, and other occupancies shall be in accordance with NFPA 30 or, for marine applications, 46 CFR 147 covers use of cabinets and 46 CFR 92.05-10 specifies design and construction.

09.B.13 Flammable liquids in quantities greater than that required for 1 day's use shall not be stored in buildings under construction and not more than a 2 day supply shall be stored on paint barges.

09.B.14 Flammable liquids shall not be stored in areas used for exits, stairways, or safe passage of people.

09.B.15 Safety cans and other portable containers for flammable liquids having a flash point at or below 73°F (23°C) shall be labeled/listed and painted red with a yellow band around the can and the name of the contents legibly indicated on the container.

09.B.16 Unopened containers of flammable liquids, such as paints, varnishes, lacquers, thinners, and solvents, shall be kept in a well ventilated location, free of excessive heat, smoke, sparks, flame, or direct rays of the sun.

09.B.17 In areas where flammable liquids are handled or stored, a self-closing metal refuse can, listed by a nationally recognized testing laboratory, shall be provided and maintained in good condition.

09.B.18 Storage areas/tanks shall be surrounded by a curb, earthen dike or other equivalent means of containment of at least 6 in (15 cm) in height and higher as needed to contain the contents in the event of a leak.

a. Other secondary containment methods that are approved by the EPA or USCG can be used in lieu of curbs or dikes (double-walled tanks, etc.).

b. When dikes or curbs are used, provisions shall be made for draining off accumulations of ground or rain water or spills of flammable liquids.

c. Drains shall terminate at a safe location and shall be accessible to operation under fire conditions. If fuel and oil storage areas are subject to the provisions of 40 CFR 112 (Spill Prevention Control and Countermeasures), those provisions shall apply as well.

TABLE 9-1

Maximum Allowable Size of Portable Containers and Tanks for Flammable Liquids

Container type	Flammable Liquids Categories			
	1	2	3	4
Glass	16 oz (473 mL)	32 oz (946 mL)	1gal (3.8 L)	1 gal (3.8 L)
Metal (other than DOT drums) or approved plastic)	1 gal (3.8 L)	5 gal (19 L)	5 gal (19 L)	5 gal (19 L)
Safety cans	2 gal (7.6 L)	5 gal (19 L)	5 gal (19 L)	5 gal (19 L)
Metal drum (DOT) specification	60 gal (8.1 ft^3) (0.23 m^3)	60 gal (8.1 ft^3) (0.23 m^3)	60 gal (8.1 ft^3) (0.23 m^3)	60 gal (8.1 ft^3) (0.23 m^3)
Approved portable tanks	660 gal (88.3 ft^3) (2.5 m^3)	660 gal (88.3 ft^3) (2.5 m^3)	660 gal (88.3 ft^3) (2.5 m^3)	660 gal (88.3 ft^3) (2.5 m^3)

NOTE: Flammable liquid means any liquid having a flashpoint at or below 199.4°F (93°C). Flammable liquids are divided into four categories as follows:
-Category 1 shall include liquids having flashpoints below 73.4°F (23°C) and having a boiling point at or below 95°F (35°C).
-Category 2 shall include liquids having flashpoints below 73.4°F (23°C) and having a boiling point above 95°F (35°C).
-Category 3 shall include liquids having flashpoints at or above 73.4°F (23°C) and at or below 140°F (60°C). When a Category 3 liquid with a flashpoint at or above 100°F (37.8°C) is heated for use to within 30°F (16.7°C) of its flashpoint, it shall be handled in accordance with the requirements for a Category 3 liquid with a flashpoint below 100°F (37.8°C).
-Category 4 shall include liquids having flashpoints above 140°F (60°C) and at or below 199.4°F (93°C).When a Category 4 flammable liquid is heated for use to within 30°F (16.7°C) of its flashpoint, it shall be handled in accordance with the requirements for a Category 3 liquid with a flashpoint at or above 100°F (37.8°C).

09.B.19 Where liquids are used or handled, provisions shall be made to promptly and safely dispose of leakage or spills.

09.B.20 Flashlights and electric lanterns used while handling flammable liquids shall be listed by a nationally recognized testing laboratory for the intended use.

09.B.21 Dispensing flammable liquids - general.

a. All pumping equipment used for the transfer of Category 1 or 2 flammable liquids or Category 3 flammable liquids with a flashpoint below 100°F (37.8^{o}C) shall be listed by a nationally recognized testing laboratory or approved by, and labeled or tagged in accordance with, the Federal agency having jurisdiction, such as the DOT.

b. Dispensing systems for Category 1 or 2 flammable liquids or Category 3 flammable liquids with a flashpoint below 100°F (37.8^{o}C) shall be electrically bonded and grounded. All fuel tanks, hoses, and containers of 5 gal (18.9 L) or less shall be kept in metallic contact while flammable liquids are being transferred; transfer of flammable liquids to containers in excess of 5 gal shall be done only when the containers are electrically bonded.

c. Flammable liquids shall be drawn from, or transferred into, vessels, containers, or tanks within a building or outside only through a closed piping system, from safety cans, by means of a device drawing through the top, or from a container, or portable tanks, by gravity or pump, through an approved self-closing valve. Transferring by means of air pressure on the container or portable tanks is prohibited.

d. Areas in which flammable liquids are transferred in quantities greater than 5 gal (18.9 L) from one tank or container to another, shall be separated from other operations by at least 25 ft (7.6 m) or a barrier having a fire resistance of at least 1 hour. Drainage or other means shall be provided to control spills. Natural or mechanical ventilation shall be provided to maintain the concentration of flammable vapor at or below 10% of the lower flammable limit.

e. Dispensing units shall be protected against collision damage by suitable means and permanent dispensing units shall be securely bolted in place.

f. Dispensing nozzles and devices for Category 1 or 2 flammable liquids or Category 3 flammable liquids with a flashpoint below 100°F shall be listed.

g. Lamps, lanterns, heating devices, small engines, and similar equipment shall not be filled while hot: these devices shall be filled only in well ventilated rooms free of open flames or in open air and shall not be filled in storage buildings.

h. Dispensing devices shall be in all cases at least 20 ft (6 m) from any activity involving fixed sources of ignition.

09.B.22 Service and refueling areas.

a. Dispensing hoses shall be listed. Dispensing nozzles shall be an approved automatic-closing type without a latch-open device.

b. Equipment using flammable liquids as fuel shall be shut down during refueling, servicing, or maintenance, except for emergency generators. Waiver requests may be reviewed and granted by the local SOHO for operations in remote sites or regions where cold weather conditions pose a significant risk when equipment fails to restart (copy provided to CESO).

c. Dispensing of Category 1 or 2 flammable liquids or Category 3 flammable liquids with a flashpoint below 100°F (37.8^{o}C) from tanks of 55 gal (0.20 m^{3}) capacity or more shall be

by listed pumping arrangement. Transferring by air pressure on the container or portable tank is prohibited.

d. Clearly identified and easily accessible switch(es) shall be provided at a location remote from dispensing devices to shut off the power to all dispensing devices in an emergency.

e. A listed emergency breakaway device designed to retain liquid on both sides of the breakaway point shall be installed on each hose dispensing Category 1 or 2 flammable liquids or Category 3 flammable liquids with a flashpoint below 100°F (37.8^{o}C) liquids.

09.B.23 Tank cars/trucks.

a. Tank cars/trucks shall be spotted and not loaded or unloaded until brakes have been set and wheels chocked.

b. Tank cars/trucks shall be attended for the entire time they are being loaded or unloaded. Precautions shall be taken against fire or other hazards.

c. Tank cars/trucks shall be properly bonded and grounded while being loaded or unloaded. Bonding and grounding connections shall be made before dome covers are removed on tank cars/trucks and shall not be disconnected until such covers have been replaced. Internal vapor pressure shall be relieved before dome covers are opened.

09.C Liquefied Petroleum Gas (LP-Gas).

09.C.01 Storage, handling, installation, and use of LP-Gas and systems shall be in accordance with NFPA Standard 58 and USCG regulations, as applicable.

09.C.02 LP-Gas containers, valves, connectors, manifold valve assemblies, regulators, and appliances shall be of an approved type.

09.C.03 Any appliance that was originally manufactured for operation with a gaseous fuel other than LP-Gas and is in good condition may be used with LP-Gas only after it is properly converted, adapted, and tested for performance with LP-Gas.

09.C.04 Polyvinyl chloride and aluminum tubing shall not be used in LP-Gas systems.

09.C.05 Safety devices.

a. Every container and vaporizer shall be provided with one or more safety relief valves or devices. These valves and devices shall be arranged to afford free vent to the outside air and discharge at a point not less than 5 ft (1.5 m) horizontally from any building opening that is below the discharge point.

b. Container safety relief devices and regulator relief vents shall be located not less than 5 ft (1.5 m) in any direction from air openings into sealed combustion system appliances or mechanical ventilation air intakes.

c. Shut-off valves shall not be installed between the safety relief device and the container, or the equipment or piping to which the safety relief device is connected, except that a shut-off valve may be used where the arrangement of the valve is such that full required capacity-flow through the safety relief device is always afforded.

09.C.06 Container valves and accessories.

a. Valves, fittings, and accessories connected directly to the container, including primary shut off valves, shall have a rated working pressure of at least 250 psi (1723.6 kPa) gauge and shall be of material and design suitable for LP-Gas service.

b. Connections to containers (except safety relief connections, liquid level gauging devices, and plugged openings) shall have shutoff valves located as close to the container as practical.

09.C.07 Multiple container systems.

a. Valves in the assembly of multiple container systems shall be arranged so that replacement of containers can be made without shutting off the flow of gas in the system (this is not to be construed as requiring an automatic changeover device).

b. Regulators and low-pressure relief devices shall be rigidly attached to the cylinder valves, cylinders, supporting standards, building walls, or otherwise rigidly secured and shall be installed or protected from the elements.

09.C.08 LP-Gas containers and equipment shall not be used in unventilated spaces below grade in pits, below-decks, or other spaces where dangerous accumulations of heavier-than-air gas may accumulate due to leaks or equipment failure.

09.C.09 Welding is prohibited on LP-Gas containers.

09.C.10 Dispensing.

a. Equipment using LP-Gas shall be shut down during refueling operations.

b. Filling of fuel containers for motor vehicles from bulk storage containers shall be performed not less than 10 ft (3 m) from the nearest masonry-walled building, not less than 25 ft (7.6 m) from the nearest building of other construction, and, in any event, not less than 25 ft from any building opening.

c. Filling, from storage containers, of portable containers or containers mounted on skids shall be performed no less than 50 ft (15.2 m) from the nearest building.

09.C.11 Installation, use, and storage outside buildings.

a. Containers shall be upright upon firm foundations or otherwise firmly positioned. Flexible connections (or other special fixtures) shall be provided to protect against the possibility of the effect of settlement on the outlet piping.

b. Containers shall be in a suitable ventilated enclosure or otherwise protected against tampering.

c. Storage outside buildings, of containers awaiting use, shall be located from the nearest building or group of buildings in accordance with Table 9-2.

d. Storage areas shall be provided with at least one approved portable fire extinguisher rated no less than 20-B:C.

TABLE 9-2

Outside Storage of LP-Gas Containers and Cylinders - Minimum Distances

Quantity of LP-Gas stored	Distance
Less than 500 lb (227 kg)	0 ft
500 lb (227 kg) 6,000 lb (2730 kg)	10 ft (3 m)
6,000 lb (2730 kg) 10,000 lb (4545 kg)	20 ft (6 m)
More than 10,000 lb (4545 kg)	25 ft (7.6 m)

09.C.12 Installation, use, and storage inside of buildings.

a. Storage of LP-gas containers (empty or full) in industrial buildings (not normally frequented by the public) shall not exceed 300 lbs (2,598 ft^3 in vapor form). When stored inside, empty containers which have been in LP-Gas service shall be considered as full containers for the purpose of determining the maximum quantity of LP-Gas permitted.

➢ Exemption: A total of 5 one-pound propane cylinders may be stored indoors as long as they are stored away from exits and stairways, or in areas normally used for the safe exit of people.

b. Containers stored inside shall not be located near exits, stairways, or in areas normally used for the safe exit of people.

c. Container valves shall be protected while in storage as follows: by setting into recess of container to prevent the possibility of it being struck if the container is dropped upon a flat surface, or by ventilated cap or collar fastened to the container capable of withstanding blow from any direction equivalent to that of a 30 lb (13.6 kg) weight dropped 4 ft (1.2 m).

d. Outlet valves of containers in storage shall be closed.

e. Storage locations shall be provided with at least one approved portable fire extinguisher having a minimum rating of 8-B:C.

f. Containers, regulating equipment, manifolds, pipe, tubing, and hose shall be located to minimize exposure to high temperatures or physical damage.

g. The maximum water capacity of individual containers shall be 245 lb (111.1 kg), nominal 100 lb (45.3 kg), LP-Gas capacity.

h. Containers having a water capacity greater than 2.5 lb LP-Gas capacity (1.1 kg), (nominal 1 lb (0.4 kg), that are connected for use shall stand on a firm and substantially level surface and, when necessary, shall be secured in an upright position. Systems using containers having a water capacity greater than 2.5 lb shall be equipped with excess flow valves internal either with the container valves or in the connections to the container valve outlets.

i. Regulators shall be directly connected to either the container valves or to manifolds connected to the container valves. The regulator shall be suitable for use with LP-Gas. Manifolds and fittings connecting containers to pressure regulator inlets shall be designed for at least 250 psi (1723.6 kPa) gauge service pressure.

j. Valves on containers having water capacity greater than 50 lb (22.6 kg) (nominal 20 lb (9 kg) LP-Gas capacity) shall be protected from damage while in use or storage.

k. Hoses shall be designed for working pressure of at least 250 psi (1723.6 kPa) gauge. Design, construction, and performance of hoses and connections shall have been suitability determined by listing by a nationally recognized testing agency. Hose length shall be as short as possible but long enough to permit compliance with spacing requirements without kinking, straining, or causing the hose to be so close to a burner as to be damaged by heat.

09.D Temporary Heating Devices.

09.D.01 Only temporary heating devices approved by the GDA shall be used. Each heater should have a safety data plate permanently affixed by the manufacturer. The plate shall provide requirements or recommendations for:

a. Clearances from combustible materials;

b. Ventilation (minimum air requirements for fuel combustion);

c. Fuel type and input pressure;

d. Lighting, extinguishing, and relighting;

e. Electrical power supply characteristics;

f. Location, moving, and handling; and

g. Name and address of the manufacturer.

➢ Note: If this information is not available on a data plate, it shall be in writing at the job site.

09.D.02 A positive operating procedure shall be established to assure the following:

a. Proper placement and servicing;

b. Safe clearance from combustible material;

c. Close surveillance;

d. Safe fuel storage and refueling;

e. Proper maintenance; and

f. Ventilation and determination of gaseous contamination or oxygen deficiency.

09.D.03 Heater installation and maintenance shall be in accordance with the manufacturer's instructions.

09.D.04 Open-flame heating devices having exposed fuel below the flame are prohibited.

09.D.05 Heaters, when in use, shall be set horizontally level, unless otherwise permitted by the manufacturer's specifications.

09.D.06 Heaters unsuitable for use on wood floors shall be so marked. When such heaters are used, they shall rest on suitable heat insulating material, such as concrete of at least 1 in (2.5 cm) thickness or equivalent; the insulating material shall extend 2 ft (0.6 m) or more in all directions from the edges of the heater.

09.D.07 Heaters used near combustible tarpaulins, canvas, or similar coverings shall be located at least 10 ft (3 m) from such coverings; coverings shall be securely fastened to prevent them from igniting or upsetting the heater due to wind action.

09.D.08 Heaters shall be protected against damage.

09.D.09 Installation of temporary heating devices shall provide minimum clearances to combustible materials as specified in Table 9-3.

TABLE 9-3

Temporary Heating Device Clearances

Heater type	Sides	Rear	Chimney Connector
Room heater – circulating	12 in (30.5 cm)	12 in (30.5 cm)	18 in (45.8 cm)
Room heater – radiant	36 in (91.5 cm)	36 in (91.5 cm)	18 in (45.8 cm)

09.D.10 Fuel combustion space heating devices used in any enclosed building, room, or structure shall be vented by a flue pipe to the exterior of the structure.

a. Fresh air shall be supplied, by natural or mechanical means, in sufficient quantities to ensure the health and safety of workers. Particular attention shall be given to areas where heat and fumes may accumulate.

b. When heaters are used in confined spaces, precautions shall be taken to ensure proper combustion, maintenance of a safe and healthful atmosphere for workers, and limitation of temperature rise in the area. These precautions shall be addressed in the confined space entry permit. > See Section 34.

c. Vent pipes shall be located at least 18 in (0.5 m) from flammables and combustibles. Where vent pipes pass through combustible walls or roofs, they shall be properly insulated and securely fastened and supported to prevent accidental displacement or separation.

09.D.11 When a heater is placed in operation, initial and periodic checks shall be made to ensure it is functioning properly.

09.D.12 Fuel combustion heater CO hazards.

a. When heaters are used in enclosed or partially enclosed structures, CO shall be continuously monitored. If not feasible, this shall be so stated in the AHA and tests for the presence of CO shall be made within 1 hour of the start of each shift and at least every 4 hours thereafter.

b. CO concentrations greater than 25 ppm (TLV) of air volume at worker breathing levels shall require extinguishing of the heater unless additional ventilation is provided to reduce the CO content to acceptable limits.

09.D.13 Personnel involved in fueling heaters shall be trained in, and thoroughly familiar with, the manufacturer's recommended safe fueling procedures.

09.D.14 Heaters shall be equipped with an approved automatic device to shut off the flow of fuel if the flame is extinguished (on liquid fuel heaters, barometric or gravity oil feed shall not be considered a primary safety control).

09.D.15 Spark arresters shall be provided on all smoke stacks or burning devices having forced drafts or short stacks permitting live sparks or hot materials to escape.

09.D.16 Solid fuel heaters are prohibited in buildings and on scaffolds.

09.D.17 Gas Heaters - General.

a. All piping, tubing, and hose shall be leak tested using soap suds or other noncombustible detection means (tests shall not be made with a flame) after assembly and proven free of leaks at normal operating pressure.

b. Hose and fittings shall be protected from damage and deterioration.

c. All hoses and fittings shall be checked to ensure that the type, capacity, and pressure ratings are as specified by the heater manufacturer. Hose shall have a minimum working pressure of 250 psi (1723.6 kPa) gauge and a minimum bursting pressure of 1250 psi (8618.4 kPa) gauge.

d. All hose connectors shall be capable of withstanding, without leakage, a test pressure of 125 psi (861.8 kPa) gauge for natural gas, and 500 psi (3,447 kPa) gauge for LP-Gas and shall be capable of withstanding a pull test of 400 lb (181.4 kg).

e. Hose connectors shall be securely connected to the heater by mechanical means. Neither "slip-end" connectors (connections that allow the hose end to be held only by the friction of the hose material against the metal fitting of the unit) nor ring keepers (tightened over the hose to provide an increased force holding the hose to the metal fitting) are permitted.

09.D.18 Natural gas heaters. When flexible gas supply lines are used, the length shall be as short as practical and shall not exceed 25 ft (7.6 m).

09.D.19 Portable LP-Gas Heaters. > See also Section 09.C.

a. If LP-Gas is supplied to a heater by hose, the hose shall not be less than 10 ft (3 m), or more than 25 ft (7.6 m), in length.

b. Heaters shall be equipped with an approved regulator in the supply line between the fuel cylinder and the heater unit. Cylinder connectors shall be provided with an excess flow valve to minimize the flow of gas in the event the fuel line ruptures.

c. LP-Gas heaters having inputs above 50,000 British Thermal Unit (BTU)/hour shall be equipped with either a pilot, which must be lighted and proved before the main burner can be turned on, or an electronic ignition. > These provisions do not apply to portable heaters under 7,500 BTU/ hour when used with containers having a maximum water capacity of 2.5 lb (1.1 kg).

d. Container valves, connectors, regulators, manifolds, piping, and tubing shall not be used as structural support for LP-Gas heaters.

e. Heaters, other than integral heater-container units, shall be located at least 6 ft (1.8 m) from any LP-Gas container (this shall not prohibit the use of heaters designed specifically for attachment to the LP-Gas container or to a supporting standard, provided they are designed and installed to prevent direct or radiant heat application from the heater into the containers). Blower and radiant type heaters shall not be directed toward any LP-Gas container within 20 ft (6 m).

f. If two or more heater-container units (of either the integral or non-integral type) are located in an unpartitioned area of the same floor, the container or containers of each unit shall be separated from the container or containers of any other unit by at least 20 ft (6 m).

g. When heaters are connected to containers for use in an unpartitioned area on the same floor, the total water capacity of containers, manifolded together for connection to a heater(s), shall not be greater than 735 lb (333.3 kg), [nominal 300 lb (136 kg) LP-Gas capacity]. Such manifolds shall be separated by at least 20 ft (6 m).

09.D.20 Installation of heating equipment in service or lubrication areas.

a. Heating equipment installed in lubrication or service areas where there is no dispensing or transferring of flammable liquids shall be installed such that the bottom of the heating unit is at least 18 in (.5 m) above the floor and is protected from damage.

b. Heating equipment installed in lubrication or service areas where flammable liquids are dispensed shall be of a type approved for garages and shall be installed at least 8 ft (2.4 m) above the floor.

09.E Heating Devices and Melting Kettles.

09.E.01 Heating devices and melting kettles shall be placed on firm, level, non-combustible foundations and shall be protected against traffic, accidental tipping, or similar hazards and, whenever possible, shall be placed downwind from employees or occupied buildings.

09.E.02 A method to contain uncontrolled spills of the heated material, which might be on fire, shall be developed. The placement of a fire retardant tarp under the kettle (or other effective means) shall be used.

09.E.03 A minimum of 2 fire extinguishers, rated not less than 2A:20B:C shall be available within 25 ft (7.6 m) of the working kettles. > Hot work permits shall be required on Government installations unless otherwise indicated by the GDA.

09.E.04 The kettle operator must be trained in the proper operation of the kettle and have knowledge of the material being heated so as to not allow the material to be heated beyond the allowable temperature. A working thermometer shall be provided and used.

09.E.05 Heating devices and melting kettles shall not be left unattended when in use. When the kettle is heating material to the working temperature, the operator must be located on the same level as the kettle, be within eyesight and be within 25 ft (7.6 m) of the kettle. > See 09.K.03.

09.E.06 Bituminous-material melting kettles shall be provided with an effective tight fitting lid or hood, and a calibrated thermometer in operating condition.

a. The temperature shall be maintained 25° below the flash point of the bituminous material.

b. All melting kettles shall be sized for the job.

c. Asphalt and tar kettles shall not be located on roofs.

09.E.07 Bituminous-material melting kettles shall not be used or operated inside or within 25 ft (7.6 m) of combustible materials, including propane tanks stored or in use. The lid for the kettle should open away from the building.

09.E.08 The liquid propane container(s) used as the heat source shall be kept at least 10 ft (3 m) away from the kettle and shall be placed in an upright and secured position to insure it doesn't tip over.

09.E.09 Kettles shall be located so that means of egress is not restricted and shall be no closer than 10 ft (3 m) of egress path.

09.E.10 Enclosed areas in which hot substances are heated or applied shall be ventilated.

09.E.11 Ladles, equipment, and material shall be moisture-free before being used or placed in heated material.

09.E.12 Flammable liquids with a flash point below 100°F (37.8^{o}C) shall not be used to thin the mixture or to clean equipment.

09.E.13 An effective fire prevention plan shall be included in the APP, AHA and maintained at the jobsite. All workers shall be trained in the specifics of the plan.

09.F First Response Fire Protection.

09.F.01 Portable fire extinguishers shall be provided where needed as specified in Table 9-4.

a. Fire extinguishers shall be inspected monthly and maintained as specified in NFPA 10.b. Records shall be kept on a tag or label attached to the extinguisher, on an inspection check list maintained on file, or by an electronic method that provides a permanent record. Record/tag shall include date inspection was performed and initials of the person performing the inspection.

09.F.02 Approved fire extinguishers.

a. Fire extinguishers shall be approved by a nationally recognized testing laboratory and labeled to identify the listing and labeling organization and the fire test and performance standard that the fire extinguisher meets or exceeds.

b. Fire extinguishers shall be marked with their letter (class of fire) and numeric (relative extinguishing effectiveness) classification.

c. Fire extinguishers using carbon tetrachloride or chlorobromomethane extinguishing agents are prohibited.

d. Soldered or riveted shell self-generating foam or gas cartridge water-type portable extinguishers that are operated by inverting the extinguisher to rupture or initiate an uncontrollable pressure generating chemical reaction to expel the agent are prohibited.

09.F.03 Fire extinguishers shall be in a fully charged and operable condition and shall be suitably placed, distinctly marked, and readily accessible.

09.F.04 When portable fire extinguishers are provided for employee use in the workplace, the employer shall provide training (upon initial employment and at least annually thereafter) in the following:

a. General principles of fire extinguisher use and the hazards involved with incipient stage fire fighting to all employees; and

b. Use of the appropriate firefighting equipment to those employees designated in an emergency action plan to use firefighting equipment.

TABLE 9-4

Fire Extinguisher Distribution

	Occupancy					
	Low Hazard		Medium Hazard		High Hazard	
	Class A	Class B	Class A	Class B	Class A	Class B
Minimum rating for single extinguisher	2-A	5-B or 10-B(1)	2-A	10-B or 20-B	4-A	40-B or 80-B(2)
Maximum coverage (floor area) per unit of A-rating	3,000 ft^2	n/a	1,500 ft^2	n/a	1,000 ft^2	n/a
Maximum floor area for extinguisher	11,250 ft^2	n/a	11,250 ft^2	n/a	11,250 ft^2	n/a
Maximum travel distance to extinguisher	75 ft	30 ft for 5-B 50 ft for 10-B	75 ft	30 ft for 10-B 50 ft for 20-B	75 ft	30 ft for 40-B 50 ft for 80-B

1) Up to 3 foam extinguishers of at least 2 1/2 gal (9.5 L) capacities may be used to fulfill low hazard requirements
2) Up to 3 aqueous film foaming foam (AFFF) extinguishers of at least 2 1/2 gal (9.5 L) capacities may be used to fulfill high hazard requirements
Derived from NFPA 10: In multiple-story facilities, at least 1 extinguisher shall be adjacent to stairways. On construction and demolition projects, a 1/2 in (1.2 cm) diameter garden hose, not to exceed 100 ft (30.4 m) in length and equipped with a nozzle, may be substituted for a 2-A rated fire extinguisher provided it its capable of discharging a minimum of 5 gal (18.9 L) per minute with minimum hose stream range of 30 ft (9.1 m) horizontally. The garden hose lines shall be mounted on conventional racks or reels. The number of location of hose racks or reels shall be such that at least 1 hose stream can be applied to all points in the area.

09.F.05 Approved fire blankets shall be provided and kept in conspicuous and accessible locations as warranted by the operations involved.

09.F.06 No fire shall be fought where the fire is in imminent danger of contact with explosives. All persons shall be removed to a safe area and the fire area guarded against intruders.

09.F.07 Standpipe and hose system equipment.

a. Standpipes shall be located or otherwise protected against damage. Damaged standpipes shall be repaired promptly.

b. Reels and cabinets used to contain fire hose shall be designed and maintained to ensure the prompt use of the hose valve, hose, and other equipment. Reels and cabinets shall be conspicuously identified and used only for fire equipment.

c. Hose outlets and connections shall be located high enough above the floor to avoid their obstruction and to be accessible to employees. To ensure hose connections are compatible with support fire equipment, screw threads shall be standardized or adapters shall be provided throughout the system.

d. Standpipe systems shall be equipped with vinyl type or lined hoses of such length that friction loss resulting from water flowing through the hose will not decrease the pressure at the nozzle below 30 psi (206.8 kPa) gauge. The dynamic pressure at the nozzle shall be within 30 psi (206.8 kPa) gauge and 125 psi (861.8 kPa) gauge.

e. Standpipe hoses shall be equipped with basic spray nozzles with a straight stream to wide stream spray pattern. Nozzles shall have a water discharge control capable of functions ranging from full discharge to complete shutoff.

09.F.08 The following tests shall be performed on standpipe and hose systems before placing them in service:

a. Piping (including yard piping) shall be hydrostatically tested for at least 2 hours at not less than 200 psi (1378.9 kPa), or at least 50 psi (344.7 kPa) in excess of normal pressure when the normal pressure is greater than 150 psi (1034.2 kPa)); and

b. Hose shall be hydrostatically tested with couplings in place at a pressure of not less than 200 psi (1378.9 kPa). This pressure shall be maintained for at least 15 seconds, but not more than 1 minute, during which time the hose shall not leak nor shall the jacket thread break.

09.F.09 Standpipe and hose system inspection and maintenance.

a. Water supply tanks shall be kept filled to the proper level except during repairs. When pressure tanks are used, proper pressure shall be maintained at all times except during repairs.

b. Valves in the main piping connections to the automatic sources of water supply shall be kept fully open at all times, except during repairs.

c. Hose systems shall be inspected at least annually and after each use to assure that all equipment is in place, available for use, and in operable condition.

d. When the system or any portion of the system is found not to be serviceable, it shall be removed for repair and replaced with equivalent protection (such as fire watches and extinguisher) until the repairs are complete.

e. Hemp and linen hoses shall be unracked, physically inspected for deterioration, and reracked using a different fold pattern at least annually.

09.F.10 The minimum water supply for standpipe and hose systems provided for the use of employees shall be sufficient to provide 100 gal (0.37 m^3) per minute for at least 30 minutes.

09.F.11 For all structures in which standpipes are required, or where standpipes exist in structures being altered, the standpipes shall be brought up as soon as practical and maintained as construction progresses so that they are always ready for fire protection use. There shall be at least one standard hose outlet at each floor.

09.F.12 For employees that may encounter incipient stage wild land fires, local safety programs shall provide basic training (upon initial employment and at least annually thereafter) in techniques commonly used to extinguish incipient stage wild land fires and the hazards associated with such fire fighting activities.

09.G Fixed Fire Suppression Systems.

09.G.01 Fixed fire suppression systems shall be designed, installed, and acceptance-tested in accordance with requirements of the NFPA.

09.G.02 Fixed fire suppression systems shall be inspected and maintained in accordance with UFC 3-600-02, O&M: Inspection, Testing, and Maintenance of Fire Protection Systems. Inspection and maintenance dates shall be recorded on the container, on a tag attached to the container, or in a central location.

09.G.03 Automatic sprinkler systems shall be protected from damage.

09.G.04 Vertical clearance of at least 18 in (45.7 cm) shall be maintained between the top of stored material and sprinkler deflectors.

09.G.05 If a fixed extinguishing system becomes inoperable, the employer shall notify the employees and take necessary precautions to assure their safety until the system is restored to operating order.

09.G.06 Effective safeguards shall be provided to warn employees against entry into fixed extinguishing system discharge areas where the atmosphere remains hazardous to employee safety and health. Manual operating devices shall be identified as to the hazard against which they will provide protection.

09.G.07 Warning or caution signs shall be posted at the entrance to, and inside, areas protected by fixed extinguishing systems that use agents in concentrations known to be hazardous to employee safety and health.

09.G.08 Dry chemical fixed extinguishing systems.

a. Dry chemical extinguishing agents shall be compatible with any foams or wetting agents with which they are used.

b. Dry chemical extinguishing agents of different compositions shall not be mixed together.

c. Dry chemical extinguishing systems shall be refilled with the chemical stated on the approval nameplate or an equivalent compatible material.

09.G.09 Gaseous agent fixed extinguishing systems.

a. Agents used for initial supply and replenishment shall be of a type approved for the system's application.

b. Employees shall not be exposed to toxic levels of the gaseous agent or its decomposition products.

09.G.10 When water and spray foam fixed extinguishing systems are used, the drainage of water shall be away from work areas and routes of emergency egress.

09.H Firefighting Equipment.

09.H.01 Firefighting equipment shall be provided and installed in accordance with applicable NFPA and OSHA regulations.

09.H.02 No fire protection equipment or device shall be made inoperative or used for other purposes, unless specifically approved by the GDA.

09.H.03 If fire hose connections are not compatible with local firefighting equipment, adapters shall be made available.

09.I Fire Detection and Employee Fire Alarm Systems.

09.I.01 Fire detection and employee fire alarm systems shall be designed and installed in accordance with requirements of NFPA and OSHA.

09.I.02 Fire detection systems and components shall be restored to normal operating condition as soon as possible after each test/alarm. Spare devices and components shall be maintained in sufficient quantities for the prompt restoration of the system.

09.I.03 Fire detection systems shall be maintained in operable condition except during maintenance or repairs.

a. Fire detectors and detector systems shall be tested and adjusted as often as necessary to maintain operability and reliability; factory calibrated detectors need not be adjusted after installation.

b. Pneumatic and hydraulic operated detection systems installed after January 1, 1981, shall be equipped with supervised systems.

c. The servicing, testing, and maintenance of fire detection systems shall be performed by a trained person knowledgeable in the operations and functions of the system.

d. Fire detectors that need to be cleaned of dirt, dust, or other particulate matter to be fully functional shall be cleaned at regular intervals.

09.I.04 Fire detection systems and devices shall be protected from weather, corrosion, and mechanical and physical damage.

09.I.05 Fire detectors shall be supported independently of their control wiring or tubing.

09.I.06 An alarm system shall be established by the employer so that employees on the site and the local fire department can be alerted of an emergency.

09.I.07 Manually operated alarm actuation devices shall be conspicuous and accessible and inspected and maintained in operable condition.

09.I.08 The alarm shall be distinctive and recognizable as a signal to evacuate the work area or to perform actions designated in the emergency action plan.

a. The alarm shall be capable of being perceived above ambient noise and light levels by all employees in the affected area.

b. Tactile devices may be used to alert those employees who would not otherwise be able to recognize the audible or visual alarm.

09.I.09 Employees shall be instructed in the preferred means of reporting emergencies, such as manual pull box alarms, public address systems, or telephones.

a. The alarm code and reporting instructions shall be conspicuously posted at phones and at employee entrances.

b. Reporting and evacuating instructions shall be conspicuously posted.

c. For work at installations that are equipped with radio wave fire alarm systems, a compatible fire alarm transmitter should be used at the construction site.

09.J Firefighting Organizations - Training and Drilling.

09.J.01 Firefighting organizations shall be provided to assure adequate protection to life and property. NFPA recommendations shall be used for determining type, size, and training of fire fighting organizations.

09.J.02 Fire brigade drills shall be held to assure a well-trained and efficient operating force. Records of such drills shall be maintained at the installation.

09.J.03 Demonstration and training in first-aid firefighting shall be conducted at intervals to ensure that project personnel are familiar with, and capable of operating, firefighting equipment.

09.K Fire Watch.

09.K.01 When fire watch personnel or guards are provided, they shall make frequent rounds through buildings and storage areas when work is suspended.

09.K.02 Smoke detectors shall be installed and maintained where personnel are quartered.

09.K.03 In any instance where combustible materials have been exposed to fire hazards (i.e., welding operations, hot metals, open flame, etc.), a fire watch shall be assigned to remain at the location for at least one (1) hour after the exposure has ended.

09.L USACE Wild Land Fire Control.

09.L.01 At all USACE facilities and areas with potential exposure to wild land fire, whether prescribed or planned, a wild land fire management plan shall be developed. The plan, which is further detailed in USACE Engineer Pamphlet (EP) 1130-2-540, shall address prescribed fire and wild fire prevention and suppression, shall include the following items, and shall be updated annually:

a. An individual prescribed fire burn plan procedure, as outlined in EP 1130-2-540, that requires individual burn plans to include an AHA and an on-site safety meeting to include discussion of predicted weather patterns, escape route(s), and safety zone(s);

b. An analysis of wild land fire causes and special wild fire hazards and risks;

c. Proposed measures to reduce wild fire occurrence and decrease fire damage;

d. Procedures for public education and wild fire prevention sign posting (including procedures for keeping the public informed of the current fire danger rating);

e. Provisions for cooperative efforts with all other neighboring wild land fire management protection agencies;

f. The in-house wild land fire management or control team organization and personnel roster, training and equipment requirements, and notification procedures;

g. A listing of cooperating agencies and notification procedures, (including any mutual aid agreements with adjacent fire departments and agencies);

h. A listing of additional available resources for work force, equipment, supplies, and facilities, and contracting or procurement information;

i. An up-to-date map(s) of the managed and/or protected area(s) that shows boundaries, roads, and other means of access, heliports, airports, water sources, special hazards, and special fire risks;

j. A listing of weather information sources;

k. Procedures for public notification; and

l. A pre-attack fire suppression plan as outlined in EP 1130-2-540.

09.L.02 Wild land fire management teams and operations should be organized and conducted in accordance with the requirements of NFPA 1143.

a. Wild land fire management team personnel shall, as a minimum, receive training that will include fire line safety, basic wild land fire behavior, basic wild land fire suppression tactics, communications procedures, first aid and use, limitations and care of protective and firefighting equipment.

b. Firefighting equipment shall be maintained in working and ready condition.

c. PPE, fire-resistant clothing, safety hard hats, safety toe (non steel-toe) leather boots, goggles, and fire resistant gloves, as required by NFPA 1143, part A.5.3.1.2 and NFPA 1977, shall be provided and maintained in working and ready condition. > See also Section 5.

d. Employees engaged in fire management activities shall be examined, as part of their medical surveillance, by a physician and certified to be physically able to perform assigned fire management duties.

e. Communication equipment shall be provided to personnel as necessary for coordination, control, and emergency needs.

09.L.03 Recommendations of NFPA 1143 shall be complied with in wild land fire situations not covered in this Section.

09.L.04 Wild land fire management teams shall consist of 2 or more qualified individuals.

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SECTION 10

Welding and Cutting

10.A General.

10.A.01 Welders, cutters, and their supervisor shall be trained in the safe operation of their equipment, safe welding/cutting practices, and welding/cutting respiratory and fire protection. > AIHA publication "Welding Health and Safety: A Field Guide for OEHS Professionals" is recommended.

10.A.02 All welding equipment shall be inspected before each use to ensure that all required safety devices and ancillary equipment are in place and properly functioning. Defective equipment shall be removed from service, replaced or repaired, and reinspected before again being placed in service.

10.A.03 Electrical and pressurized system requirements.

a. Welding cylinders and their use and maintenance shall meet the applicable requirements of Section 20.

b. Arc welding and cutting systems and their use shall meet the applicable requirements of this section.

10.A.04 Arc welding and cutting operations shall be shielded by noncombustible or flameproof screens that will protect employees and other persons working within 35 ft (10.7 m) from the direct rays of the arc, sparks, molten metal, spatter, and chipped slag.

a. Welding curtains shall be suitable for the welding process and amperage.

b. Welding curtains shall provide a high degree of safety against ultraviolet radiation and blue light.

c. Welding curtains shall be fade resistant and flame retardant.

d. The use of blue tinted welding curtains is prohibited if observers are in the work area as they provide very little blue light protection.

10.A.05 Cable, hoses, and other equipment shall be kept clear of passageways, ladders, and stairways.

10.A.06 Welding and cutting of hazardous materials.

a. When welding, cutting, or heating on steel pipelines containing natural gas, 49 CFR 192 shall apply.

b. Before welding, cutting, or heating is commenced on any surface covered by a preservative coating whose flammability is not known, a test shall be made to determine its flammability. Preservative coatings shall be considered highly flammable when scrapings burn with extreme rapidity.

c. Preservative coatings shall be removed a sufficient distance from the area to be heated to ensure any temperature increase of the un-stripped metal will not result in visually observable decomposition, or degradation of the coatings; artificial cooling of the metal surrounding the heating area may be used to limit the area to be stripped.

d. When welding, cutting, or heating toxic surface coatings (paints, preservatives, surface stripping chemicals, etc.) in enclosed spaces, all surfaces covered with the coatings shall be stripped of such for a distance of at least 4 in (10.1 cm) from the area of heat application or the employees shall be protected by airline respirators.

10.A.07 Critical Items. > See Appendix Q.

a. All structural welding performed on critical items, such as scaffolding, shoring, forms, ladders, piling, etc., as well as other critical items as determined by a Qualified Person (QP), shall only be performed by welders certified in accordance with American Welding Society (AWS) standards using qualified and approved welding practices and procedures (AWS certification or approved equivalent organization which trains to AWS standards).

b. Welds on critical items shall be inspected by either a current, AWS-certified Senior Certified Welding Inspector (CSWI) or Certified Welding Inspector (CWI) (or equivalent).

10.A.08 Before heat is applied to a drum, container, or hollow structure, a vent or opening shall be provided for the release of any built-up pressure generated during the application of heat. The use of the heat or spark producing tools to create or provide venting is not permitted.

10.A.09 Employees performing welding, cutting, and heating work shall be protected by PPE appropriate for the hazards that they may encounter and based upon the results of an AHA conducted specifically for the welding, cutting, or heating operation that they will be performing. All required respiratory, eye and face, noise, head, foot, and skin protection equipment shall be selected and used in accordance with Sections 10.B, 10.C. and Section 5.

10.A.10 All welding and cutting equipment and operations shall be in accordance with standards and recommended practices of ANSI/AWS Z49.1.

10.B Eye and Face Protection. The eyes and face of welders shall be protected against UV and infrared radiation and flying objects during welding, grinding and chipping operations.

10.B.01 Personnel performing and/ or exposed to these tasks shall have appropriate eye and face protection based on the hazards, in accordance with this section and Section 05.

10.B.02 Personnel performing and/ or exposed to work that produces UV, blue light, and Infrared light shall be protected from these hazards.

a. Shaded lenses shall be selected based on the type of equipment and work. > See Section 5, Table 5-2.

b. Protective helmets shall have non-reflective surfaces and shall be free of cracks or openings.

c. Lenses that are cracked or pitted shall not be used.

d. All filter lenses shall meet ANSI Z87.1.Ultraviolet, Luminous, and Infrared Transmittance requirements.

e. Welding Helmets shall always be used in conjunction with ANSI Z87.1 rated safety glasses with top and side protection.

f. Electronic-shading welding helmets shall not be used for welding processes requiring a higher shade than the helmet is capable of. Most auto-darkening helmets are not suited for welding processes requiring a Filter Shade of 14 or higher.

10.C Controls.

10.C.01 All welding, cutting, and heating operations shall be ventilated (natural or mechanical) such that personnel exposures to hazardous concentrations of airborne contaminants are within acceptable limits. > See Section 06.

10.C.02 Welding, cutting, and heating not involving conditions or materials described in this Section may normally be done without mechanical ventilation or respiratory protective equipment.

10.C.03 Either general mechanical or local exhaust ventilation shall be provided whenever welding, cutting, or heating is performed in a confined space. > See Sections 10.A.06.d and 10.C.05.

10.C.04 Materials of toxic significance. Welding, cutting, or heating operations that involve or generate any of the substances listed below shall be performed in accordance with the following subparagraphs: Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium (VI), Cobalt, Copper, Lead, Manganese, Mercury, Nickel, Ozone, Selenium, Silver, or Vanadium. > See also Section 10.A.06.d.

a. Whenever these materials are encountered in confined spaces, local mechanical exhaust ventilation and personal respiratory protective equipment shall be used. The use of local mechanical exhaust ventilation systems that permit the re-entry of exhaust air back into the work area, or local exhaust which incorporate a system for the filtration and recirculation of exhaust air back into the work area shall not be permitted.

b. Whenever these materials, except beryllium and chromium (VI), are encountered in indoor operations, local mechanical exhaust ventilation systems that are sufficient to reduce and maintain personal exposures to within acceptable limits shall be used and maintained in accordance with manufacturer's instruction. Care shall be taken to ensure replacement filters are from the same manufacturer and are the correct filter for the exhaust system. When either beryllium or chromium (VI) is encountered in indoor operations, approved local mechanical exhaust ventilation systems and personal respiratory protection shall be used.

(1) In areas where only welding is conducted, a general exhaust system ventilation rate of 2,000 CFM per welder is required in open welding areas.

(2) Local exhaust ventilation should have a capture velocity of 100 FPM as measured from the farthest distance from the work, and a duct transport velocity of 1,000 FPM minimum. Local exhaust ventilation systems which filter and return the air back into the work environment shall be allowed for welding, that is not in a confined space or does not include beryllium or chromium, if the provisions of Section 06.H.01.f. are followed.

c. Whenever these materials, except beryllium and chromium (VI), are encountered in outdoor operations, and local mechanical exhaust ventilation systems sufficient to reduce and maintain personal exposures to within acceptable limits are not provided, then appropriate respiratory protective equipment shall be used.

d. Whenever beryllium and chromium (VI) are encountered in outdoor operations, the need for and type of engineering and work practice controls to be implemented, as well as the need for and type of respiratory protection to be provided shall be based upon the results of an initial worker exposure assessment and exposure determination with regards to these substances.

e. Workers may be exposed to hazardous concentrations of chromium (VI) while welding, cutting or performing hot work on stainless steel, high chrome alloys or chrome-coated metal, or during the application and removal of chromate-containing paints and other surface coatings. > See Section 06.L.

f. Workers working with materials of toxic significance, shall remove outer clothing, vacuum off, and wash before taking a break, drinking, smoking, or leaving for the day.

g. A good housekeeping plan shall be developed and implemented for all work areas where welding, cutting, or heating operations involve materials of toxic significance. The plan shall require all surfaces to be regularly HEPA vacuumed and wet wiped. The frequency shall maintain the surfaces free of contamination and will be dependent on the frequency, type, and volume of welding, cutting, or heating completed in the area.

10.C.05 Welding, cutting, or heating operations that involve or generate fluorine or zinc compounds shall be performed in accordance with the following:

a. In confined spaces, local mechanical exhaust ventilation and personal respiratory protection sufficient to maintain exposures to within acceptable limits shall be used.

b. In open spaces, sampling shall be performed as required and following the procedures in Section 6.A.01 to determine concentrations of fluorides or zinc compounds and the need for local exhaust ventilation and personal respiratory protection sufficient to maintain exposures to within acceptable limits.

10.C.06 Arc and gas cutting. Oxygen cutting using either an iron powder or chemical flux, gas-shielded arc cutting, and plasma cutting shall employ local mechanical exhaust ventilation or other means adequate to remove the fumes generated.

10.C.07 Other persons exposed to the same atmosphere as welders or cutters shall be protected in the same manner as welders or cutters.

10.D Fire Protection.

10.D.01 Suitable fire extinguishing equipment of sufficient capacity shall be provided in the immediate vicinity of welding or cutting operations and maintained in a state of constant readiness for immediate use. Hot work permits shall be required on Government installations when welding, cutting, or heating operations are performed unless otherwise indicated by the GDA.

10.D.02 Before conducting welding or cutting operations, the area shall be surveyed to ensure it is free of the following hazards:

a. Combustible materials located close to the operation;

b. The presence or possible generation of potentially explosive atmospheres (flammable gases, vapors, liquids, or dusts); and

c. The presence or nature of an oxygen-enriched atmosphere.

10.D.03 Hierarchy of fire control. Objects to be welded, cut, or heated shall be:

a. Moved to a location free of dangerous combustibles;

b. If the work cannot be moved, all moveable fire hazards in the vicinity shall be taken to a safe place (moved at least 35 ft (10.6 m) horizontally from the welding or cutting area) or the combustible material and construction shall be protected from the heat, sparks, and slag of welding;

c. When welding or cutting must be done in a location where combustible or flammable materials are located, inspection and authorization by the GDA shall be required before such operations are begun. During welding or cutting, a fire watch shall stand with a fire extinguisher equipment readily available and be trained in its use and in sounding an alarm in the event of a fire. A fire watch shall be maintained for at least an hour after completion of the welding or cutting operation to extinguish possible smoldering fires. > See also Section 09.J.03.

10.D.04 When a welding, cutting, or heating operation is such that normal fire prevention precautions are not sufficient, additional qualified fire watch personnel shall be assigned to guard against fire and shall be instructed in anticipated fire hazards and how firefighting equipment is to be used. > See Section 09.J.03.

10.D.05 When welding or cutting is to be done over combustible flooring, the flooring shall be protected by fire-resistant shielding, covered with damp sand, or kept wet. Where flooring is wet or damp, personnel operating arc welding or cutting equipment shall be protected from potential shock hazards.

10.D.06 Noncombustible barriers shall be installed below welding or burning operations in a shaft or raise,

10.D.07 Openings or cracks in walls, floors, or ducts within 35 ft (10.7 m) of the site of welding or cutting operations shall be tightly covered to prevent the passage of sparks to adjacent areas.

10.D.08 Where welding or cutting is to be done near walls, partitions, ceilings, or roofs of combustible construction, fire resistant guards shall be used to prevent ignition.

10.D.09 Where welding or cutting is to be done on a metal wall, partition, ceiling, or roof, precautions shall be taken to prevent ignition, due to heat conduction or radiation, of combustibles on the other side.

10.D.10 Welding or cutting shall not be done on a metal partition, wall, ceiling, or roof with a combustible covering nor on walls or partitions of combustible sandwich-type panel construction.

10.D.11 Before welding or cutting drums, tanks, or other containers and equipment that have contained hazardous materials, the containers shall be thoroughly cleaned in accordance with NFPA 326 and ANSI/AWS F4.1.

10.D.12 Hot tapping or other welding or cutting on a flammable gas or liquid transmission or distribution pipeline shall be performed only by personnel qualified to make hot taps and only with the permission of the GDA.

10.D.13 When welding or cutting is to be conducted near a sprinkler head, a wet cloth or equivalent protection shall be used to cover the sprinkler head and then removed at the completion of the welding or cutting operation.

10.D.14 When welding or cutting in areas protected by fire detection and suppression systems, precautions shall be taken to avoid accidental initiation of these systems.

10.E Oxyfuel Gas Welding and Cutting.

10.E.01 Oxyfuel gas welding and cutting equipment shall be listed by a nationally-recognized testing laboratory.

10.E.02 Oxygen cylinders and apparatus.

a. Oxygen cylinders and apparatus shall be kept free from oil, grease, and other flammable or explosive substances and shall not be handled with oily hands or gloves.

b. Oxygen cylinders and apparatus shall not be used interchangeably with any other gas.

c. Oxyfuel cylinders shall not be placed in a confined space with the workers.

10.E.03 Hose and hose connections.

a. Fuel gas hose and oxygen hose shall be readily distinguishable from each other.

b. Oxygen and fuel gas hoses shall not be interchangeable. A single hose having more than one gas passage shall not be used.

c. Hose couplings of the type that can be unlocked or disconnected without a rotary motion are prohibited.

d. Hose that has been subject to flashback or that shows evidence of severe wear or damage shall be tested to twice the normal pressure to which it is subjected, and in no case less than 300 psi (2068.4-kPa) gauge. Damaged hose and hose connectors, or hose and hose connectors in questionable condition, shall not be used.

e. When parallel runs of oxygen and fuel gas hose are taped together, not more than 4 in out of every 12 in (10 cm out of every 30.4 cm) shall be covered by tape.

f. Boxes used for the storage of gas hoses and all enclosed spaces which hoses run through or are used shall be properly ventilated.

g. Hose connections shall be clamped or otherwise securely fastened in a manner that will withstand, without leakage, twice the pressure to which they are normally subjected in service, but not less than 300 psi (2,068 kPa) gauge.

10.E.04 Torches.

a. Torches shall be inspected before each use for leaking shutoff valves, hose couplings, tip connections and damaged torch tips. Defective torches shall not be used.

b. Hoses shall be purged individually before lighting the torch for the first time each day. Hoses shall not be purged into confined spaces or near ignition sources.

c. Clogged torch tip openings shall be cleaned with suitable cleaning wires, drills, or other devices designed for such purposes.

d. Torches shall be lighted by friction lighters or other approved devices, not by matches or from hot work.

10.E.05 Torch valves shall be closed and the gas supply shut off whenever work is suspended.

10.E.06 The torch and hose shall be removed from confined spaces whenever work is suspended.

10.E.07 Protective equipment.

a. Oxyfuel gas, and other oxygen-fuel gas welding and cutting systems using cylinder-regulator-hose-torch shall be equipped with both a reverse-flow check valve and a flash arrestor, in each hose, at the torch unless otherwise indicated by the manufacturer instructions.

b. When oxygen-fuel gas systems are manifolded together, the provisions of NFPA 51 shall apply.

10.E.08 Connection of multiple sets of oxyacetylene hoses to a single regulator on a single set of oxyacetylene tanks may only be accomplished by installing a commercially available fitting approved by Compressed Gas Association (CGA) standards and listed by a nationally-recognized testing laboratory. The fitting shall be installed on the output side of the regulator and shall have a built-in shut-off valve and reverse-flow check valve on each branch.

10.E.09 Acetylene regulators shall not be adjusted to permit a discharge greater than 15 psi (103.4 kPa) gauge.

10.F Arc Welding and Cutting.

10.F.01 Electric welding apparatus shall be installed, maintained, and operated in accordance with the NEC.

10.F.02 Manual electrode holders.

a. Only manual electrode holders specifically designed for arc welding and cutting of a capacity capable of safely handling the maximum rated current required by the electrodes shall be used.

b. All current carrying parts passing through the portion of the holder that is gripped by the welder or cutter, and the outer surfaces of the jaws of the holder, shall be fully insulated against the maximum voltage encountered to ground.

10.F.03 Welding cables and connectors.

a. Cables shall be completely insulated, flexible, capable of handling the maximum current requirements of the work in progress, and in good repair. Cables in need of repair shall not be used.

b. Welding cables shall be inspected for wear or damage before each use. Cables with damaged insulation or connectors shall be replaced or repaired to achieve the same mechanical strength, insulating quality, electrical conductivity, and water tightness of the original cable. Cables containing splices or repaired insulation within a minimum distance of 10 ft (3 m) from the end of the cable to which the electrode holder is connected shall not be used.

c. Where it becomes necessary to connect or splice lengths of cable together, insulated connectors of a capacity at least equivalent to that of the cable shall be used. When connections are affected by cable lugs, they shall be securely fastened together to give good electrical contact and the exposed metal parts of the lugs shall be completely insulated. The joining of lengths of cable shall be accomplished by methods specifically intended for that purpose and connection methods shall provide insulation adequate for the service conditions.

10.F.04 The frames of arc welding and cutting machines shall be grounded either by a third wire in the cable connecting the circuit conductor or by a separate wire that is grounded at the source of the current.

10.F.05 Neither terminal of the welding generator shall be bonded to the frame of the welder.

10.F.06 Pipelines containing gases or flammable liquids or conduits carrying electrical conductors shall not be used for a ground return circuit.

10.F.07 Circuits from welding machines used for other than welding tools shall be grounded.

10.F.08 Welding supply cables shall not be placed near power supply cables or other high-tension wires.

10.F.09 Welding leads shall not be permitted to contact metal parts supporting suspended scaffolds.

10.F.10 Switching equipment for shutting down the welding machine shall be provided on or near the welding machine.

10.F.11 Equipment shall be shut down when the leads are unattended.

10.F.12 Arc welding and cutting operations shall be shielded by noncombustible or flameproof screens to protect employees and other visitors from the direct rays of the arc as in Section 10.A.04.

10.F.13 Coiled welding cable shall be spread out before use.

10.G Gas Metal Arc Welding.

10.G.01 Chlorinated solvents shall be kept at least 200 ft (61 m) away from the exposed arc, unless shielded. Surfaces prepared with chlorinated solvents shall be dry before welding is permitted on such surfaces.

10.G.02 Persons less than 35 ft (10.7 m) from the arc not protected from the arc by screening shall be protected by filter lenses. When two or more welders are exposed to each other's arc, filter lens goggles shall be worn under welding helmets. Hand shields shall be used to protect the welders against flashes and radiant energy when either the helmet is lifted or the shield is removed.

10.G.03 Welders and other persons who are exposed to radiation shall be protected so that the skin is covered to prevent burns and other damage by UV rays. Welding helmets and hand shields shall be free of leaks, cracks, openings, and highly reflective surfaces.

10.G.04 When gas metal arc welding is performed on stainless steel, chrome alloy steel, or chrome-coated metal, personnel shall be protected against dangerous concentrations of nitrogen dioxide and other air contaminants such as chromium (VI), by means of an approved local exhaust ventilation system. The system shall be capable of reducing and maintaining personal exposures to within permissible limits, or by means of other effective work practice and engineering controls such as the use of an argon-rich (> 75% argon) shielding gas for use in gas metal arc welding (GMAW) or flux cored arc welding (FCAW) operations. Wherever engineering and work practice controls are not sufficient to reduce employee exposures below permissible limits, the employer shall use them to reduce employee exposures to the lowest levels achievable, and shall supplement such methods by the use of respiratory protection that complies with the requirements of this Section and Section 05.

10.H Plasma Cutting.

10.H.01 Plasma arc cutting equipment shall be installed, maintained and operated in accordance with the NEC and manufacturer's instructions.

10.H.02 All cables and torch leads shall be inspected before each use. Any damaged cables and torch leads shall be replaced before use.

10.H.03 All consumables (nozzles, electrodes, etc.) shall be verified for proper installation before each use.

10.H.04 All torches used in plasma cutting shall contain a trigger safety device to prevent accidental contact.

10.I Thermite Welding. > See Appendix Q.

10.I.01 The mold for a thermite weld shall be dried thoroughly and provided cover before the charge is ignited to prevent spray back during the thermite welding reaction.

10.I.02 Storage of thermite welding supplies.

a. Bulk storage of thermite welding materials shall be maintained in a detached shed or building at least 50 ft (15 m) from the welding area.

b. Bulk storage areas for thermite welding materials shall be maintained dry and locked.

c. Storage containers for the starting material shall be closed tightly immediately after each use.

10.I.03 Thermite welding molds shall not be removed until sufficient cooling has taken place as stated in the manufacturer's literature.

10.I.04 Smoking shall not be allowed in areas where thermite welding material is being used or stored.

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SECTION 11

Electrical

11.A General.

11.A.01 Approval and qualification. The term “Qualified Person (QP)”, as used in this section, refers to “Qualified Person, Electrical”. > See Appendix Q.

a. All electrical wiring and equipment shall be a type listed by a nationally recognized testing laboratory for the specific application for which it is to be used.

b. All electrical work shall comply with applicable National Electrical Safety Code (NESC), National Electric Code (NEC), National Fire Protection Association (NFPA), OSHA and USCG regulations. If the work being performed (as described within this chapter) conflicts with the above codes and regulations, the most stringent shall apply.

c. Electrical work shall be performed by QP with verifiable credentials who are familiar with applicable code requirements. Verifiable credentials consist of State, National and/or Local Certifications or Licenses that a Master or Journeyman Electrician may hold, depending on work being performed, and should be identified in the appropriate AHA. Journeyman/Apprentice ratio shall be in accordance with State, Local and Host Nation requirements applicable to where work is being performed.

d. USACE and/or other Government designated QPs must possess verifiable credentials and shall be familiar with applicable code requirements. Verifiable credentials consist of State, National and/or Local Certifications/Licenses that a Master or Journeyman Electrician may hold, or USACE-sponsored local training programs (e.g., hydropower training program, District navigation training program, etc.) but the following applies:

(1) Training shall be provided by an electrically qualified source to the level of work being performed;

(2) Training and qualifications shall be verifiable and documented;

(3) Qualification level shall be identified in the employee’s PHA;

(4) QPs must demonstrate skills and knowledge related to the construction, operation and maintenance of the electrical equipment and installations and receive relevant safety training to recognize, avoid and control associated hazards.

e. Emergency Procedures and training. Employees exposed to shock hazard and those employees responsible for taking action in case of emergency shall be trained in methods of release of victims from contact with exposed energized electrical conductors or circuit parts. Employees shall be regularly instructed in methods of first aid and emergency procedures, such as approved methods of resuscitation, if their duties warrant such training. Training and re-training of employees in approved methods of resuscitation, including cardiopulmonary resuscitation and automatic external defibrillator (AED) use, shall be certified by the employer as required by Section 03.A and OSHA 29 CFR 1910.151 and NFPA 70E 110.2(c).

11.A.02 Isolation.

a. Before work begins, a Qualified Person in charge shall ascertain by inquiry, direct observation and by instruments, whether any part of an electric power circuit (exposed or concealed) is located such that the performance of work could bring any person, tool, or machine into physical or electrical contact with it. This verification procedure shall be documented prior to work beginning.

b. All equipment and circuits to be worked on shall be de-energized before work is started. Personnel shall be protected by a Hazardous Energy Control Program (HECP) and procedures (i.e. lockout/tagout, blanking, positive means of blocking, grounding, etc.). Positive means shall be provided for rendering controls or devices inoperative while repairs or adjustments are being made to the machines they control. > See Section 12.

➢ Note: If work MUST be performed on an energized system, then the employer must first demonstrate that de-energizing introduces additional or increased hazards (i.e., interruption of life support equipment, removal of light for an area, etc.) or is infeasible due to equipment design or operational limitations (i.e., testing, troubleshooting, etc.).

c. Energized work may never be performed without prior authorization. Once it has been determined that equipment must be worked on in an energized condition, an energized work permit shall be submitted to GDA for acceptance. > See NFPA 70E**.** Permits must be prepared in advance and include, as a minimum:

(1) Description of work and location;

(2) Justification for why the work must be performed in an energized condition;

(3) Description of work practices to be followed;

(4) An electrical shock analysis and boundaries (safe working distances);

(5) Arc flash hazard analysis and arc flash boundary determination;

(6) Identification of PPE necessary to safely perform the task;

(7) Means to restrict access of unqualified persons in work area;

(8) Evidence of completing the job briefing (includes safety, tools, PPE, any other hazards and controls).

d. Live parts of wiring or equipment shall be guarded to protect all persons or objects from harm.

e. High voltage equipment (i.e., switchyards, transformers, etc) shall be protected from unauthorized access. Entrances not under constant observation shall be kept locked; metallic enclosures shall be grounded and signs warning of high voltage and prohibiting unauthorized entrance shall be posted at entrances.

f. Enclosure gates or doors shall swing outward or provide clearance from installed equipment.

11.A.03 When it is necessary to work on energized lines or equipment, rubber gloves and other protective equipment and hotline tools meeting the provisions of ANSI and ASTM standards shall be used. For work on energized equipment, only tools insulated for the rated voltage shall be used. > See Section 05.I and NFPA 70E.

11.A.04 Flexible cords.

a. Refer to NEC (NFPA 70) for minimum requirements on permanent use flexible cords for permanently installed equipment such as cranes and elevators.

b. For maintenance and construction activities, all portable flexible cords or cables (i.e., extension cords) shall be inspected by the user of the cord at least daily.

c. Portable flexible cords shall contain the number of adequately sized conductors required for the load plus an adequately sized equipment ground conductor. A QP shall determine appropriate hard or extra hard usage flexible cord length and size as specified in the NEC, Article 400. Portable flexible cords shall be minimum 14 AWG.

d. Portable flexible cords passing through work areas shall be protected from damage (including that caused by foot traffic, vehicles, sharp corners, protections, and pinching). Flexible cords and cables passing through holes shall be protected by bushings or fittings.

e. Portable flexible cords shall be used only in continuous lengths without splice or tap. The repair of hard-service cords/cord sets is permitted if conductors are spliced in accordance with NEC - the splices must be performed by a QP, the insulation is equal to the cable being spliced, and wire connections are soldered.

f. Patched, oil-soaked, worn, or frayed electric portable flexible cords shall not be used.

g. Portable flexible cords shall be supported in place at intervals that ensure that they will be protected from physical damage. Support shall be in the form of cable ties, straps or similar type fittings installed so as not to cause damage. They shall not be hung from nails, or suspended by bare wire.

11.A.05 The QP is responsible for determining the number of workers required to perform the job safely and shall identify work hazards and controls in the corresponding AHA. Work must be performed with a sufficient number of workers to provide a safe working environment.

11.A.06 Switchboxes, receptacle boxes, metal cabinets, enclosures around equipment, and temporary power lines shall be marked to indicate the maximum operating voltage.

11.A.07 Insulation mats or platforms of substantial construction and providing good footing shall be placed on floors and on the frames of equipment having exposed live parts so that the operator or persons in the vicinity cannot touch such parts unless standing on the mats, platforms, or insulated floors.

11.A.08 Suitable temporary barriers or other means shall be provided to designate arc flash and electrical shock boundaries. Boundaries shall ensure a workspace cannot be used as a passageway while electrical work is being performed.

11.A.09 When fuses are installed or removed with one or both terminals energized, use an insulated fuse pulling tool for the rated voltage.

11.A.10 Attachment plugs and receptacles.

a. Plugs and receptacles shall be kept out of water unless of an approved submersible type.

b. Attachment plugs for use in work areas shall be constructed so that they will endure rough use and shall be equipped with a cord grip to prevent strain on the terminal screws.

c. Attachment plugs and other connectors supplying equipment at more than 240 volts shall be skirted or otherwise designed so that arcs will be confined.

d. Plugs and receptacles in power distribution networks of over 240 volts shall be inspected by a QP before each use.

e. Physical attachment of plugs into receptacles rated over 240 volts shall be made with the circuit de-energized.

f. Appropriate PPE shall be worn prior to energizing circuits feeding equipment plugged in to receptacles rated over 240 volts.

g. When a National Electrical Manufacturers Association (NEMA) standard configuration exists for a particular voltage, amperage, frequency, or type of current, the NEMA standard plug and receptacle shall be used.

11.A.11 Portable hand lamps.

a. Portable hand lamps shall be of molded composition or another type approved for the purpose.

b. Metal-shell, paper-lined lamp holders shall not be used.

c. Hand lamps shall be equipped with a handle and a substantial guard over the bulb. The guard shall be attached to the lamp holder or the handle.

11.A.12 Metal jewelry (i.e., wristbands, watch chains, rings, bracelets, necklaces, body jewelry, piercings, etc) shall not be worn when working on or near electrical equipment.

11.B Arc Flash.

11.B.01 Whenever work on or near energized parts greater than 50 volts is necessary, a hazard analysis/arc flash hazard analysis will be conducted in accordance with NFPA 70E. Either Appendices or Tables may be used to conduct the analysis. The flash protection boundary, approach distances, hazard/risk category and personal protective equipment (PPE) requirements shall all be identified.

11.B.02 PPE that provides appropriate arc flash protection is required for all personnel working on or near exposed energized electrical equipment operating at 50 volts or more. Identification of required PPE is based on equipment arc flash labels or NFPA 70E task tables. > See Section 05.I.

11.B.03 PPE garments shall meet and be labeled in accordance with ASTM F1506, Standard Specification for Flame Resistant Textile Materials for Wearing Apparel for use by Electrical Workers Exposed to Momentary Electric Arc and Related Thermal Hazards.

11.B.04 Arc rated clothing shall be properly worn. Long sleeves must be rolled down and buttoned, shorts are prohibited and trousers shall extend the full length of the leg. Garments with exposed metallic fasteners shall not be worn unless the garments are properly arc rated.

11.B.05 Garments, to include fall protection harnesses, worn over arc rated protective clothing, must also be arc rated.

11.B.06 Clothing that could increase the extent of injuries when exposed to electric arcs or open flames (i.e., acetate, nylon, polyester, rayon or any blend, celluloid or other flammable plastic), shall not be worn. No metal slides or zippers unless they are effectively covered.

11.B.07 Arc flash labels must be placed on energized equipment. Labels are required to warn of potential arc flash hazards and appropriate PPE. Labels, at minimum, shall include:

a. Limits of approach;

b. Nominal system voltage;

c. Hazard/Risk category (required PPE);

d. Incident energy at working distance.

11.B.08 All personnel entering the identified arc flash protection boundary must be QPs and properly trained in NFPA 70E requirements and procedures. Unless permitted by NFPA 70E, Article 130.4, no Unqualified Person shall be permitted to approach nearer than the Limited Approach Boundary of energized conductors and circuit parts. Training must be administered by an electrically qualified source and documented.

11.C Overcurrent Protection, Disconnects and Switches.

11.C.01 All circuits shall be protected against overload.

a. Overcurrent protection shall be based on the current-carrying capacity of the conductors supplied and the power load being used.

b. No overcurrent device shall be placed in any permanently grounded conductor except where the overcurrent device simultaneously opens all conductors of the circuit or where the device is required by NEC 430 for motor overload protection.

c. Overcurrent protection devices must be readily accessible, clearly labeled, not exposed to physical damage, not placed in the vicinity of easily ignitable materials, and located or shielded such that their operation will not expose employees to injury due to arcing or the sudden movement of parts.

d. Circuit breakers shall clearly indicate whether they are in the open (de-energized/off) or closed (energized/on) position.

e. Enclosures containing overcurrent protective devices shall be provided with lockable, close-fitting doors.

f. Access and working space shall be provided and maintained around all electrical equipment to permit ready and safe operation and maintenance in accordance with NFPA 70, Article 110.26, Spaces About Electrical Equipment. Where required clearance is not feasible (i.e., floating plant, vessels, etc.), procedures shall be in place to ensure sufficient clearance is maintained for fully opening the door and/or servicing the electrical enclosure.

11.C.02 Disconnects.

a. Disconnecting means shall be located or shielded so that persons will not be injured when the disconnect is operated.

b. Enclosures for disconnecting means shall be securely fastened to the surface and fitted with covers.

c. Disconnecting means shall be capable of accepting a lock and of being locked in the open (de-energized/off) position.

11.C.03 Switches.

a. A readily accessible, manually-operated switch shall be provided for each incoming service or supply circuit.

b. Switches shall be of the externally operable type mounted in an enclosure listed for the intended use and installed to minimize the danger of accidental operation.

11.C.04 Switches, fuses, and automatic circuit breakers shall be marked, labeled, or arranged for ready identification of the circuits or equipment that they supply.

11.C.05 Switches, circuit breakers, fuse panels, and motor controllers located outdoors or in wet locations shall be in a listed weatherproof enclosure or cabinet.

11.D Grounding.

11.D.01 All electrical circuits, equipment and enclosures shall be grounded in accordance with the NEC and the NESC to provide a permanent, continuous and effective path to ground unless otherwise noted in this manual.

a. A ground shall be provided for non-current carrying metallic parts of equipment such as generators (per NEC 250.34, portable and vehicle-mounted generators are exempt from grounding provided conditions if Section 11.D.01.b and c are met), non-engine driven electrically powered arc welders, light plants, switches, motor controller cases, fuse boxes, distribution cabinets, frames, non-current carrying rails used for travel and motors of electrically operated cranes, electric elevators, metal frames of non-electric elevators to which electric conductors are attached, other electric equipment, and metal enclosures around electric equipment.

b. Portable Generators. Portable describes equipment that is easily carried by personnel from one location to another. The frame of a portable generator is not required to be grounded and may serve as the grounding electrode for a system supplied by the generator under the following conditions:

(1) The generator supplies ONLY equipment mounted on the generator, cord-and-plug-connected equipment through receptacles mounted on the generator, or both; and

(2) The non-current-carrying metal parts of the equipment and the equipment grounding conductor terminals of the receptacles are bonded to the generator frame.

c. Vehicle-Mounted Generators. The frame of a vehicle need not be grounded and may serve as the grounding electrode for a system supplied by a generator located on the vehicle under the following conditions:

(1) The frame of the generator is bonded to the vehicle frame;

(2) The generator supplies only equipment located on the vehicle or cord-and-plug-connected equipment through receptacles mounted on the vehicle;

(3) The non-current-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are bonded to the generator frame; and

(4) The system complies with provisions of Section 11.D.01.

d. A system conductor that is required to be grounded (per NEC 250.34) shall be bonded to the generator frame where the generator is a component of a separately derived system.

e. Portable and semi-portable electrical tools and equipment shall be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug and receptacle.

f. Floodlights, light plants and work lights shall be grounded.

g. Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double-insulated tools shall be distinctly marked and listed by a nationally-recognized testing laboratory.

h. A grounding terminal or grounding type device on a receptacle, cord connector, or attachment plug may not be used for purposes other than grounding.

11.D.02 Grounding rod and pipe electrodes.

a. Electrodes of rod or pipe shall be free from non-conducting coatings and, if practicable, shall be embedded below permanent moisture levels.

b. Grounding rods and pipe electrodes shall be in unbroken 8 ft (2.4 m) lengths and driven to full depth. Where rock bottom is encountered, the electrode shall be driven at an angle not to exceed 45° from the vertical or shall be buried in a trench that is at least 2.5 ft (0.7 m) deep.

c. A single electrode that does not have a resistance to ground of 25 ohms or less, shall be augmented by one additional electrode spaced no closer than 6 ft (1.8 m) to the first electrode.

d. Electrodes or rods of iron or steel shall be at least 5/8 in (15 mm) diameter. Nonferrous rods, or their equivalent, shall be listed by a nationally-recognized testing laboratory and shall be at least ½ in (12 mm) diameter.

e. Electrodes or pipe or conduit shall be at least ¾ in (21 mm) trade size. Pipes and conduit of iron or steel shall have the outer surface galvanized or otherwise metal-coated for corrosion control.

f. Grounding electrode systems of permanent facilities shall be in accordance with NEC 250.

11.D.03 Conductors used for bonding or grounding stationary and movable equipment shall be of ample size to carry the anticipated current.

a. When attaching bonding and grounding clamps or clips, a secure and positive metal-to-metal contact shall be made.

b. The ground end shall be attached first. The equipment end shall be attached and removed by insulated tools or other suitable devices.

c. When removing grounds, the grounding device shall be removed from the line or equipment first, using insulated tools or other suitable devices.

d. Bonding and grounding attachments shall be made before systems are activated and shall not be broken until after systems are de-activated.

e. A designated grounding conductor shall not be used as a current carrying conductor.

11.D.04 Grounding circuits shall be checked to ensure that the circuit between the ground and a grounded power conductor has a resistance low enough to permit sufficient current flow to allow the fuse or circuit breaker to interrupt the current.

11.D.05 Ground-Fault Circuit-Interrupter (GFCI) Protection For Personnel. All receptacle outlets (125-volt, 15-, 20-, 30-amperage and greater) that provide temporary electrical power during construction, remodeling, maintenance, repair, or demolition shall have ground-fault circuit-interrupter (GFCI) protection for personnel. > See NEC, Article 590.6 and 29 CFR 1926.404(b); See also paragraph g below.

a. GFCI protection shall be provided on all circuits serving portable electric hand tools or semi-portable electric power tools (such as block/brick saws, table saws, air compressors, welding machines, and drill presses).

b. The GFCI device shall be calibrated to trip within the threshold values of 5 ma +/- 1 ma as specified in UL Standard 943. GFCI devices shall be tested before initial use and before use after modification.

c. Receptacle outlets that are not part of the permanent wiring of the building or structure shall be GFCI protected by one of the following means:

(1) A receptacle outlet with integral GFCI protection;

(2) A standard receptacle outlet connected downstream of a receptacle outlet with integral GFCI protection; or

(3) Receptacles protected by a GFCI-type circuit breaker.

d. Receptacle outlets that are part of the permanent wiring of the building or structure and are used for temporary electric power, (including portable generators) shall use a portable GFCI if the receptacle outlets are not already GFCI protected. The portable GFCI shall be as near as practicable to the receptacle outlet.

➢ Exception: In industrial facilities only, where conditions of maintenance and supervision ensure that only qualified personnel are involved, an Assured Equipment Grounding Conductor Program (AEGCP), see also Appendix E, shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power was interrupted or having a design that is not compatible with GFCI protection.

e. Electric tool circuits that are hard-wired directly to an electrical source of power shall be protected by a GFCI circuit-breaker type.

f. GFCIs shall be installed in accordance with the NEC. The permanent wiring shall consist of electrical circuits grounded in accordance with the NEC.

g. GFCIs may be sensitive to some equipment (such as concrete vibrators), or unavailable for the voltage and current rating. In these instances, an AEGCP in accordance with Appendix E is acceptable in lieu of GFCIs if the exception is documented on an AHA and contains the following:

(1) The conditions, or need, for the exception; and

(2) Implementation of the requirements of the AEGCP;

(3) The request for the exception, the AHA, and the AEGCP must be submitted and accepted by the GDA prior to implementing the program.

11.E Temporary Wiring and Lighting.

11.E.01 A sketch of proposed temporary power distribution systems shall be submitted to the GDA and accepted for use before temporary power is installed. The sketch shall indicate the location, voltages, and means of protection of all circuits, including receptacles, disconnecting means, grounding, GFCIs, and lighting circuits.

11.E.02 Testing.

a. Temporary electrical distribution systems and devices shall be checked and found acceptable for polarity, ground continuity, and ground resistance before initial use and before use after modification. GFCI shall be tested monthly.

b. Ground resistance and circuits shall be measured at the time of installation and shall comply with Sections 11.D.02 and 11.D.04. The measurement shall be recorded and a copy furnished to the GDA.

11.E.03 The vertical clearance of temporary wiring for circuits carrying 600 volts or less shall be:

a. 10 ft (3 m) above finished grade, sidewalks, or from any platform;

b. 12 ft (3.8 m) over areas other than public streets, alleys, roads and driveways, subject to vehicular traffic other than truck traffic;

c. 15 ft (4.5 m) over areas other than public streets, alleys, roads and driveways, subject to truck traffic;

d. 18 ft (5.5 m) over public streets, alleys, roads, and driveways.

11.E.04 Wet Locations. An Activity hazard Analysis (AHA) shall be developed by the work crew for these activities.

a. Submersible electric pumps may be used to support periodic maintenance and/or construction activities only when the pump is designed by the manufacturer to operate in wet locations.

(1) The pump shall be installed and tested by a QP and operated by personnel trained to the appropriate level.

(2) When personnel are, or could be, present in the water during pump operation, the pump shall be equipped with a Ground Fault Circuit Interrupter (GFCI), except as noted in (3) below.

➢ Note: If pump manufacturer does not allow personnel in the area when pumps are used in water, an appropriate Hazardous Energy Control Program, to include lockout/tagout, must be in place. > See Section 12.

(3) Where conditions of maintenance and supervision ensure that only qualified personnel are involved, an Assured Equipment Grounding Conductor Program (AEGCP, see Appendix E) shall be permitted for those receptacle outlets used to supply equipment that is not compatible with GFCI protection or that would create a greater hazard if power was interrupted. > See Section 11.D.05.g, NEC Article 590.6 and 29 CFR 1926.404(b).

➢ Note: The AEGCP shall be continuously enforced at the site by one or more designated persons to ensure that equipment grounding conductors for all temporary power are installed and maintained in accordance with the AEGCP, NEC and OSHA.

b. Where a receptacle is used in a wet location, it shall be contained in a weatherproof enclosure, the integrity of which is not affected when an attachment plug is inserted.

c. All temporary lighting strings in outdoor or wet locations (such as tunnels, culverts, valve pits, floating plant, etc.) shall consist of lamp sockets and connection plugs permanently molded to the hard service cord insulation.

11.E.05 Wires shall be insulated from their supports.

11.E.06 Temporary lighting.

a. Bulbs attached to temporary lighting strings and extension cords shall be protected by guards unless the bulbs are deeply recessed in a reflector.

b. Unless designed for suspension, temporary lights shall not be suspended by their electric wire.

c. Exposed empty light sockets and broken bulbs shall be replaced immediately.

d. Portable electric lighting used in wet and/or other conductive locations (e.g., drums, tanks, vessels, sumps, scroll cases, etc.) shall be rated and operated at 12 volts or less. > See also Section 11.H.

11.E.07 When temporary wiring is used in tanks or other confined spaces, an approved disconnect, properly identified, UL labeled, and rated for this application and environment, shall be provided at or near the entrance to such spaces for the purpose of readily disconnecting the electrical power in case of an emergency.

11.E.08 Non-metallic sheathed cable may be used as allowed by the NEC and as follows:

a. Along studs, joists, or similar supports closely following the building finish or running boards when 7 ft-8 in (2.3 m) or more above the floor;

b. When firmly attached to each cabinet, box fitting, or fixture by means of a cable clamp. > Non-metallic sheathed cable may not be used when precluded by the NEC nor as portable extension cords, lying on the ground subject to any type of traffic, where subject to frequent flexing, or as service entrance cable.

11.E.09 Temporary lighting circuits shall be separate from electric tool circuits. Receptacle circuits shall be dedicated to either temporary lighting or electric tools and shall be labeled "LIGHTS ONLY" or "TOOLS ONLY," as applicable.

11.F Operations Adjacent to Overhead Lines.

11.F.01 Overhead transmission and distribution lines shall be carried on towers and poles that provide safe clearances over roadways and structures.

a. Clearances shall be adequate for the movement of vehicles and for the operation of construction equipment.

b. All electric power or distribution lines shall be placed underground in areas where there is extensive use of equipment having the capability to encroach on the clearance distances specified in Section 11.E.03. For voltages greater than 600, reference NESC for required clearance distance.

c. Protection of outdoor trolleys and portable cables rated above 600 volts for supplying power to moveable construction equipment such as gantry cranes, mobile cranes, shovels, etc., shall conform to NESC.

11.F.02 Work activity adjacent to overhead lines shall not be initiated until a survey has been made to ascertain the safe clearance from energized lines. > See Section 11.A.02.

11.F.03 Any overhead wire shall be considered energized unless the person owning such line or operating officials of the electrical utility supplying the line certifies that it is not energized and it has been visibly grounded and tested.

11.F.04 Operations adjacent to overhead lines are prohibited unless at least one of the following conditions is satisfied:

a. Power has been shut off and positive means taken to prevent the lines from being energized;

b. Equipment, or any part of the equipment, does not have the capability of coming within the minimum clearance from energized overhead lines as specified in Table 11-1, OR the equipment has been positioned and blocked to assure no part, including cables, wire rope, components and attachments, can come within those clearances; AND a notice of the minimum required clearance has been posted at the operator's position;

c. Electric line trucks and/or aerial lifts used for working on energized overhead lines must meet the requirements of OSHA 1910.269 and Table 11-I.

➢ Note: Cranes and other equipment (excavators, forklifts, etc) used to hoist loads with rigging: Equipment operations in which any part of the equipment, load line, or load (including rigging and lifting accessories) is closer than the minimum approach distance in Table 11-1 to an energized power line is prohibited, except as allowed in Section 16.G.12. > See 16.G.12 and Table 16-2.

11.F.05 Work activity that could affect or be affected by overhead lines shall not be initiated until coordinated with the appropriate utility officials.

11.F.06 Standard emergency communication procedures shall be established and rehearsed to assure rapid emergency shutdown for all work being conducted on overhead power lines.

11.F.07 Floating plant and associated equipment shall not be sited or placed within 20 ft (6 m) of overhead transmission or distribution lines.

11.F.08 Cage boom guards, insulating links, or proximity warning devices may be used on cranes, but such devices shall not alter the requirements of any other regulation of this part, even if such device is required by law or other regulation. Insulating links shall be capable of withstanding a 1 minute dry low frequency dielectric test of 50,000 volts AC.

TABLE 11-1

Minimum Clearance from Energized Overhead Electric Lines

Voltage (nominal, kV, alternating current)	Minimum clearance distance
Up to 50	10 ft (3 m)
51 – 200	15 ft (4.6 m)
201 – 350	20 ft (6 m)
351 – 500	25 ft (7.6 m)
501 – 750	35 ft (10.7 m)
751 – 1000	45 ft (13.7 m)
Over 1,000	(As established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution)

Note: All dimensions are distances from live part to equipment and components at any potential reach.

11.F.09 Induced currents.

a. Before work near transmitter towers where there is potential for an electrical charge to be induced in equipment or materials, the transmitter shall be de-energized or tests shall be conducted to determine if an electrical charge could be induced.

b. The following precautions shall be taken to dissipate induced voltages:

(1) The equipment shall be provided with an electrical ground to the upper rotating structure supporting the boom; and

(2) Ground jumper cables shall be attached to materials being handled by boom equipment when electrical charge could be induced while working near energized transmitters. Crews shall be provided with nonconductive poles having large alligator clips or other similar protection to attach the ground cable to the load and insulating gloves will be used.

11.G Batteries and Battery Charging.

11.G.01 Batteries shall be stored in enclosures with outside vents or in well-ventilated rooms and be so arranged as to prevent the escape of fumes, gasses, electrolyte spray, or liquid electrolyte into other areas.

11.G.02 Provisions shall be made for sufficient diffusion and ventilation of gases from storage batteries to prevent the accumulation of explosive mixtures.

11.G.03 Battery storage and handling.

a. Racks and trays shall be substantial and shall be treated to make them resistant to the electrolyte.

b. Floors shall be of acid resistant construction or protected from accumulation of acid.

c. Facilities for quick drenching of the eyes and body shall be provided for emergency use within 25 ft (7.6 m) of battery handling areas. > See Section 06.B.02.b.

d. Use only insulated tools in the battery area to prevent accidental shorting across battery connections.

e. PPE shall be used as prescribed in Section 11.G.06 and Section 5.

f. For lead acid batteries, bicarbonate of soda to neutralize any acid spillage [1 lb/gal (0.1 kg/L)of water] shall be provided for flushing and neutralizing spilled electrolyte and for fire protection.

11.G.04 Battery charging.

a. Battery charging installations shall be located in areas designated for that purpose.

b. Charging apparatus shall be protected against physical damage.

c. When charging batteries, the vent caps shall be kept in place to avoid spray of electrolyte. Care shall be taken to assure vent caps are functioning.

d. Prior to charging batteries, the electrolyte level shall be checked and adjusted to the proper level if necessary.

11.G.05 Exit route from battery area shall remain unobstructed.

11.G.06 PPE. The following shall be available and used for safe battery handling.

a. Goggles and faceshields appropriate to the chemical and electrical hazard;

b. Acid-resistant rubber gloves;

c. Protective rubber aprons and safety shoes;

d. Lifting devices of adequate capacity, when required.

11.H Hazardous (Classified) Locations.

11.H.01 Locations of electrical equipment and wiring shall be classified on the properties of the flammable vapors, liquids or gases, or combustible dusts or fibers that may be present and the likelihood that a flammable or combustible concentration or quantity is present. In classifying locations, each room, section, or area shall be classified on an individual basis in accordance with the definitions given in Table 11-2 and NEC Article 500. These hazardous locations within the facility, as designated, shall be documented by the employer.

11.H.02 All equipment, wiring methods, and installations of equipment in hazardous (classified) locations shall be either listed as intrinsically safe, listed for the hazardous location, or demonstrated to be safe for the location.

11.H.03 Only equipment wiring and installation of equipment in hazardous locations shall be permitted in those hazardous (classified) locations.

11.H.04 Equipment and wiring listed for the hazardous (classified) location shall be approved not only for the class of location but also for the ignitable or combustible properties of the specific gas, vapor, dust, or fiber that will be present.

a. This equipment shall be marked to show the class, group, and operating temperature or temperature range for which it is approved.

b. With the following exceptions, the temperature marking shall not exceed the ignition temperature of the specific gas or vapor to be encountered.

(1) Equipment of the non-heat producing type (e.g., junction boxes and conduit) and equipment of the heat producing type having a maximum temperature not more than 212°F (100°C) need not have a marked operating temperature or temperature range.

(2) Fixed lighting fixtures marked for use in Class I, Division 2 or Class II, Division 2 locations need not be marked to indicate the group.

(3) Fixed general-purpose equipment in Class I locations, other than lighting fixtures, that is acceptable for use in Class I, Division 2 locations need not be marked with the class, group, division, or operating temperature.

(4) Fixed dust-tight equipment, other than lighting fixtures, that is acceptable for use in Class II, Division 2, and Class III locations need not be marked with the class, group, division, or operating temperature.

TABLE 11-2

Hazardous (Classified) Locations

Class I Gasses, Vapors or Liquids (A, B, C and D)	
Division 1	Division 2
Normally explosive and hazardous	Not normally present in an explosive concentration (but may accidentally exist).
Zone 0 (IEC Stds)	Zone 1 (IEC Stds)
Class II Dusts (E, F and G)	
Division 1	Division 2
Ignitable quantity of dust that is normally or may be, in suspension or conductive dust may be present	Dust not normally suspended in an ignitable concentration (but may accidentally exist). Dust layers are present.
Class III Fibers or Flyings (H)	
Division 1	Division 2
Handled or used in manufacturing	Stored or handled in storage (exclusive of manufacturing).

A - Acetylene
B – Hydrogen
C - Ethyl-ether vapors, ethylene, etc
D –Hydrocarbons, fuels, solvents, etc
E - Metal dust (conductive* and explosive);
F - Carbon dusts (some are conductive* and all are explosive)
G - Flour, starch, grain, Combustible Plastic or Chemical Dusts (explosive)
H –Textiles, woodworking, etc.,(easily ignitable, not likely to be explosive)
*Note: Electrically conductive dusts are dusts with a resistivity less than 10^5 OHM-centimeter

11.H.05 Equipment that is safe for the hazardous location shall be of a type and design that will provide protection from the hazards arising from the combustibility and flammability of vapors, liquids, gases, dusts, or fibers involved.

11.H.06 Equipment approved for a specific hazardous location shall not be installed or intermixed with equipment approved for another specific hazardous location.

11.H.07 All wiring components and utilization equipment shall be explosion proof (vapor, dust, or fiber tight) and shall be maintained in that condition.

a. There shall be no loose or missing screws, gaskets, threaded connections, or other impairments to this tight condition.

b. Conduits shall be threaded and made wrench-tight: where it is impractical to make a threaded joint tight, a bonding jumper shall be used.

11.I Power Transmission and Distribution.

11.I.01 The requirements in this subsection shall apply to the erection of new electric transmission and distribution lines and equipment, and the alteration, conversion, and improvement of existing electric transmission and distribution lines and equipment.

11.I.02 Before starting work, existing conditions shall be evaluated and determined. Such conditions shall include, but not be limited to, location and voltage of energized lines and equipment, conditions of poles, and location of circuits and equipment including power and communication lines and fire alarm circuits.

a. Electric equipment and lines shall be considered energized until determined to be de-energized by tests, or other means, and grounds applied.

b. New lines or equipment may be considered de-energized and worked as such where the lines or equipment are grounded or where the hazard of induced voltages is not present and adequate clearances or other means are implemented to prevent contact with energized lines or equipment.

c. The operating voltage of equipment and lines shall be determined before working on or near energized parts.

11.I.03 Clearance requirements of either subparagraph a or b below shall be observed.

a. No QP shall be permitted to approach or take any conductive object without an approved insulating handle closer to exposed energized parts than shown in Table 11-3 (phase to ground) unless:

(1) The QP is insulated or guarded from the energized part (gloves or gloves with sleeves rated for the voltage involved shall be considered insulation of the QP from the energized part);

(2) The energized part is insulated or guarded from the QP and any other conductive object at a different potential; or

(3) The QP is isolated, insulated, or guarded from any other conductive object(s), as during live-line, bare-hand work.

b. The minimum phase to ground working distance and minimum clear hot stick distances in Table 11-3 shall not be exceeded. The minimum clear hot stick distance refers to the distance from the hot end of live-line tools to the lineman when performing live-line work. Conductor support tools (such as link sticks, strain carriers, and insulator cradles) may be used provided the clear length of insulation is at least as long as the insulator string or as long as the minimum phase to ground distance in Table 11-3.

11.I.04 When de-energizing lines and equipment operated in excess of 600 volts, and the means of disconnecting from electric energy is not visibly open or visibly locked and tagged out, provisions a through g below are required. > In addition, requirements in Section 12 apply.

a. The equipment or section of line to be de-energized shall be clearly identified and shall be isolated from all sources of voltage.

b. Notification and assurance from the GDA shall be obtained that:

(1) All switches and disconnects through which electric energy may be supplied to the particular section of line or equipment to be worked have been de-energized;

(2) All switches and disconnects are plainly tagged and/or locked indicating that persons are at work; and

(3) All switches and disconnects capable of being rendered inoperable are rendered inoperable.

c. After all designated switches and disconnects have been opened, rendered inoperable, and tagged and/or locked, visual inspections shall be conducted to ensure that equipment or lines are de-energized.

d. Protective grounds shall be applied on the disconnected equipment or lines to be worked on. > See Section 11.I.07.

e. Guards or barriers shall be erected as necessary to adjacent energized lines.

f. When more than one crew requires the same line or equipment to be de-energized, a prominent tag and lock for each crew shall be placed on the line or equipment by the Authorized Individual(s) holding the clearance(s) on said equipment or line.

g. Upon completion of work on de-energized lines or equipment, each Authorized Individual holding a clearance shall determine that all employees in the crew are clear and request a release of the clearance. The protective grounds installed will be removed. Authorized Individual will report to the GDA that all tags and locks protecting the crew may be removed.

TABLE 11-3

AC Live Work Minimum Approach Distance
Reference 29 CFR 1910.269(L)(10), Table R-6

Voltage in kV (phase-to-phase) [1,2]	Distance to Employee			
	Phase-to-ground		Phase-to-phase	
	(m)	(ft-in)	(m)	(ft-in)
0 to 0.050	Not specified		Not specified	
0.051 to 0.300	Avoid contact		Avoid contact	
0.301 to 0.750	0.31	1-0	0.31	1-0
0.751 to 15	0.65	2-2	0.67	2-3
15.1 to 36.0	0.77	2-7	0.86	2-10
36.1 to 46	0.84	2-9	0.96	3-2
46.1 to 72.5	1.00[3]	3-3[3]	1.20	3-11
72.6 to 121	0.95[3]	3-2[3]	1.29	4-3
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500 to 550	3.42	11-3	5.50	18-1
765 to 800	4.53	14-11	7.91	26-0

[1] For single-phase systems use the highest voltage available.
[2] For single-phase lines off three phase systems, use phase-to-phase voltage of the system.
[3] The 46.1 to 72.5 kV phase-to-ground 3-3 (ft-in) distance contains a 1-3 (ft-in) electrical component and a 2-0 (ft-in) inadvertent movement component while the 72.6 to 121 kV phase-to-ground 3-2 (ft-in) distance contains a 2-0 (ft-in) electrical component and a 1-0 (ft-in) inadvertent movement component.

11.I.05 When opening or closing a disconnect switch or circuit breaker on a power transmission/distribution line, exposure to potential explosion shall be limited. Safe operating procedures shall be established to minimize the risk of explosion.

11.I.06 When a crew working on a line or equipment can clearly see that the means of disconnecting from electrical energy are visibly open or visibly locked-out, the following provisions are required. > See Section 12.

a. Guards or barriers shall be erected as necessary to adjacent energized lines.

b. Upon completion of work on de-energized lines or equipment, each designated person-in-charge shall determine that all employees in the crew are clear that all protective grounds installed by the crew have been removed and shall report to the GDA that all tags and locks protecting the crew may be removed.

11.I.07 Grounding.

a. De-energized conductors and equipment that are to be grounded shall be tested or visually checked by meters or indicators to be de-energized.

b. Requirements as detailed in NEC and NESC for placing and removing protective grounds shall be followed.

c. Grounds shall be placed between the work location and all sources of energy and as close as practicable to the work location, or grounds shall be placed at the work location.

(1) If work is to be performed at more than one location in a line section, the line section must be grounded and short circuited at one location in the line section and the conductor to be worked on shall be grounded at each work location.

(2) The minimum distance in Table 11-3 shall be maintained from ungrounded conductors at the work location.

(3) Where the making of a ground is impractical, or the conditions resulting from it would be more hazardous than working on the lines or equipment without grounding, the grounds may be omitted and the line or equipment worked as energized.

d. Grounds may be temporarily removed only when necessary for test purposes and extreme caution shall be exercised during the test procedures. The lines or equipment from which grounds have been removed shall be considered energized.

e. When grounding electrodes are used, such electrodes shall have a resistance to ground of less than 25 ohms to remove the danger of harm to personnel or permit prompt operation of protective devices (NEC 250).

f. Grounding to tower shall be made with a tower clamp capable of conducting the anticipated fault current.

g. All ground leads shall be properly sized for the anticipated fault current, but shall never be sized smaller than No. 2 AWG.

11.I.08 Tools.

a. All hydraulic tools that are used on or around energized lines or equipment shall use non-conducting hoses having adequate strength for the normal operating pressures.

b. All pneumatic tools that are used on or around energized lines or equipment shall have non-conducting hoses of adequate strength for the normal operating pressures and have an accumulator on the compressor to collect moisture.

c. Portable metal or conductive ladders shall not be used near energized lines or equipment except in specialized work such as in high voltage substations where nonconductive ladders might present a greater hazard than conductive ladders. Conductive or metal ladders shall be prominently marked as conductive and all precautions shall be taken when used in specialized work.

d. Conductive pull tape or rope shall not be used when working on or near energized parts.

11.I.09 Aerial lift trucks. > See Sections 18 and 22.M.

a. The aerial device manufacturer shall state in the operator's manual and on the instruction plate whether the aerial device is insulating or non-insulating.

b. Aerial lift trucks shall be grounded or barricaded and considered as energized equipment, or the aerial lift truck shall be insulated for the work being performed. Table11-1 will be legibly printed on a plate of durable non-conductive material and shall be mounted on the bucket or its vicinity so as to be visible to the operator of the boom.

c. Equipment or material shall not be passed between a pole or structure and an aerial lift while an employee working from the basket is within reaching distance of energized conductors or equipment that are not covered with insulating protective equipment.

d. Only qualified electrical workers may operate aerial lift equipment within the restricted approach boundary distances.

11.I.10 With the exception of equipment certified for work on the proper voltage, mechanical equipment shall not be operated closer to any energized line or equipment than the clearances in Table 11-1 unless:

a. An insulated barrier is installed between the energized part and the mechanical equipment;

b. The mechanical equipment is grounded;

c. The mechanical equipment is insulated; or

d. The mechanical equipment is considered as energized.

11.I.11 Material handling and storage.

a. When hauling poles during the hours of darkness, illuminated warning devices shall be attached to the trailing end of the longest pole.

b. Materials and equipment shall not be stored under energized bus, energized lines, or near energized equipment if it is possible to store them elsewhere. If materials or equipment must be stored under energized lines or near energized equipment, clearance shall be maintained as in Table 11-1 and extraordinary caution shall be exercised in maintaining these clearances when operating equipment or moving materials near such energized equipment.

c. Tag lines shall be of a non-conducting type when used near energized lines.

11.I.12 Before climbing poles, ladders, scaffolds, or other elevated structures, an inspection shall determine that the structures are capable of sustaining the additional or unbalanced stresses to which they will be subjected. Poles or structures that may be unsafe for climbing shall not be climbed until made safe by guying, bracing, or other means.

11.I.13 Before installing or removing wire or cable, action will be taken as necessary to prevent the failure of poles and other structures.

11.I.14 When setting, moving, or removing poles by cranes, derricks, gin poles, A-frames, or other mechanized equipment near energized lines or equipment, precautions shall be taken to avoid contact with energized lines or equipment, except in bare hand, live-line work, or where barriers or protective devices are used.

11.I.15 Unless using protective equipment for the voltage involved, employees standing on the ground shall avoid contacting equipment or machinery working adjacently to energized lines or equipment.

11.I.16 Lifting equipment shall be bonded to an effective ground or it shall be considered energized and barricaded when used near energized equipment or lines.

11.I.17 Pole holes shall not be left unattended or unguarded.

11.I.18 Where necessary to assure the stability of mobile equipment, the location shall be graded and leveled.

11.I.19 When employees are working at two or more levels on a tower, activities shall be conducted such that there is a minimum exposure of employees to falling objects.

11.I.20 Guy lines shall be used to maintain sections or parts of tower sections in position and to reduce the possibility of tipping. Guy lines on towers shall be protected at ground level from accidental contact.

11.I.21 Tower members and sections being assembled shall be adequately supported.

11.I.22 No one shall be permitted under a tower that is in the process of erection or assembly, except as may be required to guide and secure the section being set.

11.I.23 When erecting towers using hoisting equipment adjacent to energized transmission lines, the lines shall be de-energized when practical. If the lines are not de-energized, minimum clearance distances shall be maintained as specified in Table 11-1 and extraordinary caution shall be exercised in maintaining these clearances when operating equipment or moving materials near such energized equipment.

11.I.24 The load line shall not be detached from a tower section until the section is adequately secured.

11.I.25 Except during emergency restoration procedures, tower erection shall be discontinued in high wind or other adverse weather conditions that could make the work hazardous. When work is conducted under such conditions, the hazards and the means for their control shall be delineated in an AHA.

11.I.26 Before stringing operations, a briefing shall be held to discuss the following:

a. The plan of operation;

b. The type of equipment to be used;

c. Grounding devices and procedures to be followed;

d. Crossover methods to be employed; and

e. Clearance authorizations that are required.

11.I.27 When there is a possibility of a de-energized conductor being installed or removed coming into accidental contact with an energized circuit or receiving a dangerous induced

voltage buildup, the conductor being installed or removed shall be grounded or provisions made to insulate or isolate the employee.

11.I.28 If an existing line is de-energized, proper clearance authorization shall be secured and the line grounded on both sides of the crossover or the wire being strung or removed shall be considered and worked as energized.

11.I.29 When crossing over energized conductors in excess of 600 volts, ropes, nets or guard structures shall be installed unless provision is made to isolate or insulate the worker or the energized conductor. Where practical the automatic re-closing feature of the circuit-interrupting device shall be made inoperative. In addition, the line being strung shall be grounded on either side of the crossover or considered and worked as energized.

11.I.30 Conductors being strung or removed shall be kept under positive control by tension reels, guard structures, tie lines, or other means to prevent accidental contact with energized circuits.

11.I.31 Guard structure members shall be sound, of adequate dimension and strength, and adequately supported.

11.I.32 Catch-off anchors, rigging, and hoists shall be of ample capacity to prevent loss of the lines.

11.I.33 Reel handling equipment, including pulling and braking machines, shall have ample capacity, operate smoothly, and be leveled and aligned in accordance with the manufacturer's operating instructions.

11.I.34 The manufacturer's load rating shall not be exceeded for stringing lines, pulling lines, sock connections, and all load-bearing hardware and accessories.

11.I.35 Pulling lines and accessories shall be inspected regularly and replaced or repaired when damaged or when dependability may be doubtful.

11.I.36 Conductor grips shall not be used on wire rope unless designed for this application.

11.I.37 Employees shall not be permitted under overhead operations or on cross-arms while a conductor or pulling line is being pulled (in motion).

11.I.38 A transmission clipping crew shall have a minimum of two structures clipped between the crew and the conductor being sagged. When working on bare conductors, clipping and tying crews shall work between grounds at all times; the grounds shall remain intact until the conductors are clipped in, except on dead end structures.

11.I.39 Except during emergency restoration procedures, work from structures shall be discontinued when adverse weather (such as high wind or ice on structures) makes the work hazardous. Stringing and clipping operations shall be discontinued during an electrical storm in the vicinity.

11.I.40 Reliable communications between the reel tender and pulling rig operator shall be provided.

11.I.41 Each pull shall be snubbed or dead ended at both ends before subsequent pulls.

11.I.42 Before stringing parallel to an existing energized transmission line, a determination, by a QP, shall be made to ascertain whether dangerous induced voltage buildups will occur, particularly during switching and ground fault conditions. When there is a possibility that such dangerous induced voltage may exist, the employer shall comply with the provisions of Sections 11.I.42 through 11.I.49 in addition to the provisions of Sections 11.I.25 through 11.I.40 unless the line is worked as energized.

11.I.43 When stringing adjacent to energized lines, the tension stringing method or other methods that preclude unintentional contact between the lines being pulled and any person shall be used.

11.I.44 All pulling and tensioning equipment shall be isolated, insulated, or grounded.

11.I.45 A ground shall be installed between the tensioning reel setup and the first structure to ground each bare conductor, sub-conductor, and overhead ground conductor during stringing operations.

11.I.46 During stringing operations, each bare conductor, sub-conductor, and overhead ground conductor shall be grounded at the first tower adjacent to both the tensioning and pulling setup and in increments so that no point is more than 2 mi (3.2 km) from a ground.

a. The grounds shall be left in place until conductor installation is complete.

b. These grounds shall be removed as the last phase of aerial cleanup.

c. Except for moveable-type grounds, the grounds shall be placed and removed with a hot stick.

11.I.47 Conductors, sub-conductors, and overhead ground conductors shall be grounded at all dead-end or catch-off points.

11.I.48 A ground shall be located at each side and within 10 ft (3 m) of working areas where conductors, sub-conductors, or overhead ground conductors are being spliced at ground level. The two ends to be spliced shall be bonded to each other. Splicing should be carried out on either an insulated platform or a conductive metallic grounding mat bonded to both grounds. The grounding mat should be roped off and an insulated walkway provided for access to the mat.

11.I.49 All conductors, sub-conductors, and overhead ground conductors shall be bonded to any isolated tower where it may be necessary to complete work on the transmission line.

a. Work on dead-end towers shall require grounding on all de-energized lines.

b. Grounds may be removed as soon as the work is completed provided the line is not left open-circuited at the isolated tower at which work is being completed.

11.I.50 When performing work from the structure, clipping crews and all others working on conductors, sub-conductors, or overhead ground conductors shall be protected by individual grounds installed at every workstation.

11.I.51 Before using the live-line bare-hand technique on energized high-voltage conductors or parts, a check shall be made of:

a. The voltage rating of the circuit on which the work is to be performed;

b. The clearances to ground of lines and other energized parts of which work is to be performed; and

c. The voltage limitations of the aerial-lift equipment intended to be used.

11.I.52 Only tools and equipment designed, tested, and intended for live-line bare-hand work shall be used, and such tools and equipment shall be kept clean and dry.

11.I.53 All work shall be personally supervised by a person trained and qualified to perform live-line bare-hand work.

11.I.54 The automatic re-closing feature of circuit interrupting devices shall be made inoperative where practical before working on any energized line or equipment.

11.I.55 Work shall not be performed during electrical storms or when electrical storms are imminent.

11.I.56 A conductive bucket liner or other suitable conductive device shall be provided for bonding the insulated aerial device to the energized line or equipment.

a. The employee shall be connected to the bucket liner by conductive shoes, leg clips, or other suitable means; climbers shall not be worn while performing work from an aerial lift.

b. Where necessary, electrostatic shielding for the voltage being worked or conductive clothing shall be provided.

11.I.57 Before the boom is elevated, the outriggers on the aerial truck shall be extended and adjusted to stabilize the truck. The body of the truck shall be bonded to an effective ground or barricaded and considered as energized equipment.

11.I.58 Before moving an aerial lift into the work position, all controls (ground level and bucket) shall be checked and tested to determine that they are in proper working condition.

11.I.59 Electrical insulating components and systems of aerial devices that are rated and used as an insulating device shall be, after a thorough inspection of their condition and cleanliness, tested for compliance with their rating.

a. Tests shall be conducted in accordance with the manufacturer's recommendations.

b. Tests shall be conducted only by QPs who are knowledgeable of the hazards.

11.I.60 All aerial lifts to be used for live-line bare-hand work shall have dual controls (ground level and basket).

a. The basket controls shall be within easy reach of the employee in the basket. If a two-basket lift is used, access to the controls shall be within easy reach from either basket.

b. The ground level controls shall be located near the base of the boom and will permit override operation of equipment at any time.

c. Except in case of an emergency, ground level lift control shall not be operated unless permission has been obtained from the employee in the lift. > See Section 11.I.57.

11.I.61 Before an employee contacts the energized part to be worked on, the conductive bucket liner shall be bonded to the energized conductor by a positive connection that shall remain attached to the energized conductor until the work on the energized circuit is completed.

11.I.62 The minimum clearances for live-line bare-hand work shall be as specified in Table 11-3.

a. These minimum clearances shall be maintained from all grounded objects and from lines and equipment at a different potential than that to which the insulated aerial device is bonded, unless such grounded objects or other lines and equipment are covered by insulated guards.

b. These distances shall be maintained when approaching, leaving, and when bonded to the energized circuit.

c. When approaching, leaving, or bonding to an energized circuit, the minimum distances in Table 11-3 shall be maintained among all parts of the insulated boom assembly and any grounded parts (including the lower arm or portions of the truck).

d. When positioning the bucket alongside an energized bushing or insulator string, the minimum line-to-ground clearances of Table 11-3 must be maintained among all parts of the bucket and the grounded end of the bushing or insulator string.

e. A minimum clearance table (as in Table 11-3) shall be printed on a plate of durable nonconductive material and mounted in the bucket or in its vicinity so as to be visible to the boom operator.

f. Only insulated measuring sticks shall be used to verify clearance distances.

11.I.63 Handlines between buckets, booms, and the ground are prohibited.

a. Conductive materials more than 36 in (1 m) long shall NOT be placed in the bucket, except for appropriate length jumpers, armor rods, and tools.

b. Non-conductive handlines may be used from line to ground when not supported from the bucket.

11.I.64 The bucket and boom shall not exceed the manufacturer's rated capacity while attempting to lift or support additional load.

11.J Underground Electrical Installations.

11.J.01 Guarding underground openings.

a. Warning signs and rigid barricades shall be promptly placed when covers of manholes, handholes, or vaults are removed.

b. When an employee enters an underground opening the opening shall be protected with a barricade, temporary cover, or other guard appropriate for the hazard.

c. Underground opening guards and warning signs shall be adequately illuminated.

11.J.02 Maintenance holes and unvented vaults shall be treated as, and subject to the requirements of confined spaces. > See Section 33.

11.J.03 Smoking shall be prohibited in maintenance holes and vaults.

11.J.04 When open flames must be used in manholes, ventilation shall be provided.

11.J.05 Before using open flames in maintenance holes or vaults, the holes/vaults shall be tested and found safe or cleared of any combustible gases or liquids.

11.J.06 When underground facilities are exposed (electric, gas, water, telephone, etc., or cables other than the one being worked on), they shall be protected to avoid damage.

11.J.07 Before cutting into a cable or opening a splice, the cable shall be identified and verified to be the proper cable and de-energized.

11.J.08 When working on buried cable or on cable in manholes, metallic sheath continuity shall be maintained by bonding across the opening or by equivalent means.

11.K Work In Energized Substations.

11.K.01 When working in an energized substation, authorization shall be obtained from the GDA before work is begun.

11.K.02 When work is to be done in an energized substation, the following shall be determined:

a. The facilities that are energized, and

b. Any protective equipment and precautions are necessary for the safety of personnel.

11.K.03 Clearance requirements per Section 11.I.03 shall be followed.

11.K.04 Only qualified employees shall perform work on or adjacent to energized control panels. > See Sections 11.A.01, 11.B.

11.K.05 Precautions shall be taken to prevent accidental operation of relays or other protective devices due to jarring, vibration, or improper wiring.

11.K.06 Use of vehicles, gin poles, cranes, and other equipment in unguarded high voltage equipment areas shall at all times be controlled by qualified employees. > See Table 11-1.

11.K.07 All mobile cranes and derricks shall be effectively grounded when being moved or operated near energized lines or equipment or the equipment shall be considered energized.

11.K.08 When a substation fence must be expanded or removed, a temporary fence affording similar protection, when the site is unattended, shall be provided. Adequate interconnection with ground shall be maintained between temporary fence and permanent fence.

11.K.09 All gates to unattended substations shall be locked except when work is in progress.

11.K.10 When switching gang switches, visual inspection shall be made to ensure all insulators and the switch handle ground is in good condition. Insulating gloves must be worn when operating switch handles.

11.L Communication Facilities.

11.L.01 Employees shall not look into an open wave guide or antenna that is connected to an energized electromagnetic source.

11.L.02 If the electromagnetic radiation level within an accessible area exceeds the levels given in Section 06.F, the area shall be posted with appropriate signs.

11.L.03 When an employee works in an area where the electromagnetic radiation <u>is unknown</u> or could exceed the levels given in Section 06.F, measurements shall be taken to ensure that employee's exposure is not greater than that permitted.

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SECTION 12

Control of Hazardous Energy

12.A General. Hazardous energy is any energy, including but not limited to mechanical (e.g., power transmission apparatus, counterbalances, springs, pressure, and gravity), pneumatic, hydraulic, electrical, chemical, nuclear, and thermal (e.g., high or low temperature) energies, that could cause injury to employees. > See Section 12.B.

12.A.01 When working on or near any system that produces, uses, or stores hazardous energy, a Hazardous Energy Control Program (HECP) is required.

a. USACE-owned/operated facilities and activities shall comply with ER 385-1-31, The Control of Hazardous Energy Program, and any regional HECP as well as local supplements in lieu of this section.

➢ Note: When USACE employees are on a site that is controlled by a contractor and are affected by the contractor-managed HECP (e.g., QA's on construction sites, etc.), they shall comply with the contractor's HECP.

b. On contractor-controlled sites:

(1) The contractor shall develop an HECP in accordance with this Section as well as all requirements of 29 CFR 1910.147, ANSI Z244.1, and ANSI A10.44. This HECP shall be submitted as part of their Accident Prevention Plan (APP) to the GDA for acceptance.

(2) The GDA and the contractor shall fully coordinate all control activities with one another throughout the planning and implementation of these activities. Each shall inform the other of their HECPs and Hazardous Energy Control (HEC) procedures, ensure that their own personnel understand and comply with rules and restrictions of the procedures agreed upon to be used for the job, and ensure that their employees affected by the HEC activity are notified when the procedural steps outlined in the HECP are to be initiated.

(3) HEC procedures shall be submitted to the GDA as part of the AHA for that phase of work. HEC procedures cannot be initiated until these procedures have been accepted by the GDA.

(4) The Prime Contractor, as the Controlling Contractor, is also responsible for the HEC procedures of all their sub-contractors. The prime and the sub-contractors shall fully coordinate all HEC activities with one another throughout the planning and implementation of work. Procedures to be used shall be discussed and coordinated to insure all contractor, government or public persons are protected from hazardous energy, especially where crossover of contractor programs occur.

c. When contractor work involving hazardous energy will be performed at or on a USACE-operated facility, the following must occur:

(1) Contractors shall submit their HECP to the GDA for acceptance;

(2) HEC procedures shall be submitted to the GDA as part of the AHA for that phase of work. HEC procedures cannot be initiated until these procedures have been reviewed by a person knowledgeable in HEC and accepted by the GDA.

(3) The GDA and the Contractor shall fully coordinate all HEC activities with one another throughout the planning and implementation of these activities. The agreed upon HECP and HEC procedures shall be identified and documented.

(4) Both parties shall ensure that their own personnel understand and comply with rules and restrictions of the procedures agreed upon to be used for the job, and ensure that their employees affected by the HEC activity are notified when the procedural steps outlined in the HECP are to be initiated.

12.A.02 A preparatory meeting and inspection with the GDA and Contractor personnel shall be conducted to coordinate HEC activities. This meeting/inspection shall be documented.

a. Employees shall be trained and tested prior to working on Corps' Facilities where the Corps' HECP is in use to ensure that they are knowledgeable of the procedures.

b. Contractors shall ensure that all of their employees and sub-contractors are trained and knowledgeable in their HECPs.

c. When HEC procedures affect USACE and Contractors, USACE and Contractor authorized personnel will participate to ensure that HEC programs and procedures are in place and coordinated.

12.A.03 Introducing Energy inside Clearance Boundaries**.** To provide for safe work practices where energy is introduced within boundaries of an existing clearance (e.g., commissioning equipment and/or testing activities, etc.), these activities will be coordinated with and communicated to all affected personnel.

a. An AHA, by the contractor performing the work, shall be created and implemented for these activities to ensure the integrity of the clearance boundary.

b. Test procedures shall be provided to the GDA prior to performing these activities.

12.B Hazardous Energy Control Program (HECP).

12.B.01 The HECP shall clearly and specifically outline the scope, purpose, authorization, roles and responsibilities, rules, and techniques to be used for the control of hazardous energy.

12.B.02 The HECP shall include, but not be limited to, the following:

a. HECP procedures: Equipment-specific steps to control each energy source and must include isolating, blocking, verifying and securing systems;

b. Means of coordinating and communicating HEC activities with all site personnel (include contractor, sub-contractor, government, suppliers, public, visitors and any other personnel) to insure continuity of protection;

c. Procedural steps and responsibilities for the placement, removal, and transfer of locks, tags and other control devices;

d. Procedural steps, responsibilities and a means of accounting for placing and removing personal protective grounds;

e. Procedural steps, responsibilities and requirements for testing the system to verify the effectiveness of isolation and control;

f. Coordination (Shift/Schedule Change). Provisions shall be made to ensure total continuity of HEC protection during shift or personnel change;

g. Details of any emergency procedures;

h. Procedural steps and responsibilities for daily inspections (conducted to insure that all requirements of the HECP procedures are being followed and documented) and periodic inspections (shall be documented and shall specify the system where the HEC procedures were inspected, the date of the inspection, the names of employees performing and included in the inspections, and any deficiencies in complying with the HEC procedures); and

i. The means to enforce compliance with the HECP.

12.C Training.

12.C.01 Training applicable to the roles and responsibilities shall be provided to ensure that the purpose and function of the HEC procedures are understood by employees and that employees possess the knowledge and skills required for the safe application, usage, and removal of HEC devices.

12.C.02 When tagout systems are used (only when lockout is not possible), employees shall be trained in the limitations of tags.

12.C.03 Employees shall be retrained in HEC procedures whenever:

a. There is a change in employee job responsibilities or a change in systems or processes that present a new energy control hazard;

b. A periodic inspection reveals, or there is reason to suspect the presence of, inadequacies in or deviations from the employee's knowledge or use of HEC procedures;

c. There is a change in contractor or local HEC procedures.

12.C.04 All training shall be documented. Documentation shall contain: names of employees trained; the time, date, and location of training; the name and qualifications of the trainer.

12.D Energy Isolating Devices and Procedures.

12.D.01 Energy Isolating Devices.

a. Energy isolating devices are mechanical devices that, when utilized or activated, physically prevent the unplanned transmission or release of energy and include, but are not limited to the following:

(1) A manually operated electrical circuit breaker;

(2) A disconnect switch;

(3) A valve, bolted blank flange and bolted slip blinds;

(4) A block (e.g., a safety block or cribbing).

b. Push-buttons, selector switches, safety interlocks, programmable logic controllers, software programming, and other control circuit type devices shall NOT be used as energy isolating devices.

12.D.02 Locks or other positive means control must always be used when the energy isolation involves equipment that is accessible by the public.

12.D.03 All equipment shall be covered by the HEC procedures and all energy sources shall be controlled before performing servicing, maintenance, testing, installation or removal on equipment in which the unexpected energizing, startup, or release of stored energy could occur and cause any of the following: Personal injury, property damage, loss of content, loss of protection, loss of capacity, or harm to the environment.

12.E Locks and Tags.

12.E.01 Systems with energy isolating devices that are capable of being locked out shall be locked out. If an energy isolating device is not capable of being locked out, the HEC procedures shall use tagout providing full personnel protection.

a. All tagout requirements of this regulation and of the HEC procedures shall be complied with;

b. The tag shall be attached to the same location, if possible, that the lock would have been attached. If this is not possible then the tag shall be attached as close a safely possible to the device and in a position that will be immediately obvious to anyone attempting to operate the device, and

c. Additional means (e.g., placement of the tag in a manner that inhibits operation of the energy isolating device, removal of an isolating circuit mechanism, blocking of a control switch, opening of an extra disconnecting device, removal of a valve handle to reduce the likelihood of inadvertent energizing, etc.) shall be employed to provide a level of protection commensurate with that provided by a lock.

d. When tags only must be used (the use of locks is not possible), employees shall be instructed in the following requirements and limitations of tags.

(1) Tags must be legible and understood by all authorized and affected employees and incidental personnel.

(2) Tags and their means of attachment must be made of materials that will withstand the environments encountered in the workplace.

(3) Tags shall be securely attached to energy isolating devices so that they cannot become inadvertently or accidentally detached during use.

(4) Tags shall not be removed without authorization of the authorized employee and shall never be bypassed, ignored, or otherwise defeated.

(5) Tags are essentially warning devices affixed to energy isolating devices and do not provide the physical protection that is provided by a lock; tags may evoke a false sense of security.

12.E.02 LOTO shall be performed only by authorized employees.

12.E.03 All employees affected by the LOTO shall be notified, before and upon completion of, the application and removal of locks or tags.

12.E.04 Locks and tags used for lockout/tagout (LOTO) shall:

a. Be capable of withstanding the environment that they are exposed to for the maximum period of time the exposure is expected;

b. Indicate the identity of the employee applying the device;

c. Be of a unique design or color to readily identify them as belonging to the LOTO program;

d. Not be used for anything other than lockout activities;

e. Identify the person who applied the lock or tag. Locks may have a tag attached with the employee's name and/or photograph which will satisfy this requirement;

f. Locks shall be substantial enough to prevent removal without the use of excessive force or unusual techniques (such as with the use of bolt cutters);

g. Tags shall, in addition, meet all of the following requirements:

(1) Have a standardized (within a project) print and format;

(2) Be constructed and printed so that exposure to weather conditions, ultraviolet (UV) light, wet or damp locations, or corrosive environments will not cause the tag to deteriorate or the message to become illegible;

(3) Be attached by means that are: Non-reusable; Substantial enough to prevent inadvertent or accidental removal; Attachable by hand; Self-locking; Non-releasable, with a minimum unlocking strength of no less than 50 lb (22.6 kg); and have the basic characteristics of being at least equivalent to a one-piece, all-environment-tolerant nylon cable tie; and

(4) Warn against the hazardous condition resulting from system energization and include wording such as "DANGER - DO NOT START, OPEN, CLOSE, ENERGIZE, OPERATE".

12.E.05 Application and Removal Of Locks and Tags.

a. The authorized employee shall ensure that all energy isolating devices needed to control energy to or within the system are identified and that the system is shut down, isolated, blocked and secured in accordance with HEC procedures.

b. Any system operated by a remotely controlled source will be completely isolated such that it cannot be operated by that or any other source.

c. The authorized employee shall affix lock and tag to each energy isolating device in accordance with the HEC procedures.

d. When there is a possibility of re-accumulation of stored energy to a hazardous level, verification of isolation shall be continued until the energy control procedure is complete.

e. Before starting work on systems that have been locked/tagged out, the authorized individual shall verify that isolation and de-energization of the system have successfully been accomplished.

12.E.06 Personal Protective Grounds. Following the application of locks and/or tags to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved or otherwise rendered safe.

a. Protective grounds shall be identified and accounted for in some manner, as identified in the Contractor's HECP and procedures.

b. The authorized employee (or his designee) is responsible for ensuring the control of residual energy and for placing and removing personal protective grounds in accordance with the Contractor's HECP and procedures.

12.E.07 Before locks or tags are removed and energy restored to the system, the authorized individual shall ensure that the following actions have been taken:

a. The work area has been inspected and all nonessential items (e.g., tools and materials) have been removed from the system, the system components are operationally intact, and all employees have been safely positioned or removed from the area; and

b. All affected individuals have been notified that the locks or tags are about to be removed.

12.E.08 With the exception of the following conditions, each lock and/or tag shall be removed from each energy-isolating device by the authorized individual or systems operator who applied the device. When this employee is not available, the device(s) may be removed by another individual appointed by, and under the direction of the Contractor Project Manager or Contractor designated authority, provided that the following procedures are complied with:

a. The Contractor ensures that the individual appointed to remove locks and/or tags is knowledgeable of the scope and procedures of the safe clearance;

b. This individual and the requirements for transferring removal authority to him/her from the authorized individual are listed in the hazardous energy control plan;

c. Verification by the Contractor that the authorized employee who applied the device is not at the facility;

d. The Contractor designated authority makes all reasonable efforts to contact the authorized employee to inform him that the locks and/or tags are to be removed; and if a group clearance is involved, then an attempt must be made to have all affected persons sign off on the clearance or they must be contacted by phone. If contact cannot be made, then the lift may be made only after all necessary precautions are taken;

e. The authorized employee, upon returning, must be immediately notified of the lift prior to resuming their work.

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SECTION 13

Hand and Power Tools

13.A General.

13.A.01 Power tools shall be of a manufacturer listed by a nationally recognized testing laboratory for the specific application for which they are to be used.

13.A.02 Use, inspection, and maintenance.

a. Hand and power tools shall be used, inspected, and maintained in accordance with the manufacturer's instructions and recommendations and shall be used only for the purpose for which designed. A copy of the manufacturer's instructions and recommendations shall be maintained with the tools.

b. Hand and power tools shall be inspected, tested, and determined to be in safe operating condition before use. Continued daily inspections shall be made to assure safe operating condition and proper maintenance.

c. Hand and power tools shall be in good repair and with all required safety devices installed and properly adjusted. Tools having defects that will impair their strength or render them unsafe shall be removed from service.

13.A.03 Guarding.

a. Power tools designed to accommodate guards shall be equipped with such guards. All guards must be functional.

b. Reciprocating, rotating, and moving parts of equipment shall be guarded if exposed to contact by employees or otherwise create a hazard.

13.A.04 When work is being performed overhead, tools not in use shall be secured or placed in holders.

13.A.05 Throwing tools or materials from one location to another or from one person to another, or dropping them to lower levels, shall not be permitted.

13.A.06 Only non-sparking tools shall be used in locations where sources of ignition may cause a fire or explosion.

13.A.07 Tools requiring heat treating or redressing shall be tempered, formed, dressed, and sharpened by personnel who are experienced in these operations.

13.A.08 The use of cranks on hand-powered winches or hoists is prohibited unless the hoists or winches are provided with positive self-locking dogs. Hand wheels with exposed spokes, projecting pins, or knobs shall not be used.

13.A.09 Hydraulic fluid used in powered tools shall retain its operating characteristics at the most extreme temperatures to which it will be exposed. > For underground use, see Section 26.D.07.

13.A.10 Manufacturers' safe operating pressures for hydraulic hoses, valves, pipes, filters and other fittings shall not be exceeded.

13.A.11 All hydraulic or pneumatic tools that are used on or around energized lines or equipment shall have non-conducting hoses of adequate strength for the normal operating pressures.

13.A.12 When fuel-powered tools are used in confined or enclosed spaces, the requirements for concentrations of toxic gases as outlined in Sections 5 and 34 of this manual, shall apply.

13.A.13 Clothing.

a. PPE shall be used as outlined in Section 5 of this manual.

b. Loose and frayed clothing, loose long hair, dangling jewelry (including dangling earrings, chains, and wrist watches) shall not be worn while working with any power tool.

13.A.14 For grounding requirements, see Section 11.

13.A.15 An electrical power control shall be provided on each machine/power tool to make it possible for the operator to cut off the power for the machine/power tool without leaving the point of operation.

13.A.16 On applications where injury to the operator might result if motors were to restart after power failure, provisions shall be made to prevent machines from automatically restarting upon restoration of power.

13.A.17 Floor- and bench-mounted power tools shall be anchored or securely clamped to a firm foundation. Anchoring or securing shall be sufficient to withstand lateral or vertical movement.

13.B Grinding and Abrasive Machinery.

13.B.01 With the exception of the following, abrasive wheels shall be used only on machines provided with safety guards. > See ANSI B74.2 for descriptions of abrasive wheel types.

a. Wheels used for internal work while within the work being ground;

b. Mounted wheels, 2 in (5 cm) and smaller in diameter, used in portable operations;

c. Types 16, 17, 18, 18R, and 19 cones and plugs and threaded hole pot balls where the work offers protection or where the size does not exceed 3 in (7.6 cm) in diameter by 5 in (12.7 cm) long;

d. Type 1 wheels not larger than 2 in (5 cm) in diameter and not more than ½ in (1.2 cm) thick, operated at peripheral speeds less than 1800 surface-feet per minute (ft/min) (9.1 surface-m/s) when mounted in mandrels driven by portable drills;

e. Type 1 reinforced wheels not more than 3 in (7.6 mm) in diameter and ¼ in (6 mm) in thickness, operating at peripheral speeds not exceeding 9500 surface-ft/min (48.3 surface-m/s), if safety glasses and face shield protection are worn.

13.B.02 Tongue guards on bench/stand grinders shall be adjustable to within ¼ in (6 mm) of the constantly decreasing diameter of the wheel at the upper opening.

13.B.03 Grinders shall be supplied with power sufficient to maintain the spindle speed at safe levels under all conditions of normal operation.

13.B.04 Work or tool rests shall not be adjusted while the grinding wheel is in motion.

13.B.05 Work/tool rests on power grinders shall not be more than 1/8 in (3 mm) distance from the wheel.

13.B.06 Abrasive wheels shall be closely inspected and ring-tested before mounting. Cracked or damaged grinding wheels shall be destroyed.

13.B.07 Grinding wheels shall not be operated in excess of their rated safe speed.

13.B.08 Floor stand and bench-mounted abrasive wheels used for external grinding shall be provided with safety guards (protective hoods).

a. The maximum angular exposure of the grinding wheel periphery and sides shall be not more than 90°, except that when work requires contact with the wheel below the horizontal plane of the spindle the angular exposure shall not exceed 125°; in either case, the exposure shall begin not more than 65° above the horizontal plane of the spindle.

b. Safety guards shall be strong enough to withstand the effect of a bursting wheel.

13.C Power Saws and Woodworking Machinery.

13.C.01 Woodworking machinery shall be operated and maintained in accordance with ANSI 01.1.

13.C.02 Guarding.

a. Circular saws shall be equipped with guards that automatically and completely enclose the cutting edges, splitters, and anti kickback devices.

b. Portable power-driven circular saws shall be equipped with guards above and below the base plate or shoe.

(1) The upper and lower guards shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts and for the minimum arc required to allow proper retraction and contact with the work, respectively.

(2) When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to the covering position.

c. Blades of planers and jointers shall be fully guarded and have cylindrical heads with throats in the cylinder.

d. Band saw blades shall be fully enclosed except at the point of operation.

13.C.03 Automatic feeding devices shall be installed on machines whenever possible. Feeder attachments shall have the feed rolls or other moving parts covered or guarded so as to protect the operator from hazardous points.

13.C.04 The operating speed shall be permanently marked on circular saws more than 20 in (50.8 cm) in diameter or operating at over 10,000 peripheral ft/minute (min) (50.8 peripheral m/s).

a. Saws shall not be operated at a speed other than that marked on the blade.

b. When a marked saw is re-tensioned for a different speed, the marking shall be corrected to show the new speed.

13.C.05 Radial arm power saws shall be equipped with an automatic brake.

13.C.06 The table of radial arm or swing saws shall extend beyond the leading edge of the saw blade.

13.C.07 Radial arm power saws shall be installed in such a manner that the cutting head will return to the starting position when released by the operator. All swing cutoff and radial saws or similar machines that are drawn across a table shall be equipped with limit stops to prevent the leading edge of the tool from traveling beyond the edge of the table.

13.C.08 Each hand-fed crosscut table saw and each hand-fed circular ripsaw shall have a spreader to prevent the material from squeezing the saw or being thrown back on the operator.

13.C.09 Operating procedures.

a. Band saws and other machinery requiring warm-up for safe operation shall be permitted to warm up before being put into operation whenever the temperature is below 45°F (7°C).

b. A push-stick, block, or other safe means shall be used on all operations close to high-speed cutting edges.

c. The use of cracked, bent, or otherwise defective parts such as saw blades, cutters, or knives is prohibited.

d. A brush shall be provided for the removal of sawdust, chips, and shavings on all woodworking machinery.

e. Power saws shall not be left running unattended.

13.D Pneumatic Power Tools.

13.D.01 Safety clips or retainers shall be installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.

a. All hoses exceeding ½-in (1.3 cm) inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.

b. Compressed air pressure and volume shall be regulated according to manufacturer's rating for the tool.

13.D.02 Pressure shall be shut off and exhausted from the line before disconnecting the line from any tool or connection.

13.D.03 A safety lashing shall be provided at connections between tool and hose and at all quick makeup type connections.

13.D.04 Hoses shall not be used for hoisting or lowering tools.

13.D.05 Airless spray guns of the type which atomize paints and fluids at high pressures [1,000 lb (453.5 kg) or more, per square inch] shall be equipped with automatic or visible manual safety devices which will prevent pulling of the trigger to prevent release of the paint or fluid until the safety device is manually released. In lieu of the above, a diffuser nut that will prevent high-pressure velocity release while the nozzle tip is removed plus a nozzle tip guard that will prevent the tip from coming into contact with the operator, or other equivalent protection may be provided.

13.D.06 Impact wrenches shall be provided with a locking device for retaining the socket.

13.E Explosive-Actuated Tools.

13.E.01 Explosive-actuated (powder-actuated) tools shall meet the design requirements of ANSI A10.3.

13.E.02 Only qualified operators shall operate explosive-actuated tools. A qualified operator is one who has:

a. Been trained by an authorized instructor (one who has been trained, authorized, and provided an authorized instructor's card by the tool manufacturer or by an authorized representative of the tool manufacturer);

b. Passed a written examination provided by the manufacturer of the tool; and

c. Possesses a qualified operator's card supplied by the manufacturer and issued and signed by both the instructor and the operator.

13.E.03 Each tool shall be provided with the following:

a. A lockable container with the words "POWDER- ACTUATED TOOL" in plain sight on the outside and a notice reading "WARNING - POWDER-ACTUATED TOOL TO BE USED ONLY BY A QUALIFIED OPERATOR AND KEPT UNDER LOCK AND KEY WHEN NOT IN USE" on the inside;

b. Operator’s instruction and service manual;

c. Power load and fastener charts;

d. Tool inspection record; and

e. Service tools and accessories.

13.E.04 Inspection and testing.

a. Daily inspection, cleaning, and testing shall be performed as recommended by the manufacturer.

b. Explosive-actuated tools shall be tested, in accordance with the manufacturer's recommended procedure, each day before loading to see that safety devices are in proper working condition.

c. Explosive-actuated tools shall be inspected, thoroughly cleaned, and tested after each 1,000 fastenings.

13.E.05 Explosive-actuated tools and the charges shall be secured at all times to prevent unauthorized possession or use.

13.E.06 Explosive-actuated tools shall not be loaded until just before the intended firing time. Neither loaded nor empty tools are to be pointed at any employees. Hands shall be kept clear of the open barrel end.

13.E.07 The use of explosive-actuated tools is prohibited in explosive or flammable atmospheres.

13.E.08 Fasteners shall not be driven:

a. Into soft or easily penetrable materials unless they are backed by a material that will prevent the fastener from passing through to the other side;

b. Into very hard or brittle material, such as cast iron, hardened steel, glazed or hollow tile, glass block, brick, or rock;

c. Into concrete unless the material thickness is at least three times the penetration of the fastener shank; or

d. Into spalled concrete.

13.E.09 The tool operator shall wear appropriate PPE, to include eye protection, hard hats, safety shoes and hearing protection as required. > See Section 5.

13.E.10 If the powder-actuated tool misfires, the employee shall wait at least 30 seconds, then try firing again. If the tool will not fire after a second attempt, the employee shall wait at least another 30 seconds before removing the faulty cartridge. The faulty cartridge shall be placed in water until disposal. Disposal shall follow manufacturer’s instructions.

13.F Chainsaws.

13.F.01 Chainsaws shall have an automatic chain brake or kickback device.

13.F.02 The idle speed shall be adjusted so that the chain does not move when the engine is idling.

13.F.03 See Section 5 for proper PPE.

13.F.04 Chainsaws will not be fueled while running, while hot, or near an open flame. Saws will not be started within 10 ft (3 m) of a fuel container.

13.F.05 The operator will hold the saw with both hands during all cutting operations.

13.F.06 A chainsaw must never be used to cut above the operators' shoulder height.

13.F.07 See Section 31 for tree maintenance and removal requirements.

13.G Abrasive Blasting Equipment.

13.G.01 Hose and hose connections shall be designed to prevent build up of static electricity.

13.G.02 Connections and nozzles shall be designed to prevent accidental disengagement. All connections shall be equipped with safety lashings. > See Sections 20.A.16 and 20.A.17.

13.G.03 Nozzle attachments shall be of metal and fit on the outside of the hose. A deadman-type control device shall be provided at the nozzle to cut off the flow if the operator loses control of hose. A support shall be provided on which the nozzle may be mounted when it is not in use.

13.G.04 Additional requirements on abrasive blasting are in Sections 5 and 6.

13.H Power-Driven Nailers and Staplers.

13.H.01 This section applies to hand-held electric, combustion or pneumatically-driven nailers, staplers, and other similar equipment (referred to as “nailers” in this section) which operate by ejecting a fastener into the material to be fastened when a trigger, lever, or other manual device is actuated. This does not apply to common spring-loaded “staple guns”.

13.H.02 Nailers shall have a safety device on the muzzle to prevent the tool from ejecting fasteners unless the muzzle is in contact with the work surface. The contact trip device or trigger shall not be secured in an “on” position.

13.H.03 Nailers shall be operated in a way to minimize the danger to others and the operator from ricochets, air-firing, and firing through materials being fastened.

a. Except when used for attaching sheet goods (sheathing, sub-flooring, plywood, etc.) or roofing products, nailers shall be operated with a sequential trigger system that requires the surface contact trip device to be depressed before the firing trigger can be activated and that limits ejection to one nail per trigger pull before resetting.

b. When used for sheet goods and roofing materials, nailers may be operated in the contact trip mode (bump or bounce-nailing) only as allowed by the manufacturer. This mode may only be used when the operator has secure footing, such as on a work platform, floor or deck, and shall not be used when the operator is on a ladder, beam, or similar situations where the operator’s balance and/ or reach may be unstable.

13.H.04 Workers that use nailers shall wear appropriate PPE, to include eye protection, hard hats, safety shoes and hearing protection as required. > See Section 5.

13.H.05 When clearing a nail jam or performing maintenance on the nailer, the air hose shall be disconnected. > Use proper Hazardous Energy Control procedures per Section 12.

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SECTION 14

Material Handling, Storage and Disposal

14.A Material Handling.

14.A.01 Employees shall be trained in and shall use safe lifting techniques. > See Section 6.K.

14.A.02 Requirements for PPE are covered in Section 5.

14.A.03 Material handling devices shall be available and used for the material handling needs of an activity.

14.A.04 Whenever heavy or bulky material is to be moved, the material handling needs shall be evaluated in terms of weight, size, distance, and path of movement. The following hierarchy shall be followed in selecting a means for material handling:

a. Elimination of material handling needs via engineering solutions;

b. Movement by mechanical device (e.g., lift truck, overhead crane, or conveyor);

c. Movement by manual means with handling aid (e.g., dollie or cart); or

d. Movement using safe lifting techniques. > See NIOSH, “Work Practices Guide for Manual Lifting”.

14.A.05 Materials will not be moved over or suspended above personnel unless positive precautions have been taken to protect the personnel from falling objects.

14.A.06 Where the movement of materials may be hazardous to persons, taglines or other devices shall be used to control the loads being handled by hoisting equipment. These devices shall be nonconductive when used near energized lines.

14.A.07 Banding or strapping shall not be used as rigging to hoist loads of bundled materials.

14.B Material Hoists.

14.B.01 Material hoists shall be designed to raise and lower materials during construction, alteration, or demolition. It is not applicable to the temporary use of permanently installed elevators used as material hoists. They shall be constructed and installed in accordance with the requirements of ANSI A10.5.

14.B.02 Material hoist towers, masts, guy or braces, counterweights, drive machinery supports, sheave supports, platforms, supporting structures, and accessories shall be designed by a licensed engineer.

14.B.03 Hoist towers shall be erected and dismantled only under the direct supervision of a qualified individual.

14.B.04 A copy of the hoist operating manual shall be available for each hoist on site.

14.B.05 Material hoists and hoist tower systems shall be inspected in accordance with the manufacturer's recommendations.

a. Prior to initial use and each time after the tower is extended, all parts of the tower or mast, cage, bucket, boom, platform, hoisting machine, guy, and other equipment shall be inspected by a Qualified Person (QP) to ensure compliance with the manufacturer's inspection guidelines and ANSI A10.5.

b. Prior to initial use on a USACE project, and monthly thereafter, a periodic inspection shall be conducted by a QP. Periodic inspections shall cover those items specified by the manufacturer.

c. A GDA shall be notified at least 24 hours prior to any of the above inspections and may wish to accompany the contractor's inspector.

d. Pre-operational inspections (start-up procedures) shall be conducted by the operator prior to every operation (shift) of the hoist.

14.B.06 Before a hoist is placed in service and every 4 months thereafter, a car arresting device test shall be performed.

a. For rope-supported cars, the test shall be conducted in the following manner:

(1) Pull a loop in the lifting rope and attach the test rope to each side of the loop above the bucket or platform;

(2) Raise the platform or bucket to allow the load to be supported by the test rope; and

(3) Cut the test rope to allow the load to fall and activate the car-arresting device.

b. For car suspension other than rope supported, the test shall be conducted by creating an over speed condition of the car.

c. Structural components shall be inspected for damage after the test and before the hoist is placed in operation again.

14.B.07 Maintenance and repairs.

a. Replacement parts for load bearing or critical components shall be either obtained from or certified by the equipment manufacturer.

b. Maintenance and repairs shall be conducted in accordance with the manufacturer's procedures.

14.B.08 Landings and runways.

a. Landing platforms and runways that connect the hoist way or tower to a structure shall be designed and constructed to sustain the maximum intended load without failure.

b. Floors or platforms that may become slippery shall have slip-resistant surfaces.

c. When workers may be exposed to falling objects, overhead protection, composed of 2 in (5 cm) planking or equivalent, shall be provided.

d. A barricade shall be provided at the open ends of each landing. The barricade shall extend a minimum distance of 6 ft (1.8 m) laterally along the outer edge of the landing from each side of the hoist way, shall extend from the floor a distance of at least 3 ft (0.9 m), and shall be of #19 US gauge wire or the equivalent, with openings not exceeding ½-in (1.2 cm).

e. All hoist way entrances shall be protected by substantial gates or bars that shall guard the full width of the landing entrance. Gates shall be not less than 66 in (167.6 cm) in height, with a maximum under clearance of 2 in (5 cm), and shall be located not more than 4 in (10 cm) from the hoist way line. Gates of grille, lattice, or other open work shall have openings of not more than 2 in (5 cm).

f. Material shall not be stored on landing platforms or runways.

14.B.09 Whenever a slack line condition occurs, the proper seating of the rope in the sheaves and on the drum shall be checked prior to further operations.

14.B.10 Riding on material hoists or other hoisting equipment not meant for personnel handling is prohibited.

14.B.11 While hoisting equipment is in operation, the operator shall not perform any other work and shall not leave his/her position at the controls until the load has been safely landed or returned to ground level.

14.B.12 Not more than one cage or bucket shall be operated at the same time by any one hoisting machine or operator.

14.B.13 Operating rules shall be established and posted at the operator's station of the hoist. Such rules shall include signal system and allowable line speed for various loads. Rules and notices shall be posted on the car frame or crosshead in a conspicuous location, including the statement "NO RIDERS ALLOWED."

14.B.14 Air-powered hoists shall be connected to an air supply of sufficient capacity and pressure to safely operate the hoist. Pneumatic hoses shall be secured by some positive means to prevent accidental disconnection.

14.C Material Storage.

14.C.01 All material in bags, containers, bundles, or stored in tiers shall be stacked, blocked, interlocked, and limited in height so that it is stable and secured against sliding or collapse.

a. Material shall be stacked as low as practical and in no case higher than 20 ft (6 m) unless otherwise specified in this Section.

b. Storage of flammable and combustible materials is covered in Section 9.

c. Storage of hazardous and toxic agents is covered in Section 6.

d. Storage of compressed gas cylinders is covered in Section 20.D.03.

14.C.02 Materials that could become damaged or affected by exposure to the elements shall be adequately covered or stored indoors.

14.C.03 Materials shall not be stored in areas that would interfere with other normal operations.

14.C.04 Materials shall not be stored directly under power lines unless safe clearance/distance from all materials to the power line is achieved. Documentation shall be in an AHA.

14.C.05 Material storage shall be in compliance with manufacturer's recommendations.

14.C.06 Materials stored inside buildings under construction shall not be placed within 6 ft (1.8 m) of any hoistway or floor opening, or within 10 ft (3 m) of an exterior wall that does not extend above the materials stored.

14.C.07 Accessways shall be kept clear.

14.C.08 Unauthorized persons shall be prohibited from entering storage areas. All persons shall be in a safe position while materials are being loaded or unloaded from railroad cars, trucks or barges.

14.C.09 Material shall not be stored on scaffolds, work platforms, or runways in excess of the standards in Section 22.

14.C.10 Materials stored in bins or hoppers that could create an engulfment hazard shall be evaluated and comply with the confined space requirements in Section 33.

14.C.11 Noncompatible materials shall be segregated in storage.

14.C.12 Storage of lumber.

a. Storage of lumber during construction shall be in sections containing a maximum of 1 million board feet with at least a 10 ft (3 m) clearance from buildings.

b. Lumber shall be supported on stable sills and shall be stacked level, stable, and self-supporting.

c. Reusable lumber shall have all nails withdrawn before it is stacked for storage.

d. Lumber piles shall not exceed 20 ft (6 m) in height; lumber to be handled manually shall not be stacked more than 16 ft (4.8 m) high.

14.C.13 Storage of bagged materials.

a. Bagged materials shall be stacked by stepping back the layers and cross-keying the bags at least every 10 bags high.

b. Bags of cement and lime shall not be stacked more than 10 high without setback, except when restrained by walls of appropriate strength.

c. The bags around the outside of the stack shall be placed with the mouths of the bags facing the center of the stack.

d. During unstacking, the top of the stack shall be kept nearly level and the necessary setback maintained.

14.C.14 Storage of brick.

a. Brick shall be stacked on an even, solid surface.

b. Bricks stacks shall not be more than 7 ft (2.1 m) high. When stacked loose brick reaches a height of 4 ft (1.2 m), it shall be tapered back 2 in (5 cm) in every 1 ft (0.3 m) of height above the 4 ft (1.2 m) level.

c. Unitized brick (brick securely gathered into large standard packages and fastened with straps) shall not be stacked more than three units high.

14.C.15 Storage of floor, wall, and partition block.

a. Blocks shall be stacked in tiers on solid, level surfaces.

b. When masonry blocks are stacked higher than 6 ft (1.8 m), the stack shall be tapered back one-half block per tier above the 6 ft level.

14.C.16 Storage of reinforcing and structural steel.

a. Reinforcing steel shall be stored in orderly piles away from walkways and roadways.

b. Structural steel shall be securely piled to prevent members sliding off or the pile toppling over.

14.C.17 Storage of cylindrical material.

a. Structural steel, poles, pipe, bar stock, and other cylindrical materials, unless racked, shall be stacked and blocked so as to prevent spreading or tilting.

b. Pipe, unless racked, shall not be stacked higher than 5 ft (1.5 m).

c. Either a pyramid or battened stack shall be used.

d. Where a battened stack is used, the outside pile or pole shall be securely chocked. Battened stacks shall be tapered back at least one pile or pole in each tier.

e. Unloading of round material shall be done so that no person is required to be on the unloading side of the carrier after the tie wires have been cut or during the unlocking of the stakes.

14.D Housekeeping.

14.D.01 Work areas and means of access shall be maintained safe and orderly.

a. Sufficient personnel and equipment shall be provided to ensure compliance with all housekeeping requirements.

b. Work areas shall be inspected daily for adequate housekeeping and findings shall be recorded on daily inspection reports.

c. Work will not be allowed in those areas that do not comply with the requirements of this Section.

14.D.02 All stairways, passageways, gangways, and accessways shall be kept free of materials, supplies, and obstructions at all times.

14.D.03 Loose or light material shall not be stored or left on roofs or floors that are not closed in, unless it is safely secured.

14.D.04 Tools, materials, extension cords, hoses, or debris shall not cause tripping or other hazards.

14.D.05 Tools, materials, and equipment subject to displacement or falling shall be adequately secured.

14.D.06 Empty bags having contained lime, cement, and other dust-producing material shall be removed periodically as specified by the GDA.

14.D.07 Form and scrap lumber and debris shall be cleared from work areas and accessways in and around building storage yards and other structures.

14.D.08 Protruding nails in scrap boards, planks, and timbers shall be removed, hammered in, or bent over flush with the wood at the time it is disassembled.

14.D.09 Storage and construction sites shall be kept free from the accumulation of combustible materials.

a. Weeds and grass shall be kept down.

b. A regular procedure shall be established for the cleanup of the areas as specified by the GDA.

c. Rubbish, brush, long grass, or other combustible material shall be kept from areas where flammable and combustible liquids are stored, handled, or processed.

14.D.10 Accumulation of liquids, particularly flammable and combustible liquids, on floors, walls, etc., is prohibited. All spills of flammable and combustible liquids shall be cleaned up immediately.

14.E Debris Nets.

14.E.01 When used with personnel safety nets, debris nets shall be secured on top of the personnel safety net but shall not compromise the design, construction or performance of the personnel nets.

14.E.02 A competent person (CP) shall determine and document the size, weight and height of fall of potential falling debris. The debris netting shall have a mesh of the size and strength sufficient to contain the expected debris without penetration when properly supported.

14.E.03 Materials, scraps, equipment, tools and debris that have fallen into the net shall be removed as soon as possible from the net and at least before the next work shift.

14.E.04 Nets and debris shall be protected from sparks and hot slag resulting from welding and cutting operations.

14.E.05 Inspection of debris nets.

a. Debris nets shall be inspected by a CP in accordance with the manufacturer's recommendations.

b. Inspections shall be conducted after installation, at least weekly thereafter, and following any alteration, repair or any occurrence that could affect the integrity of the net system. Inspections shall be documented and maintained on site.

c. Defective nets shall not be used; defective components shall be removed from service.

d. When welding or cutting operations occur above the nets, frequency of inspections shall be increased in proportion to the potential for damage to the nets.

14.F Material Disposal.

14.F.01 Waste material and rubbish shall be placed in containers or, if appropriate, in piles.

a. All containers holding waste material, piles, or stacked material shall be labeled as a waste.

b. Waste material shall be piled or stacked so to prevent engulfment or material avalanche and away from any traffic areas or walkways.

14.F.02 Waste materials and rubbish shall not be thrown down from a height of more than 6 ft (1.8 m), unless the following are complied with:

a. The materials or rubbish are dropped through an enclosed chute constructed of wood or equivalent material. Chutes for debris shall be enclosed, except for openings equipped with closures at or about floor level for the insertion of materials. The openings shall not exceed 4 ft (1.2 m) in height measured along the wall of the chute. Openings shall be kept closed when not in use.

b. When debris cannot be handled by chutes, the area into which the material is dropped shall be enclosed with barricades not less than 42 in (1.1) in height. Barricades shall be positioned to keep personnel from all debris landing areas. Signs warning of the hazard of falling material shall be posted at all debris landing areas and at each level exposed to falling debris.

14.F.03 Burning requirements are found in Section 9.

14.F.04 Separate covered, self-closing, nonflammable/non-reactive containers shall be provided for the collection of garbage, oily, flammable, and dangerous wastes.

a. The containers shall be labeled with a description of the contents.

b. The contents shall be properly disposed of daily.

14.F.05 Hazardous material waste (i.e., vehicle and equipment oils and lubricants, containers and drums for solvents, adhesives, etc.) shall be collected, stored, and disposed of in accordance with Section 06.B.03, Federal, State, and local requirements.

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SECTION 15

Rigging

15.A General.

15.A.01 Inspection and use.

a. Rigging equipment shall be inspected as specified by the manufacturer, by a Competent Person (CP), before use on each shift as necessary during its use to ensure that it is safe. The CP must have training and experience equivalent to, or be under the supervision of a Qualified Rigger (QR) as defined in Appendix Q.

b. Defective rigging shall be removed from service.

c. The use, inspection and maintenance of rigging equipment shall be in accordance with the rigging equipment manufacturer. Rigging equipment shall not be loaded in excess of its working load limit (WLL).

d. Rigging equipment, when not in use, shall be removed from the immediate work area and properly stored and maintained in a safe condition.

15.A.02 Hoist rope shall not be wrapped around the load.

15.A.03 All eye splices shall be made in an approved manner per ASME B30.9.

15.A.04 When hoisting loads, a positive latching device shall be used to secure the load and rigging (e.g., self-closing or self-locking hooks, an alloy anchor type shackle with a bolt, nut and retaining pin, screw-pin shackle, etc). > See Section 15.E.07.

15.A.05 Custom fabricated grabs, hooks, clamps, or other lifting accessories (e.g., equalizing beams, lifting or spreader beams, etc.) for such units as modular panels, prefabricated structures, and similar materials shall be designed by an Registered Professional Engineer (RPE), marked to indicate the WLL and shall be proof-tested before initial use, to 125% of their WLL.

15.A.06 Structural and mechanical lifting devices shall be designed, tested and used in accordance with ASME B30.20, Below the Hook Lifting Devices.

15.B Personnel Qualifications.

15.B.01 Any worker engaged in the duties and performance of rigging shall be a Qualified Rigger (QR). Employers must determine and designate in writing the QRs and the specific rigging tasks for which they are qualified and provide to the GDA for acceptance.

➢ Note: The term "rigger" or "Qualified Rigger (QR)" in this manual refers to the function performed, and in no way relates to the worker's job classification or position.

a. Each QR may have different credentials or experience. A QR is a person that:

(1) Has extensive knowledge, training and experience sufficient to calculate loads, load weights, safe capacities and apply other safe rigging principles and procedures;

(2) Demonstrates the ability to utilize rigging materials and principles, and;

(3) Is capable of safely inspecting and performing rigging operations.

b. In addition, a QR must:

(1) Be at least 18 years of age;

(2) Be able to communicate effectively with the crane operator, the lift supervisor, signal person and affected personnel on site;

(3) Have basic knowledge and understanding of equipment-operating characteristics, capabilities, and limitations and one whose competence in this skill has been demonstrated through training and experience satisfactory to management personnel.

15.B.02 A QR shall also be able to demonstrate knowledge and proficiency to appropriate management personnel in the following:

a. Personnel roles and responsibilities;

b. Site preparation (terrain, environment);

c. Rigging equipment and materials;

d. Safe Hoisting Equipment operating procedures;

e. Principles of safe rigging;

f. Environmental hazards (includes overhead interferences);

g. Rigging and handling the load;

h. Identification of hoisting-related hazards;

i. The associated hazards when employee is required to be in the fall zone to handle a load.

15.C Multiple Lift Rigging (MLR) ("Christmas Tree Rigging"). USACE allows multiple lift rigging practices for the purpose of erecting/placing structural steel ONLY.

15.C.01 Strict compliance with this section and 29 CFR 1926.753 Subpart R shall be mandated.

15.C.02 A lift using a MLR Assembly is considered a critical lift**.** It requires a carefully detailed, written critical lift plan per Section 16.H. In addition, all details and requirements of this section are required to be addressed:

a. Identifying all multi-lift hazards on the job site;

b. Beam list;

c. Determining load capacity;

d. Determining weight of a member;

e. Proper crane hand signals;

f. Safety rules for MLR;

g. Seven-foot rule;

h. Safe route/path of load and crane;

i. Power line issues;

j. Crane requirements;

k. Marking centerlines;

l. Use of tag line;

m. Qualifications and/or certifications of the operator(s) and rigger(s) to be performing these operations;

n. Rigging equipment: wire rope slings, hooks & shackles;

o. Clean lay-down area;

p. Cribbing;

q. Storage/staging;

r. Wind/environmental limits; and

s. Personal protective equipment.

15.C.03 A lift using a MLR Assembly may only be performed if the following criteria are met:

a. A MLR assembly is used;

b. A maximum of five members are hoisted per lift;

c. Only beams and similar structural members are lifted;

d. All employees engaged in MLR shall be trained in the following:

(1) The nature of the hazards associated with multiple lifts;

(2) The proper procedures and equipment to perform multiple lifts required in this section and as per 29 CFR 1926.753(e).

e. All loads shall be rigged by a QR per Section 15.B;

f. No crane is permitted to be used for multiple lift where such use is contrary to the manufacturer's specifications and limitations;

g. Components of the MLR assembly shall be specifically designed and assembled with a maximum capacity for total assembly and for each individual attachment point. This capacity, certified by the manufacturer or a QR, shall be based on the manufacturer's specifications with a 5:1 safety factor for all components.

h. The total load shall not exceed:

(1) The working load limit (WLL) of the hoisting equipment specified in the hoisting equipment load charts;

(2) The rigging capacity specified in the rigging rating chart.

i. The MLR assembly shall be rigged with members:

(1) Attached at their center of gravity and maintained reasonably level;

(2) Rigged from the top down; and

(3) Rigged at least 7 ft (2.1 m) apart.

j. The members on the MLR assembly shall be set from the bottom up.

k. Controlled load-lowering shall be used whenever the load is over the connectors.

15.D Slings.

15.D.01 General. This section applies to slings used in conjunction with load handling equipment (LHE) for hoisting and horizontally moving loads. All slings shall be manufactured, used, inspected and maintained according to ASME B30.9.

a. Inspections.

(1) Slings, all fastenings and attachments shall be visually inspected by a CP each day or shift when in use.

(2) Annual inspections shall be performed by a CP and must be documented. Documentation must be available on site and available to the GDA upon request.

(3) Additional inspections shall be performed during sling use, where service conditions warrant. Damaged or defective slings shall be immediately removed from service.

b. Rigging practices.

(1) All slings shall be hitched in a manner providing control of the load;

(2) Softeners. Sharp edges in contact with slings shall be padded with material of sufficient strength to protect the sling;

(3) Slings shall be shortened or adjusted only by methods approved by the sling manufacturer or a qualified person;

(4) The use of slings will be such that the entire load is positively secured;

(5) In a basket hitch, the load shall be balanced to prevent slippage;

(6) When using a basket hitch, legs of the sling shall contain or support the load from the sides, above the center of gravity, so that the load remains under control;

(7) In a choker hitch, the choke point shall only be on the sling body, never on a splice or fitting;

(8) In a choker hitch, an angle of choke less than 120 degrees shall not be used without reducing the rated load;

(9) Slings shall not be constricted, bunched, or pinched by the load, hook or any fitting;

(10) The load applied to the hook shall be centered in the base (bowl) of the hook to prevent point loading on the hook, unless the hook is designed for point loading;

(11) An object in the eye of a sling is not wider than one-third the length of the eye;

(12) The load shall not be landed on the sling;

(13) A sling shall not be pulled from under the load when load is resting on the sling;

(14) Slings shall not be dragged over abrasive surfaces;

(15) Shock loading is not allowed;

(16) Slings shall not be twisted or kinked.

c. All slings shall be manufactured under ASME B30.9 guidelines and must have an affixed durable permanent identification tag that includes the following as a minimum:

(1) Name or trademark of the manufacturer (country identification only is not acceptable);

(2) Type of material used (synthetic web slings, synthetic round slings or synthetic rope slings only);

(3) WLL for a given type of hitch and configuration;

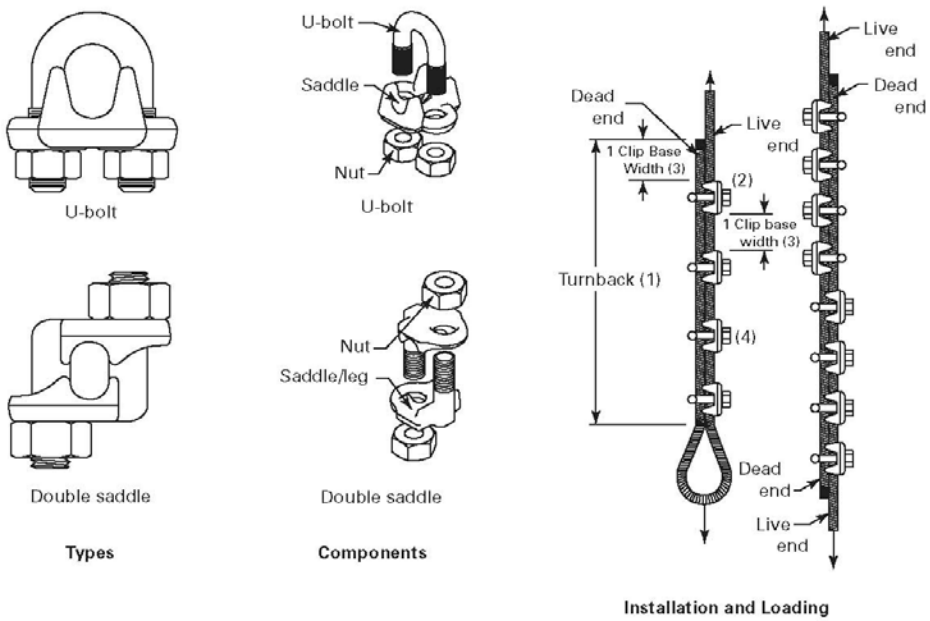
(4) Number of legs if more than one.

d. Natural fiber rope shall not be used to fabricate slings.

e. Fabricated eye slings or endless loop slings using alloy steel wire rope clips or clamps for hoisting material or lifting are prohibited except where the application precludes the use of prefabricated slings. All slings fabricated using alloy steel wire rope clips or clamps shall be designed by a RPE for the specific application. > See Figures 15-1 and 15-2.

FIGURE 15-1

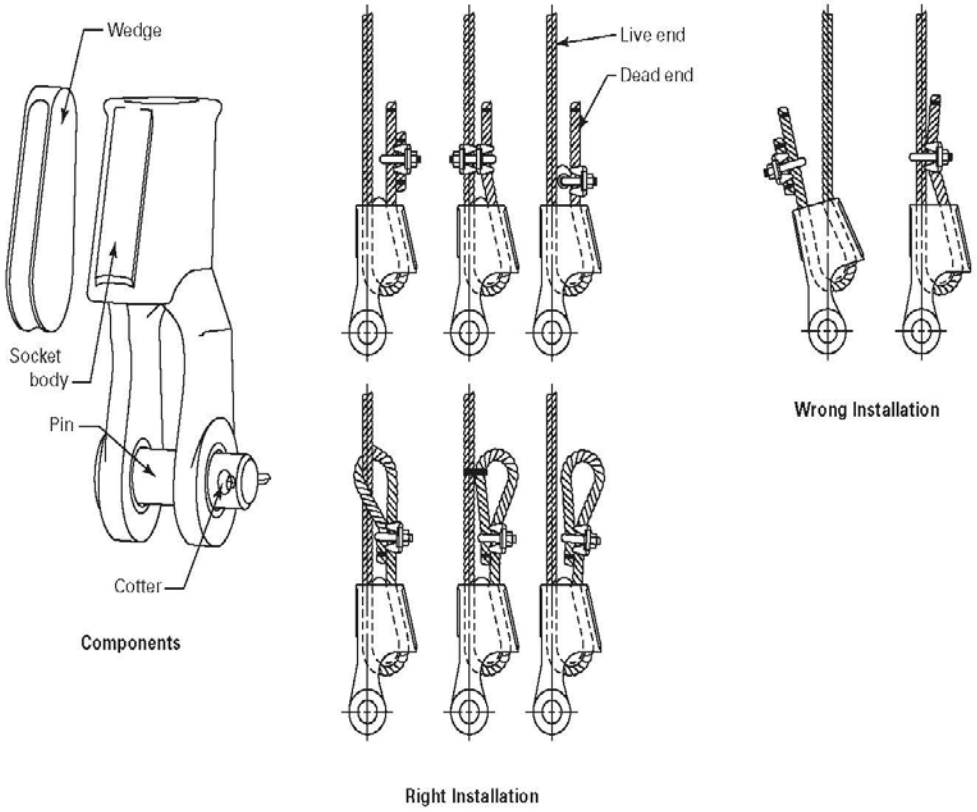
Wire Rope Clip Spacing



GENERAL NOTE: Correct number of clips for wire rope size shall be used.
NOTES:
(1) correct turnback length should be used
(2) correct orientation of saddle on live end shall be observed
(3) correct spacing of clips should be used
(4) correct torque on nuts shall be applied

FIGURE 15-2

Wire Rope Clip Orientation



15.D.02 Alloy Steel Chain Slings.

a. Only alloy chain Grade 80 or higher shall be used in rigging.

b. Chain shall be visually inspected each day or shift when in use. Inspect chains on an individual link basis. Chains shall be cleaned before they are inspected, as dirt and grease can hide nicks and cracks.

c. Chains shall be removed from service if the following conditions exist:

(1) missing or illegible sling identification;

(2) cracks or breaks;

(3) excessive wear, nicks, or gouges. Minimum thickness of chain links shall not be below the values listed in Table 15-1;

(4) stretched chain links or components;

(5) bent, twisted, or deformed chain links or components;

(6) evidence of heat damage or weld splatter;

(7) excessive pitting or corrosion;

(8) lack of ability of chain or components to hinge (articulate) freely;

(9) other conditions including visible damage that cause doubt as to the continued use of the chain.

d. When used with multiple leg slings, alloy steel chains, hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links, or other attachments shall have a WLL at least equal to that of the assembly chain.

e. Multiple leg slings shall have the number of legs and lengths identified on the tag. > See Section 15.D.01.c.

15.D.03 Wire Rope Slings. Wire rope slings shall be inspected by a CP for the following:

a. Broken wires;

b. Severe localized abrasion or scraping;

c. Kinking, crushing, bird caging or any other damage to the rope structure;

d. Evidence of heat damage;

e. Crushed, deformed, or worn end attachments;

f. Severe corrosion of the rope, and attachments or fittings;

g. Missing or illegible sling identification;

h. Other conditions that cause doubt as to safe use of sling.

TABLE 15-1

Minimum Thickness of Chain Links

Nominal Chain or Coupling Link Size	Minimum Allowable Thickness at Any Point on Link
7/32 in (5.5 mm)	0.19 in (4.80 mm)
9/32 in (7 mm)	0.24 in (6.07 mm)
5/16 in (8 mm)	0.27 in (6.93 mm)
3/8 in (10 mm)	0.34 in (8.69 mm)
1/2 in (13 mm)	0.44 in (11.26 mm)
5/8 in (16 mm)	0.55 in (13.87 mm)
3/4 in (20 mm)	0.69 in (17.45 mm)
7/8 in (22 mm)	0.75 in (19.05 mm)
1 in (26 mm)	0.89 in (22.53 mm)
1-1/4 in (32 mm)	1.09 in (27.71 mm)

15.D.04 Metal Mesh Slings. Metal mesh slings shall be inspected by a CP for the following:

a. Broken weld or brazed joint along the sling edge;

b. Broken wire in any part of the mesh;

c. Reduction in wire diameter of 25% due to abrasion or 15% due to corrosion;

d. Lack of flexibility due to distortion of the mesh;

e. Distortion of the choker fitting so that the depth of the slot is increased by more than 10%;

f. Distortion of either end fitting so the width of the eye opening is decreased by more than 10%;

g. A 15% reduction of the original cross-sectional area of metal at any point around the hook opening of end fitting;

h. Excessive pitting or corrosion of fittings; broken or cracked fittings; distortion of either end fitting out of its plane;

i. A sling in which the spirals are locked or without free articulation;

j. Other visible damage that causes doubt as to the strength of the sling.

15.D.05 Synthetic Fiber Rope Slings.

a. Synthetic rope slings shall be inspected by a CP for the following:

(1) Broken or cut fibers, either internally or externally;

(2) Cuts, gouges, abrasions; seriously or abnormally worn fibers;

(3) Powdered fiber or particles of broken fiber inside the rope between the strands;

(4) Variations in size or roundness of strands;

(5) Discoloration or rotting; weakened or brittle fibers;

(6) Excessive pitting or corrosion, or cracked, distorted, or broken fittings;

(7) Kinks;

(8) Melting or charring of the rope;

(9) Other visible damage that causes doubt as to the strength of the rope.

b. Synthetic rope slings shall not be used while frozen. When using synthetic rope slings in chemically active or excessively hot environments, consult with the sling manufacturer or Qualified Person (QP).

c. Synthetic rope slings shall be protected from abrasion by padding where it is fastened or drawn over square corners or sharp or rough surfaces.

d. Do not allow synthetic rope slings to be used in contact with objects or at temperature in excess of 194°F (90°C) or below -40°F (40°C).

➢ Note: Some synthetic yarns do not retain their breaking strength during long term exposure above 140°F (60°C).

e. Eye Splices. All splices shall be made per the rope manufacturer or a QP and in accordance with ASME B30.9.

f. Knots shall not be used in lieu of eye splices.

15.D.06 Synthetic Web Slings.

a. Synthetic Web Slings shall be inspected for the following:

(1) Acid or caustic burns;

(2) Melting or charring of any part of the sling;

(3) Snags, holes, tears, or cuts;

(4) Broken or worn stitches;

(5) Excessive abrasive wear;

(6) Knots in any part of the sling;

(7) Wear or elongation exceeding the amount recommended by the manufacturer;

(8) Excessive pitting or corrosion, or cracked, distorted, or broken fittings;

(9) Other visible damage that causes doubt as to the strength of the sling.

b. Synthetic web slings shall not be allowed to be used in contact with objects or at temperature in excess of 194°F (90°C) or below -40°F (40°C).

➢ Note: Some synthetic yarns do not retain their breaking strength during long term exposure above 140°F (60°C).

15.D.07 Synthetic Round Slings.

a. New slings (before initial use) shall be marked by the manufacturer to show the following, in addition to items required in Section 15.D.01.c:

(1) The core material;

(2) The cover material if different from the core material.

b. Synthetic Round Slings shall be inspected for the following and where any such damage or deterioration is present, remove the sling or attachment from service immediately:

(1) Missing or illegible sling identification;

(2) Acid or Caustic burns;

(3) Evidence of heat damage;

(4) Holes, tears, cuts, abrasive wear, or snags, that expose the core yarn;

(5) Broken or damaged core yarns;

(6) Welding spatter that exposes the core yarns;

(7) Knots in the round sling body, except for core yarn knots inside the cover;

(8) Discoloration and brittle or stiff areas on any part of the sling;

(9) Pitted, corroded, cracked, bent, twisted, gouged, or broken fittings;

(10) Other conditions that cause doubt as to the continued use of the sling.

c. Synthetic round slings shall not be allowed to be used in contact with objects or at temperature in excess of 194ºF (90ºC) or below -40ºF (40ºC).

➢ Note: Some synthetic yarns do not retain their breaking strength during long term exposure above 140ºF (60ºC).

15.E Rigging Hardware (Excludes Reeving Hardware). (Includes all detachable rigging hardware used for load-handling activities). > See also “Rigging Hardware” in Appendix Q. All rigging hardware shall be constructed, installed, used, inspected and maintained in accordance with ASME B30.26.

15.E.01 All rigging hardware shall be inspected for defects prior to use on each shift and periodically as necessary during use to ensure that it is safe.

➢ Note: Periodic inspections shall be documented and shall not exceed 1 year. The frequency shall be based on frequency of shackle use, severity of service conditions and nature of load-handling activities. Guidelines: for normal service is yearly; for severe service is monthly to quarterly; and for special service is as recommended by a qualified person. Defective rigging equipment shall be removed from service. Inspections shall be in accordance with the manufacturer's recommendations and at a minimum shall address:

a. Wear greater than 10%;

b. Deformations (straightness, nominal opening tolerances);

c. That manufacturer appropriate connectors are used (i.e., never replace a shackle pin with a bolt).

15.E.02 Rigging hardware shall not be painted once purchased. While the painting of rigging gear for identification is common, USACE considers this an unacceptable practice that constitutes a dangerous condition. Painting of hardware can potentially cover defects creating an unsafe condition.

15.E.03 Drums, sheaves, and pulleys shall be smooth and free of surface defects that may damage rigging. In addition, drums, sheaves, or pulleys having eccentric bores, cracked hubs, spokes, or flanges shall be removed from service.

15.E.04 Connections, fittings, fastenings, and attachments used with rigging shall be of good quality, of proper size and strength, and shall be installed in accordance with recommendations of the manufacturer.

15.E.05 Job hooks, shop hooks and links, makeshift fasteners formed from bolts and rods, and other similar attachments shall not be used.

15.E.06 Shackles. All shackles shall be manufactured according to ASME B30.26.

a. Only shackles marked by manufacturer with name or trademark of manufacturer (country only is not acceptable), WLL and size shall be used. Shackles shall be maintained by the user so as to be legible throughout the life of the shackle.

b. Each new shackle pin shall be marked by manufacturer to show name or trademark of manufacturer and grade, material type or load rating.

c. Shackles shall be inspected visually by the user (or other designated person) prior to each use and periodically.

d. Repairs and/or modifications may only be as specified by the manufacturer. Replacement parts, like pins, shall meet or exceed the original manufacturer's specifications.

e. Shackles shall not be eccentrically (side) loaded or shock loaded.

f. Multiple sling legs shall not be applied to the shackle pin.

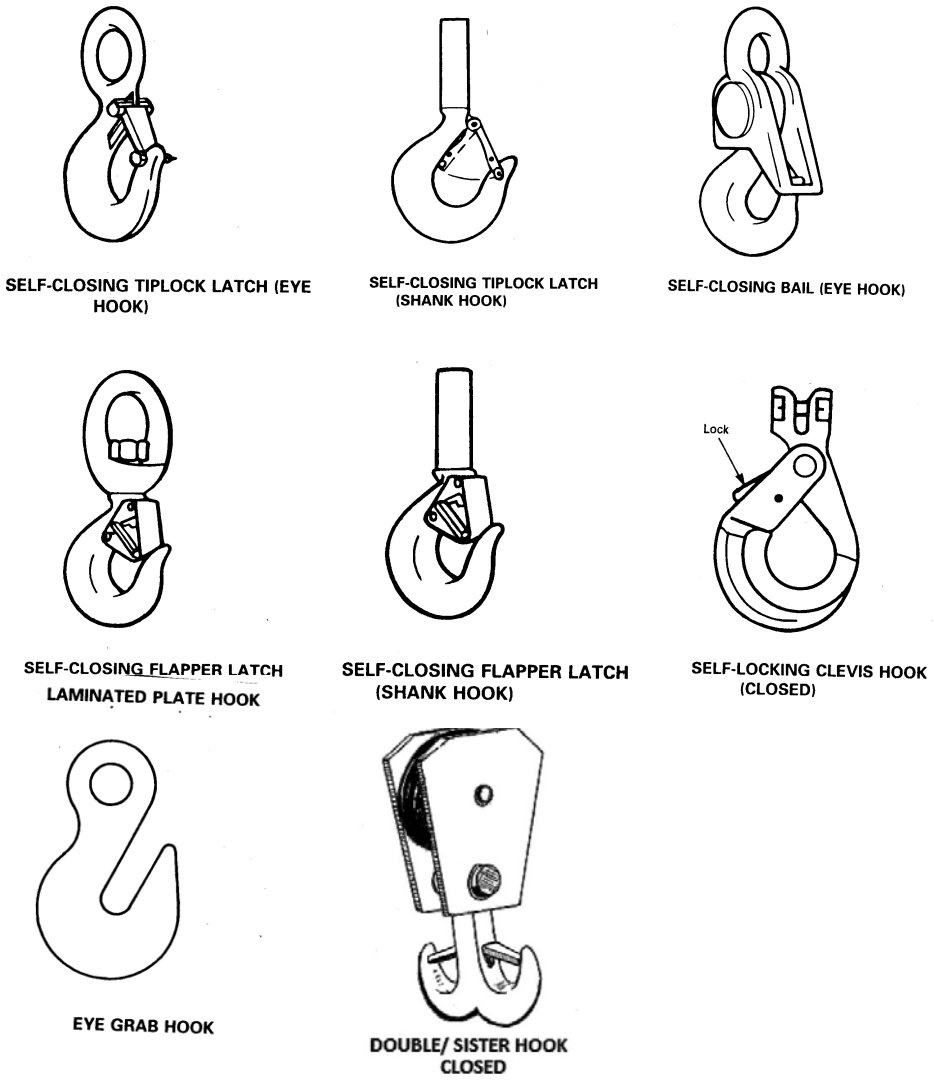
15.E.07 Hooks. All hooks used for lifting or load handling purposes shall be manufactured according to ASME B30.10. > See Figure 15-3.

a. All hooks used for lifting or load handling purposes shall not be used in any other manner.

b. Hooks that show wear exceeding 10% or an increase in the throat opening of 5% (maximum of ¼ in (6mm)), or as recommended by the manufacturer, or any visibly apparent bend or twist from the plane of the hook shall be removed from service.

FIGURE 15-3

Hooks



c. The manufacturer's recommendations shall be followed in determining the WLL of the various sizes and types of specific and identifiable hooks. Any hook for which the manufacturer's recommendations are not available shall be tested to twice the intended safe working load before it is put into use. The employer shall maintain a record of the dates and results of such tests.

d. Open hooks are prohibited in rigging used to hoist loads except for miscellaneous-type hooks (i.e., grab hooks, foundry hooks, sorting hooks, choker hooks, etc). These hooks may be used as long as they are inspected and maintained in accordance with manufacturer's recommendations. The use of these specialty-type hooks shall be identified in the applicable AHA and submitted to the GDA for acceptance. > See Figure 15-4.

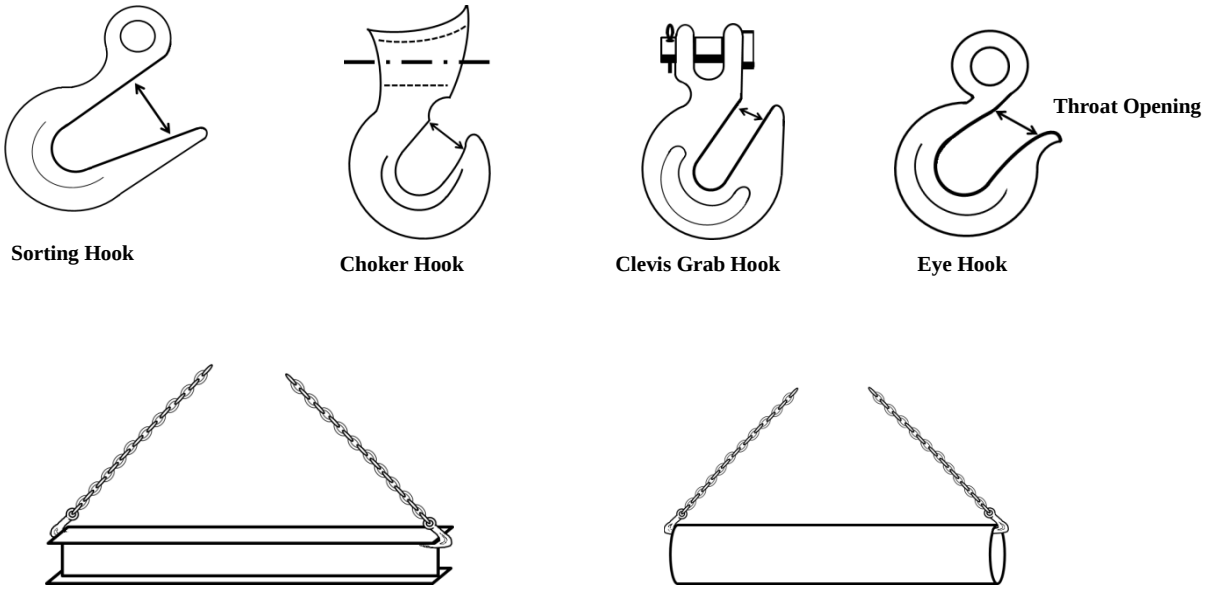
e. Manufacturer's identification (country only is not acceptable) and WLL shall be forged, cast, or die stamped on a low stress and non-wearing area of the hook.

f. Duplex (sister) hooks shall be loaded equally on both sides unless the hook is specifically designed for single-point loading.

g. If the duplex (sister) hook is loaded at the pinhole instead of at the two saddles, the load applied shall not exceed the WLL that would normally be shared by the two saddles or the WLL of the supporting equipment.

Figure 15-4

Miscellaneous-Type Open Hooks



15.E.08 Eyebolts, Eye Nuts, Swivel Hoist Rings and Turnbuckles. All eyebolts, eye nuts, swivel hoist rings and turnbuckles shall be manufactured according to ASME B30.26.

a. WLLs shall be in accordance with the manufacturer's recommendation.

b. Each turnbuckle, eye nut and eyebolt shall be marked with name or trademark of the manufacturer (country is not acceptable), size or WLL and grade (for alloy eyebolts). In addition, each swivel hoist ring must also be marked to show torque value (excluding trench cover hoist rings). Markings shall remain legible.

c. This equipment shall be inspected visually before each use by the user (or other designated person) and at least annually to determine condition is safe for use.

d. Turnbuckles shall not be side loaded and shall be rigged and secured to prevent unscrewing during the lift. In addition, end-fittings threads shall be fully engaged in the body threads.

e. Shoulderless eyebolts shall not be loaded at an angle.

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SECTION 16

Load Handling Equipment (LHE)

16.A General.

16.A.01 The requirements of this Section are applicable to all load handling equipment (LHE) to include cranes, derricks, hoists and power-operated equipment that can be used to raise, lower and/or horizontally move a suspended load.

➢ Exemptions. All requirements of Section 16 apply except as noted below:

a. Affixed A-frames performing anchor handling or dredge-related operations (ONLY) with a vessel or barge are exempt from Sections 16.B and 16.C; In addition, see Section 16.L.08 for equipment-specific requirements;

b. Base-mounted drum hoists used to hoist personnel, guided and non-guided, whether powered by internal combustion engine, electric motor or other prime mover, to include air tuggers) are exempt from Sections 16.B; In addition, see Section 16.U for equipment-specific requirements;

c. Digger derricks used for utility/pole installation;

d. Vehicle-mounted aerial devices (i.e., Bucket Trucks) - See Section 22.M Vehicle-Mounted Elevating and Rotating Work Platforms (Aerial Devices/Lifts) and also Section 22.L, Elevating Aerial Work Platforms (AWPs);

e. Hydraulic Excavators, Wheeled/Trackhoe/Backhoe loaders used to hoist loads with rigging are exempt from the requirements in Sections 16.B.02 through 16.B.05 (crane operator certifications) only. Rigger qualifications still apply, per Section 15.B. See Section 16.S for equipment-specific requirements;

f. Powered Industrial Trucks (PIT's, i.e., Forklifts)/Telehandlers when configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended (rigged) load are exempt from the requirements in 16.B.02 through 16.B.05 (crane operator certifications) only, UNLESS this equipment is used to hoist/lift personnel. This activity is considered a Critical Lift and as such, requires a physical examination for the operator (per 16.B.05 and additional criteria per Section 16.Q. Rigger qualifications still apply, per Section 15.B. > See Section 16.Q for equipment-specific requirements;

g. Machinery that hoists by using a come-a-long or chainfall (whether human-, air- or electric- powered, chain or wire-rope type);

h. Operators of equipment with a maximum manufacturer-rated hoisting/lifting capacity of 2,000 pounds (907 kg) or less, are exempt from the operator qualification or certification requirements in Sections 16.B.02 through 16.B.05 only. In addition, this equipment may not be used to hoist personnel;

i. Hoist Operators are exempt from Section 16.B.05, Physical Examination requirements UNLESS this equipment is used to hoist/lift personnel. This activity is considered a Critical Lift and requires a physical examination for the operator. In addition, all Class II operators that will be hoisting personnel shall be trained at a minimum, in the requirements listed in Section 16.T. > See also Section 16.C.07.b, Note 3 and Section 16.U;

j. Dedicated drilling rigs;

k. Tree trimming and removal work;

l. Gin poles when used for the erection of communication towers;

m. Helicopter cranes are exempt from Sections 16.B and 16.C;

n. Stacker cranes;

o. Mechanic's Trucks with a hoisting device when used in activities related to maintenance and repair;

p. Material Delivery.

(1) Articulating/knuckle-boom truck cranes that deliver material to a construction site when used to transfer materials from the truck crane to the ground, without arranging the materials in a particular sequence for hoisting.

(2) Articulating/knuckle-boom truck cranes that deliver material to a construction site when the crane is used to transfer building supply sheet goods or building supply packaged materials from the truck crane onto a structure, using a fork/cradle at the end of the boom, but only when the truck crane is equipped with a properly functioning automatic overload prevention device. Such sheet goods or packaged materials include, but are not limited to: sheets of sheet rock, sheets of plywood, bags of cement, sheets or packages of roofing shingles, and rolls of roofing felt.

(3) This exclusion does not apply when:

(a) The articulating/knuckle-boom crane is used to hold, support or stabilize the material to facilitate a construction activity, such as holding material in place while it is attached to the structure;

(b) The material being handled by the articulating/knuckle-boom crane is a prefabricated component. Such prefabricated components include, but are not limited to: precast concrete members or panels, roof trusses (wooden, cold-formed metal, steel, or other material), prefabricated building sections such as, but not limited to: floor panels, wall panels, roof panels, roof structures, or similar items;

(c) The material being handled by the crane is a structural steel member (for example, steel joists, beams, columns, steel decking (bundled or unbundled) or a component of a systems-engineered metal building.

16.A.02 Certification of Compliance (COC). Contractors shall submit a COC for each piece of LHE prior to being brought on site. The COC shall be submitted to the GDA for acceptance. > See Form 16-1, Certificate Of Compliance.

a. The COC states that the LHE and the rigging equipment meets applicable regulations (to include inspections and tests) as required by the manufacturers and the requirements of this manual. It must be signed by a Competent Person for Crane and Rigging. > See Appendix Q.

b. COC shall be posted on the LHE.

16.A.03 Standard Lift Plan (SLP). All lifts must be planned to avoid situations where the operator cannot maintain safe control of the lift.

a. A written SLP shall be prepared for every lift or series of lifts (if duty cycle or routine lifts are being performed). The SLP shall be developed, reviewed and accepted by all personnel involved in the lift. The SLP shall be maintained on the LHE for the current lift(s) being made. Historical SLPs shall be maintained for a minimum of 3 months.

b. At a minimum, the following shall be addressed or use the non-mandatory Form 16-2, Standard Pre-Lift Plan/Checklist:

(1) Personnel: roles, responsibilities, qualification, public persons or other trade personnel access or affected by lift;

(2) Area Preparation: load handling location and path of travel, blocking/cribbing, overhead lines, ground stability;

(3) LHE Considerations: capacity, configuration, obstructions, inspection, ground support conditions;

(4) Load parameters: weight, center of gravity, radii, and configuration;

(5) Rigging: type, inspection, need for softeners;

(6) Environmental Considerations: wind, storms, precipitation, power lines in area of travel or load swing, counterweight swing area barricaded.

16.A.04 The employer shall comply with all manufacturer's instructions, procedures and recommendations applicable to the operational functions of LHE, including LHE use with attachments. The safe operating speeds or loads shall not be exceeded. When they are not available, the employer shall develop and ensure compliance with all procedures necessary for the safe operation of the equipment and attachments according to:

a. Procedures for the operational controls that must be developed by a Qualified Person (QP).

b. Procedures related to the capacity of the equipment that must be developed and signed by a Registered Professional Engineer (RPE) familiar with the equipment.

16.A.05 When the manufacturer's instructions or recommendations are more stringent than the requirements of this manual, the manufacturer's instructions or recommendations shall apply.

16.A.06. The use of all electronic equipment not necessary to the work activity being performed is prohibited.

16.A.07 LHE shall be shut down before and during fueling operations. Closed systems, with an automatic shut-off that will prevent spillage if connections are broken, may be used to fuel diesel powered equipment left running.

16.A.08 Inspections or determinations of road and shoulder conditions and structures shall be made in advance to assure that clearances and load capacities are safe for the passage or placing of any LHE.

16.A.09 Equipment requirements, as applicable to the type equipment.

a. An operable fuel gage;

b. An operable audible warning device (horn);

c. Adequate rearview mirror or mirrors;

d. Non-slip surfaces on steps;

e. A power-operated starting device;

f. Seats must be provided for the operator and all personnel that are required to be in/on equipment;

g. Whenever visibility conditions warrant additional light, all vehicles, or combinations of vehicles, in use shall be equipped with at least two headlights and two taillights in operable condition;

h. Glass in windshields, windows, and doors shall be safety glass. Cracked or broken glass shall be replaced;

i. One (minimum) dry chemical or CO_2 fire extinguisher with a minimum rating of 10B:C installed in the cab or at the machinery housing;

j. All self-propelled LHE, whether moving alone or in combination, shall be equipped with a back-up alarm. > See Section 18.B.01.

k. Warning lights, attached to the applicable equipment shall be used as collision avoidance measures for airfield operations. Lighting shall be in accordance with guidance provided by the Federal Aviation Administration (FAA). > For Airfield Operations, see Section 32.

16.A.10 Rollover protective structures (ROPS) as required by the manufacturer must be in place and maintained.

16.A.11 The manufacturer's specifications and operating manuals for hydraulic equipment and attachments utilizing quick connect/disconnect systems shall be followed. After completing a switch of attachments, the equipment operator shall take the actions necessary to ensure the quick connect/disconnect system is positively engaged.

16.A.12 All required guarding and safety devices shall be provided, used and maintained:

a. All belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating, or moving parts of equipment shall be guarded when exposed to contact by persons or when they otherwise create a hazard.

b. All hot surfaces of equipment, including exhaust pipes or other lines, shall be guarded or insulated to prevent injury and fire.

c. Platforms, foot walks, steps, handholds, guardrails, and toe boards shall be designed, constructed, and installed on machinery and equipment to provide safe footing and access ways.

16.A.13 Work Area Control. When there are accessible areas in which the LHE's rotating superstructure (permanently or temporarily mounted) poses a risk of striking or pinching/crushing an employee against another part of the equipment or another object, employees shall be prevented from entering these areas.

16.A.14 Running lines located within 6 ft - 6 in (1.9 m) of the ground or working level shall be guarded or the area restricted by physical barriers to preclude injury.

16.A.15 Maintenance/Repair of LHE.

a. Maintenance, including preventive maintenance and repairs, shall be performed in accordance with the manufacturer's recommendations. Records of maintenance and repairs conducted during the life of a contract shall be made available upon request of the GDA (contractor operators) or the supervisor/leader of the activity/task (government operators).

b. Replacement parts or repairs shall have at least the original design factor; replacement parts for load bearing and other critical parts shall be obtained from the original manufacturer, (if possible) or certified by a RPE knowledgeable in LHE.

c. All LHE shall be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done.

(1) Equipment designed to be serviced while running are exempt from this requirement.

(2) Control of hazardous energy (lockout/tagout) must be considered during the maintenance and repair of equipment. A Hazardous Energy Control Program and specific isolation procedures shall be identified in the AHA and implemented to ensure the unexpected re-energization of the equipment does not occur. > See Section 12.

16.A.16 Parking.

a. Whenever LHE is parked, the parking brake shall be set.

b. LHE parked on an incline shall have the wheels chocked or track mechanisms blocked and the parking brake set.

c. All LHE left unattended at night, adjacent to a highway in normal use or adjacent to construction areas where work is in progress, shall have lights or reflectors, or barricades equipped with lights or reflectors, to identify the location of the equipment.

16.B Personnel Qualifications.

16.B.01 LHE shall be operated only by trained, certified, qualified and designated personnel. Proof of qualification shall be provided by the employer and designation shall be in writing. In addition to fully qualified LHE operators, the following personnel may be designated (in writing) to operate LHE under limited conditions;

a. Trainees under the direct supervision of the designated operator of the crane or hoist;

b. LHE maintenance, inspection and repair personnel are permitted to operate the equipment only where all of the following requirements are met.

(1) The operation is limited to those functions necessary to perform maintenance, inspect the equipment, or verify its performance.

(2) Lifting of loads by these personnel is NOT allowed and they must either operate the equipment:

(a) Under the direct supervision of a qualified operator (see Section 16.B.02), OR

(b) Must read/review the operator's manual so that they are familiar with the operations, limitation, characteristics and hazards associated with the LHE being inspected, maintained, or repaired.

c. LHE maintenance, inspection and repair personnel covered by this Section are exempt from the crane operator physical requirements identified in Section 16.B.05.

16.B.02 Crane Operator Requirements – General.

a. Prior to the start of a specific activity or task, documentation of operator certifications, qualifications and designations shall be included in the AHA and provided to the GDA (contractor operators) or the supervisor/leader of the activity/task (government operators).

(1) Certification for all crane/hoist operators shall be achieved by successful completion of written and operational testing.

(2) Qualification of all crane/hoist operators shall be made by the employer after a review of the certification documents and an assurance that the operator(s) is familiar with the equipment to be operated (has adequate knowledge of USACE and OSHA crane safety requirements and manufacturer recommendations provided in the crane operator's manual).

(3) The employer then designates the operator(s) in writing for the equipment to be operated.

b. Crane Operators shall be able to communicate effectively with the lift supervisor, rigger(s), signal person(s) and other affected employees on site.

c. Crane operators shall demonstrate their ability to read, write and comprehend in the language of the crane manufacturer's operation and maintenance instruction materials, exhibit acceptable arithmetic skills and load/capacity chart usage and use written manufacturer procedures applicable to the type and configuration of equipment for which qualification is being sought.

16.B.03 Crane Operator Certification, Qualification and Designation. The employer must ensure that, prior to operating any equipment covered under Section 16, the operator of the equipment is covered by Section 16.B.01, or is certified, qualified and designated in writing to operate the equipment in accordance with one of the following options:

a. Option 1. Current certification by a Nationally Accredited Crane Operator Testing Organization.

(1) The operator's certificate must identify the type of equipment on which the operator was certified. Once the operator has obtained the certification, the employer must insure that the operator is qualified to operate a particular piece of equipment for that type and capacity and must designate this in writing.

➢ Note: If no accredited testing agency offers certification examinations for a particular type of equipment, an operator will be deemed certified to operate that equipment if he/she has been certified for the type/capacity that is most similar to that equipment and for which a certification examination is available. Employer qualification and designation on the equipment is still required.

(2) For a testing organization to be considered accredited to certify operators, it must:

(a) Be accredited by a nationally recognized accrediting agency based on that agency's determination that industry recognized criteria for written and practical testing materials, conditions and administration are being met;

(b) Administer written and practical tests that assess operator applicants regarding necessary knowledge and skills and that provided different levels of certification based on equipment capacity and type;

(c) Have procedures for operators to re-apply and be retested in event operator applicant fails a test or is decertified;

(d) Have testing procedures for recertification;

(e) Have accreditation reviewed by the nationally recognized accrediting agency at least every 3 years;

(f) Issue a certification under this option that is portable and is valid for 5 years from date of issuance.

b. Option 2. Qualification by an audited employer program. The employer's qualification of its employee must meet the following requirements:

➢ Note: This "audited" option was associated with a phase-in period. However, because Industry has not yet met these requirements, OSHA has extended the deadline until 14 Nov 2017, to meet this Option. In lieu of a "Certified auditor that is not an employee of the employer", the employer's qualification of its employees may be performed by a "Qualified Person (QP) that may be an employee of the employer". In addition, the following must be met:

(1) Successful completion of written and practical tests that are either developed by an accredited crane operator testing organization (see Option 1 above) or approved by an auditor (QP) in accordance with the following:

(a) The auditor (QP) is certified to evaluate such tests by an accredited crane operator testing organization (see Option 1 above);

(b) The auditor is not an employee of the employer (see Note above);

(c) The approval must be based on the auditor's determination that the tests meet nationally recognized test development criteria and are valid and reliable in assessing the operator applicants' knowledge and skill needed;

(d) The audit must be conducted in accordance with nationally recognized auditing standards.

(2) The employer program shall be audited within 3 months of the beginning of the program and every 3 years thereafter;

(3) The employer program shall have testing procedures for recertification;

(4) Any significant deficiencies identified by the auditor shall be corrected prior to further qualification of any operators;

(5) Records of audits shall be retained for 3 years and made available to the GDA upon request;

(6) A qualification issued under this option:

(a) Is not portable. Such a qualification meets the requirements of this Section only where the operator is employed by (and operating the equipment for) the employer that issued the qualification;

(b) Is valid for 5 years from date of issuance.

c. Option 3. Qualification by the U.S. Military. An operator who is an employee of the U.S. military is considered qualified if he/she has a current operator certification, qualification and designation issued by the U.S. Military for operation of the equipment. An employee of the U.S. Military is a federal employee of the Department of Defense or Armed Forces and does not include employees of private contractors. This option includes USACE crane, derrick and hoist operators) and is further detailed in Section 16.B.04.

d. Option 4. Licensing by a State or Local Government Entity. A government (state or local) licensing department/office that issues operator licenses for operating equipment covered by this Section is considered a government accredited crane operator testing organization provided the following criteria are met:

(1) The requirements for obtaining the license include assessment and determination via written and operational tests of the operator applicant's knowledge regarding safe operation of the specific type of equipment the individual will operate, including, at a minimum, the knowledge and skills listed in Section 16.B.02;

(2) The testing meets industry recognized criteria for written testing materials, practical examinations, test administration, grading, facilities/equipment and personnel;

(3) The government authority that oversees the examiners has determined that the requirements for Option 4 licensing have been met;

(4) The examiner has testing procedures for recertification designed to ensure that the operator continues to meet the technical knowledge and skills requirements;

(5) A license issued by a government accredited crane operator testing organization:

(a) Meets the operator qualification requirements of this Section for operation of equipment only within the jurisdiction of the government entity; and

(b) Is valid for the period of time stipulated by the licensing department/office but no longer than 5 years.

16.B.04 USACE Operator Certification , Qualification, and Designation.

a. The following options are available for the certification and qualification of USACE operators:

(1) Each crane operator may be trained, tested and certified by a nationally accredited testing organization, (see Section 16.B.03 Option 1); If this option is chosen, USACE is still responsible for ensuring that the operator is qualified to operate a particular piece of equipment (to include, type, capacity and configuration) and must designate this in writing; OR

(2) Each operator can be trained, tested and licensed by a professional source that certifies crane operators as long as the program is audited (see Section 16.B.03, Option 2). This requirement will remain until 14 Nov 2017 whereupon this option will be replaced by one that is required to be audited by a 3rd party certified auditor. If this option is chosen, USACE is still responsible for ensuring that the operator is qualified to operate a particular piece of equipment (to include, type, capacity and configuration) and must designate this in writing, OR

(3) Each operator can be trained, tested and licensed by a USACE designated in-house crane trainer in accordance with USACE National Crane Training Program. If this option is chosen, a qualified person is responsible for ensuring that the operator is qualified to operate a particular piece of equipment (to include, type, capacity and configuration) and must designate this in writing.

b. Certification and qualification under this option is:

(1) Not portable. Such a certification and qualification meets the requirements of this Section only where the operator is employed by (and operating the equipment for) USACE; AND

(2) Is valid for 2 years from date of issuance.

16.B.05 Operator Physical Qualifications/Examination. All crane operators shall be physically qualified to operate the equipment. Physical examinations for operators are required to be conducted every 2 years and any time a condition is observed that may impact safe operation. Written proof, signed by a physician [this term is intended to mean a Medical Doctor (M.D.) or Doctor of Osteopathy (D.O.)] stating that the operator has had a physical examination and meets the medical requirements set forth below shall be submitted to the GDA for acceptance prior to allowing an operator to operate the equipment.

➢ Note: Operators of Hoisting Equipment are exempt from this requirement UNLESS this equipment is used to hoist/lift personnel. > See also Sections 16.A.01.i and 16.U;

a. Operators shall have a current physician's (M.D. or D.O.) certification, dated within the past 2 years, that states the operator meets the following physical qualifications:

(1) Vision of at least 20/30 Snellen in one eye and 20/50 in the other, with or without corrective lenses;

(2) Normal depth perception and field of vision;

(3) Ability to distinguish colors, regardless of position;

(4) Adequate hearing, with or without hearing aid, for the specific operation;

(5) Sufficient strength, endurance, agility, coordination, manual dexterity, and speed of reaction to meet the demands of equipment operation;

(6) No evidence that the operator is subject to seizures or loss of physical control. If evidence of this nature is found, it may be sufficient cause for disqualification. In such cases, specialized medical tests may be required to evaluate these conditions and determine their impact;

(7) No evidence of physical, emotional or psychological limitations that could result in a hazard to the operator, or that in the opinion of the examiner could interfere with the operator's performance. If evidence of this nature is found, it may be sufficient cause for disqualification. Specialized medical tests may be required to determine these conditions.

b. Deviations from Physical Qualification Requirements.

(1) Deviations from the physical requirements are not necessarily totally disqualifying.

(2) However, where such deviations exist, competent medical and management authorities shall give special consideration to each individual case and may recommend waivers.

(3) Waivers may be approved by the local Safety and Occupational Health office (SOHO) and must be re-issued every 2 years, based on results of operator's medical clearance examination. A copy shall be provided to HQ, SOHO.

(4) Normally, waivers shall not be granted for applicants who have never before established operator qualifications. However, an evaluation on an individual basis shall be made per the above requirements. Any limitations identified shall be noted on the operator's license and license record.

c. Contractor drug testing program. All contractor crane operators shall participate in a drug testing program and have a negative result for a substance abuse test. The level of testing will be in accordance with standard practices for industry or by the agency's random drug testing program. This test will be confirmed by a recognized laboratory service.

d. Government drug testing program. All government (DOD) crane operators, as identified below, shall participate in a drug testing program and have a negative result for a substance abuse test, per AR 600-85, paragraph 5-8 (15). In addition, if an employee is in any other specified Test Designated Position (TDP) in this AR 600-85, he/she must be tested accordingly. The level of testing will be in accordance with by the agency's testing program. This test will be confirmed by a recognized laboratory service:

(1) Crane operators that operate OVERHEAD CRANES (only) with a lifting capacity of 20T or greater, AND

(2) Are in the following job series and are required to operate, inspect, maintain, repair or rig loads for overhead cranes:

(a) WG-5725, Crane Operator;

(b) WG-3359, Instrument Mechanic;

(c) WG-5350, Machinery Mechanic; OR

(d) WK-5401, Industrial Equipment Operator.

16.B.06 Signal Person Qualifications.

a. All signal persons must be qualified by either a third party Qualified Evaluator or the employer's Qualified Evaluator/LHE trainer.

b. Documentation must be provided by the Evaluator and must specify each type of signaling (e.g., hand signals, radio signals, etc.) for which the signal person meets the requirements of this Section.

c. If subsequent actions by the signal person indicate that the individual does not meet the qualification requirement of this Section the employer must not allow the individual to continue working as a signal person until retraining is provided and a re-assessment is made.

d. The qualification means that the Evaluator has assessed the individual's capabilities and has determined that the signal person has met the qualification requirements below:

(1) Know and understand the type of signals used (radio, cell, hand, etc). If hand signals are used, the signal person must know and understand the Standard Method for hand signals;

(2) Be competent in the application of the type of signals used;

(3) Have a basic understanding of crane operation and limitations, including crane dynamics involved in swinging and stopping loads and boom deflection from hoisting loads;

(4) Demonstrate that he/she meets the requirements above through a written and practical test.

e. An assessment by an employer's Qualified Evaluator/LHE trainer is not portable. Other employers are not permitted to use it to meet these requirements.

16.C Classification of USACE LHE and Training of USACE Operators.

➢ Note: Operator qualifications/licenses detailed below are only valid provided operator receives refresher training as required below.

16.C.01 Designated personnel must be qualified to operate a particular Class (i.e., mobile, tower, overhead, etc.) and type (lattice boom, hydraulic boom, etc.) of crane or hoist and the training provided shall be applicable to that Class and type of crane or hoist. The USACE classification of cranes and hoisting equipment and their associated training requirements are identified here. All exams shall meet the applicable parts of Option 3, based on type of equipment.

16.C.02. Class I crane/hoist types:

a. Fixed cab telescopic hydraulic mobile cranes;

b. Swing cab telescopic hydraulic mobile cranes;

c. Lattice boom, truck or crawler cranes;

d. Cab-operated overhead, bridge, gantry, under hung and monorail cranes;

e. Remote-operated (wireless) overhead, bridge, gantry, under hung and monorail cranes over 30T capacity:

➢ Exemption: Operators of CONTINUALLY GUIDED loads over 30T are considered Class II operators. As an example, gates that are raised and lowered in a slot and remain in a slot. However, if a gate clears the slot and is freely suspended, then a Class I operator is required).

f. Hammerhead cranes;

g. Portal cranes;

h. Tower cranes;

i. Derricks post or stiff leg type;

j. Floating or barge-mounted LHE, temporarily or permanently mounted, that requires a Naval Architect Analysis (NAA)/floating load chart per Section 16.L.

16.C.03 Class I operators are qualified to operate, perform preventive maintenance and inspection of this equipment as required;

16.C.04 Class I training must be:

a. Initial: A minimum of 24-hour training with successful completion (passed) written and practical/operational examinations;

b. Biennial (every 24 months) Refresher: A minimum of 8-hour refresher training, with successful completion (passed) of written and practical/operational examination.

➢ Note: Grace Period - refresher training is intended to be obtained every 24 months. Understanding that emergencies and other unplanned events can occur that may interrupt the normal scheduling of this training, a 60-day grace period is permitted IF necessary and is dependent upon supervisory approval.

16.C.05 Class II crane/hoist types:

a. All hard-wired, pendant-mounted operated overhead, bridge and gantry cranes;

b. Under hung;

c. Monorail;

d. Pedestal;

e. Wall-mounted jib cranes.

f. Any remote-operated (wireless) overhead, bridge, gantry, under hung and monorail cranes 30T capacity or less;

g. Base-Mounted Drum Hoists used to Hoist Personnel, Guided and Non-guided Worker's Hoists [Whether Powered by Internal Combustion Engine, Electric Motor or Other Prime Mover (Air Tuggers)].

16.C.06 Class II crane operators are qualified to operate, perform preventive maintenance and inspection of this equipment as required.

16.C.07 Class II training, must be:

a. Initial: A minimum of 2-hour training with successful completion (passed) of written and practical/operational examinations;

b. Biennial (every 24 months) Refresher: A minimum of 1-hour refresher training with successful completion (passed) of written and practical/operational examination.

➢ Note 1: Grace Period - Refresher training is intended to be obtained every 24 months. Understanding that emergencies and other unplanned events can occur that may interrupt the normal scheduling of this training; a 60-day grace period is permitted IF necessary and is dependent upon supervisory approval.

➢ Note 2: Exemption of equipment with a maximum manufacturer-rated hoisting/lifting capacity of 2,000 pounds or less (exempt from the requirements in Sections 16.B.02 through 16.B.06 only), See Section 16.A.01.h. It is anticipated that operator of this equipment will review manufacturer's instructions for proper operation however. This equipment shall not be used for hoisting personnel.

➢ Note 3: Operators of Class II cranes/hoisting equipment are exempt from Section 16.B.05, Physical Examination requirements, UNLESS this equipment is used to hoist/lift personnel. See also Sections 16.A.01.i, 16.B.05 and 16.U. This activity is considered a Critical Lift and requires a physical examination for the operator. In addition, all Class II operators that will be hoisting personnel shall be trained at a minimum, in the requirements listed in Section 16.T, 16.U or other applicable equipment-related Section.

16.C.08 Prior to re-issuance of qualification, crane and hoisting equipment operators must have attended applicable training (initial and refresher) and passed the written and operational examination requirements specified above.

16.C.09 Each USACE activity or operating project will maintain a current list of operators, complete crane and hoisting equipment training records for each operator, and a list of all equipment that each operator is qualified to operate.

16.D Inspection Criteria for Load Handling Equipment (LHE).

16.D.01 Inspections of LHE shall be in accordance with this Section, applicable ASME standards, OSHA regulations and the manufacturer's recommendations.

16.D.02 Records of all LHE tests and inspections shall be maintained onsite. Contractors shall make these records readily available upon request and, when submitted, they shall become part of the official project file.

16.D.03 Contractor shall provide the GDA 24-hours notice in advance of any LHE entering the site (prior to inspection/tests) so that observation of the Contractor's inspection process and spot checks may be conducted.

16.D.04 Whenever any LHE is found to be unsafe, or whenever a deficiency that affects the safe operation of the LHE is observed, the affected LHE shall be immediately taken out of service and its use prohibited until unsafe conditions have been corrected.

16.D.05 Cranes, hoists, derricks and other LHE in regular service.

a. Inspection procedures for LHE in regular service are divided into three general classifications based on the intervals at which inspections shall be performed.

b. The intervals depend on the nature of critical components of the LHE and the degree of their exposure to wear, deterioration, or malfunction.

c. The three general types are: Shift, Monthly and Annual.

➢ Note: Monthly inspections are required by OSHA. The items to be inspected and the requirements are the same as those covered by the Shift inspection, therefore monthly inspections will not be addressed separately in this Section but still must be performed.

16.D.06 Shift Inspections. Before every LHE operation (at beginning of each shift) or following a change of operator, a Competent Person (CP) shall, at a minimum, visually inspect the items in accordance with this Section, applicable ASME standards, OSHA regulations and the manufacturer's recommendations. Equipment shall not be used until this inspection demonstrates that no corrective action is required.

a. The shift inspection must be documented and shall include the results of the inspection, name and signature of the CP who conducted the inspection and the date of the inspection.

b. Documentation shall be maintained for a minimum of 12 months, or the life of the contract, whichever is longer.

16.D.07 Annual Inspections shall be performed at least annually, or more frequently if recommended by the manufacturer, or if a load bearing or load controlling part or component has been altered, replaced or repaired. > See Section 16.F.02.b (1).

➢ Note: Adding/removing counterweights is not considered load controlling/load bearing.

a. Annual inspection shall be done by a QP and will include operational testing to determine that the equipment as configured in the inspection is functioning properly.

b. The inspection must be documented and shall include items checked and results of inspection, name and signature of the person who conducted the inspection, and the date and this documentation must be retained until at least the next annual inspection occurs, 12 months, or the duration of the contract, whichever is longer.

c. If any deficiency is identified, an immediate determination shall be made by the QP as to whether the deficiency constitutes a safety hazard. If so, then the equipment shall be removed from service until it has been corrected. If not yet a safety hazard, the QP may determine that the employer shall monitor daily until the deficiency is corrected.

16.D.08 Inspection of cranes, derricks and other LHE not in regular use. Annual inspection shall be performed if the equipment has been idle for 3 months or more. > See Section 16.D.07.

16.D.09 If LHE is involved in an incident or accident, an inspection shall be conducted in accordance with the manufacturer's recommendations. If the manufacturer is no longer available, a RPE shall be consulted and shall determine the level of inspection required.

16.D.10 Running and Standing Wire Rope Inspection.

a. Each Shift. A CP shall perform this inspection each shift by visually inspecting all running ropes, counterweight ropes and load trolley (standing) ropes in accordance with this Section, applicable ASME standards, OSHA regulations and the manufacturer's recommendations. Visual inspection shall concentrate on identifying apparent deficiencies in wire rope (running and standing). Opening of wire rope is prohibited and booming down is not required as part of this inspection.

(1) The shift inspection must be documented and shall include the results of the inspection, name and signature of the CP who conducted the inspection and the date of the inspection.

(2) Documentation shall be maintained for a minimum of 12 months, or the life of the contract, whichever is longer.

b. Annual. At least every 12 months, wire ropes (running and standing) in use on equipment must be inspected by a QP in accordance with this Section, applicable ASME standard, OSHA regulations and the manufacturer's recommendations. Documentation is same as for Shift inspections above.

16.E Safety Devices and Operational Aids. Safety devices and operational aids shall not be used as a substitute for the exercise of professional judgment by the operator.

16.E.01 Safety Devices. The following safety devices are required on all cranes and derricks covered by Section 16 unless otherwise specified.

a. Crane level indicator.

(1) The equipment shall have a crane level indicator that is either built into the equipment or is available on the equipment.

(2) This requirement does not apply to portal overhead or gantry cranes, derricks, floating cranes/derricks and crane/derricks on barges, pontoons, vessels or other means of flotation.

b. Boom stops, except for derricks and hydraulic booms.

c. Jib stops (if jib is attached), except for derricks.

d. Equipment with foot pedal brakes shall have locks, except for portal and floating cranes.

e. Hydraulic outrigger jacks shall have an integral holding device (check valve).

f. Equipment on rails shall have rail clamps and rail stops, except for portal cranes.

g. Horn.

16.E.02 Proper Operation of Safety Devices.

a. Operations shall not begin unless the safety devices listed above are in proper working order.

b. If a safety device stops working properly during operations, the operator shall safely stop operations.

c. Operations shall not resume until the device is again working properly.

d. Alternative measures are not permitted to be used.

16.E.03 Operational Aids.

a. Operations shall not begin unless the listed operational aids are in proper working order except where the employer meets the specified temporary alternative measures. More protective alternative measures specified by the crane manufacturer, if any, shall be followed.

b. If a listed operational aid stops working properly during operations, the operator shall safely stop operations until the temporary alternative measures are implemented or the device is again working properly. If a replacement part is no longer available, the use of a substitute device that performs the same type of function is permitted and is not considered a modification.

c. Category I operational aids and alternative measures. Operational aids listed in this paragraph that are not working properly shall be repaired not later than 7 days after the deficiency occurs.

➢ Exception: If the employer documents that it has ordered the necessary parts within 7 days of the occurrence of the deficiency, the repair shall be completed within 7 days of receipt of the parts.

(1) Boom hoist limiting device. TEMPORARY alternative measures (use at least one):

(a) Use a boom angle indicator;

(b) Clearly mark the boom hoist cable, in a visible location to the operator, at a point that will give the operator sufficient time to stop the hoist to keep the boom within the minimum allowable radius. In addition, install mirrors or remote video cameras and displays if necessary for the operator to see the mark;

(c) Clearly mark the boom hoist cable, in a visible location to the spotter, at a point that will give the spotter sufficient time to signal the operator and have the operator stop the hoist to keep the boom within the minimum allowable radius.

(2) Luffing jib limiting device. Equipment with a luffing jib shall have a luffing jib limiting device.

(3) Anti two-blocking device (A2B). Anti-two blocking devices shall be installed at all points of two-blocking.

(a) All cranes and derricks shall be equipped with A2B/Hoist-limit device that will disengage the function that is causing the two-blocking or an A2B damage prevention feature (except as noted). They shall be tested and certified functional by a CP prior to operating the crane.

(b) Lattice boom cranes: Lattice boom cranes shall be equipped with an A2B device to stop the load hoisting and boom-down functions before the load block or load contacts the boom tip.

➢ Exception 1 – Duty Cycle: Lattice boom cranes that are used exclusively for duty cycle operations are exempt from A2B equipment requirements. When a lattice boom crane engaged in duty cycle work is required to make a non-duty cycle lift (for example, to lift a piece of equipment), it will be exempt from the A2B equipment requirements if the following procedures are implemented:

(i) An international orange colored warning device (flag, tape or ball) is properly secured to the hoist line at a distance of 8 ft to 10 ft (2.4 m to 3m) above the rigging;

(ii) The signal person acts as a spotter to alert the crane operator with a “STOP” signal when the warning device approaches the boom tip and the crane operator ceases hoisting functions when alerted of this;

(iii) While the non-duty cycle lift is underway the signal person shall not stand under the load, shall have no duties other than as a signal person, and shall comply with the signaling requirements of this manual.

➢ Exception 2 – Lattice boom cranes with manually operated friction brakes: Lattice boom crane and hoisting equipment with manually activated friction brakes, A2B warning devices may be used in lieu of A2B prevention devices.

(c) Telescopic boom cranes:

(i) Telescopic boom cranes shall be equipped with an A2B device to stop the load hoisting function before the load block or load contacts the boom tip and to prevent damage to the hoist rope or other machine components when extending the boom.

(ii) Telescopic boom cranes that are used exclusively for duty cycle operations shall be equipped with a two-blocking damage prevention feature or warning device to prevent damage to the hoist rope or other machine components when extending the boom.

(d) Floating cranes: Floating cranes may use an A2B alarm system in lieu of a disengaging device unless they are hoisting personnel.

(e) Other cranes used in duty cycle operations, to include clamshell (grapple), magnet, drop ball, container handling, concrete bucket, pile driving and extracting operations, drilled shaft operations (except telescopic boom cranes), dynamic compaction and continuous flight auger drilling are exempt from the requirements for A2B devices.

(f) Temporary alternative measure: clearly mark the cable (so that it can be easily seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking and use a spotter when extending the boom.

(4) Wind speed indicating device mounted on the crane, in a location where the maximum wind speed can be measured for the lifting activity. In lieu of the above and where wind speed and gusts can be effectively determined, a hand-held anemometer may be used.

d. Category II operational aids and alternative measures. Operational aids listed in this paragraph that are not working properly shall be repaired not later than 30 days after the deficiency occurs.

➢ Exception: If the employer documents that it has ordered the necessary parts within 7 days of the occurrence of the deficiency, and the parts are not received in time to complete the repair in 30 days, the repair shall be completed within 7 days of receipt of the parts.

(1) Boom angle or radius indicator. The equipment shall have a boom angle or radius indicator readable from the operator's station (does not apply to articulating cranes or digger derricks manufactured before November 8, 2011). Temporary alternative measures: radii or boom angle shall be determined by measuring the radii or boom angle with a measuring device. Calibration and testing of indicators will be performed in accordance with the manufacturer's recommendations.

(2) Jib angle indicator (if equipment has luffing jib; does not apply to articulating cranes). Temporary alternative measures: radii or jib angle shall be determined by ascertaining the main boom angle and then measuring the radii or jib angle with a measuring device.

(3) Boom length indicator (does not apply to articulating cranes) if the equipment has a telescopic boom, except where the load rating is independent of the boom length. Temporary alternative measures: one of the following methods shall be used:

(a) Mark the boom with measured marks to calculate boom length;

(b) Calculate boom length from boom angle and radius measurements; OR

(c) Measure the boom with a measuring device.

(4) Load weighing and similar devices. Equipment shall have at least one of the following: load weighing device, load moment indicator (LMI), rated capacity indicator or rated capacity limiter (does not apply to digger derricks manufactured prior to November 8, 2011). Temporary alternative measures: The weight of the load shall be determined from a reliable source (i.e., load manufacturer), by a reliable calculation method (i.e., calculating a steel beam from measured dimensions and a known per foot weight), or by other equally reliable means. This information shall be provided to the operator prior to the lift.

➢ Exception: <u>Overhead and/or mobile LHE</u> used in duty cycle operations are exempt from the requirements for load indicating devices and LMI devices.

(5) Hoist drum rotation indicator if the drum is not visible from the operator's station. Temporary alternative measures: mark the drum and if needed, install mirrors or remote video cameras and displays if necessary for the operator to see the mark.

(6) Outrigger position (horizontal beam extension) sensor/monitor if the equipment has outriggers (required on equipment manufactured after January 1, 2008). Temporary alternative measure: the operator shall verify that the position of the outriggers is correct (in accordance with manufacturer's procedures) before beginning operations requiring outrigger deployment.

16.E.04 <u>All loads shall be determined through one of the following methods.</u> <u>This information must be known or provided to the operator prior to the lift</u>.

a. Load weighing device;

b. Load moment (or rated capacity) indicator;

c. Load moment (or rated capacity) limiter, OR

d. The weight of the load must be determined either from a source recognized by the industry (such as the load manufacturer) or by a calculation method recognized by industry [i.e., calculating a steel beam from measured dimensions and a known per foot weight as determined by a qualified rigger (QR)].

➢ Exception: Permanently installed overhead, gantry or other cranes that are used to pick gates (spillway, intake, discharge, etc) from slots have been designed with a reserve capacity and are factory proof tested at 125% of working load limit (WLL). Load cells are highly recommended to determine rigging capacities and overload conditions, but are not required.

16.F Testing.

16.F.01 Written reports of tests, showing test procedures and confirming the adequacy of repairs or alterations, shall be maintained with the crane and hoisting equipment or at the on-site project office.

16.F.02 Operational Testing.

a. A QP shall conduct operational tests in accordance with ANSI/ASME and the manufacturer's recommendations. If the manufacturer has no procedures, the requirements in this Section, as a minimum, must be performed.

b. Operational testing shall be performed:

(1) Before initial use of a crane or hoisting equipment after a load bearing or load controlling part or component, brake, travel component, or clutch (to include securing devices, skids and barges for floating cranes) has been altered, replaced, or repaired.

➢ Note: Adding/removing counterweights is not considered load controlling/load bearing.

(2) Every time a crane or hoisting equipment(s) is reconfigured or re-assembled after disassembly (to include booms);

(3) Every time a crane and/or hoisting equipment is brought onto a USACE project; and

(4) Every year during annual inspection.

➢ Note: Complete operational testing of the equipment after the replacement of wire rope is not required. However, a limited operational test shall be made prior to putting the equipment back into service.

c. Operational Testing, as a minimum, shall include the following:

(1) Load lifting and lowering mechanisms;

(2) Boom lifting and lowering mechanisms;

(3) Boom extension and retraction mechanisms;

(4) Swinging mechanisms;

(5) Travel mechanisms;

(6) Safety devices;

(7) Operational aids.

16.F.03 Load Testing. Load testing is considered a Critical Lift. > See Section 16.H.

a. Load tests shall be performed under the direction of a QP in accordance with appropriate ASME standards and the manufacturer's recommendations. At a minimum, the load test procedures shall include the following:

(1) Hoist the test load to ensure that the load is supported by the crane and held by the hoist brake(s) for a minimum of 5 minutes;

(2) Swing the crane. Insure there are no physical restrictions, the full range of its swing, with the test load;

(3) Boom the crane up and down within the allowable working radius for the test load. At the maximum radius, hold the load for a minimum of 5 minutes and insure there is no movement of the load;

(4) Lower the test load and hold the load with the brake(s).

➢ Note: If the manufacturer is no longer in business and procedures are unavailable, a QP familiar with the type of equipment involved shall develop and approve procedures, which as a minimum, shall include those listed above.

b. Load Testing shall be performed at 100 to 110% of the ANTICIPATED LOAD for the specified configuration, not to exceed 100% of the manufacturer's load chart at the configuration of the test. The actual anticipated load itself may be used as the test load if approved by the GDA.

c. Load testing shall be performed:

(1) Before initial use of crane or hoisting equipment in which a load bearing or load controlling part or component, brake, travel component, or clutch has been altered, replaced, or repaired, and

➢ Note: Adding/removing counterweights is not considered load controlling/load bearing.

(2) Every time a crane or hoisting equipment(s) is reconfigured or re-assembled after disassembly (to include booms);

➢ Note: Attaching/detaching a jib, which is an attachment, is not considered "reconfiguring or re-assembling" a crane and so does not require a load test. Installing or stowing the jib must be per manufacturer's recommendations and a competent person shall document this action prior to operation.

(3) When the manufacturer requires load testing.

(a) The employer shall specifically research, identify and document manufacturer required load-testing frequency for each USACE-owned/operated and/or Contractor-owned/operated crane or hoisting equipment and maintain and/or provide this information to the GDA;

(b) Under conditions (1) and (2) above, a selective load test may be performed (testing only those components that have or may have been affected by the alteration, replacement, or repaired);

(c) The replacement of the rope is specifically excluded from this requirement. However, a limited operational test including actions in Sections 16.F.02.c above, under a normal operating load shall be made prior to putting the equipment back into service.

d. The manufacturer's specifications and limitations applicable to the operation of any crane and hoisting equipment shall be followed. At no time shall a crane or hoisting equipment be loaded in excess of the manufacturer's rating, except overhead and gantry cranes in accordance with ANSI/ASME B30.2 or B30.16. Loads shall not exceed 125% of the rated load for test purposes or planned engineered lifts for overhead and gantry cranes. > See Section 16.H, Critical Lifts.

(1) Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a registered engineer competent in this field, and such determinations will be documented and recorded.

(2) Attachments used with crane and hoisting equipment shall not exceed the capacity, rating, or scope recommended by the manufacturer.

e. Written reports that show test procedures and confirm the adequacy of repairs or alterations shall be maintained and provided upon request.

16.G Operation.

16.G.01 All LHE shall have the following documents with them (in the cab, if applicable) at all times they are to be operated:

a. A copy of the operating manual developed by the manufacturer for the specific make and model of equipment.

(1) When not available from a manufacturer, a QP shall establish the ratings and operating limitations (load charts), recommended operating speeds, special hazard warnings, instructions and operators manual, maintenance, testing, and inspection requirements that apply during the use.

(2) Where load capacities are available only in electronic form: in the event of a failure which makes the load capacities inaccessible, the operator must immediately cease operations or follow safe shut-down procedures until the load capacities (in electronic or other form) are available. A printed copy of the load capacities shall be maintained and available.

b. A copy of the load-rating chart (separate or included in the operating manual), shall include:

(1) The LHE make and model, serial number, and year of manufacturer;

(2) Load ratings for all operating configurations, including optional equipment;

(3) Recommended reeving for the hoist line, and

(4) Operating limits in windy or cold weather conditions.

c. A durable load chart with legible letters and figures shall be readily available to the operator at the control station;

d. The crane log book shall be used to record operating hours and all crane inspections, tests, maintenance, and repair. The log shall be updated daily as the crane is used and shall be signed by the operator and supervisor. Service mechanics shall sign the log after conducting maintenance or repairs on the crane;

e. All inspections, test, maintenance and repairs for LHE shall be maintained in the log, the O&M records or equivalent for that piece of equipment.

16.G.02 No modifications or additions that affect the capacity or safe operation of LHE shall be made without the manufacturer's written approval.

a. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.

b. In no case shall the original safety factor of the equipment be reduced.

16.G.03 Hoisting wire ropes shall be installed in accordance with ANSI/ASME standards and the equipment manufacturer's recommendations.

a. Overhead and gantry cranes shall have at least two full wraps of wire rope on the drums at all times.

b. All other cranes shall have at least three full wraps (not layers) of wire rope on the drums at all times.

c. The drum end of the wire rope shall be anchored to the drum by an arrangement specified by the crane manufacturer.

16.G.04 Responsibilities.

a. The responsibilities of the operator include, but are not limited to, the following requirements:

(1) The operator shall not engage in any activity that will divert his attention while operating the equipment;

(2) The operator shall not leave the controls while a load is suspended;

(3) Before leaving the LHE unattended, the operator shall:

(a) Land any load, bucket, lifting magnet, or other device;

(b) Disengage the master clutch;

(c) Set travel, swing, boom brakes, and other locking devices;

(d) Put the controls in the “OFF” or neutral position;

(e) Secure the equipment against accidental travel; and

(f) Stop the engine.

➢ Exception: When crane operation is frequently interrupted during a shift and the operator must leave the crane. Under these circumstances, the engine may remain running and the conditions above must be followed (don't have to stop the engine). In addition, the following conditions shall apply:

(i) The operator shall remain adjacent to the equipment and is not engaged in any other duties;

(ii) The CP determines that it is safe to do so and implements measures necessary to restrain the boom hoist and telescoping, load, swing and outrigger functions;

(iii) The crane shall be located within an area protected from unauthorized entry.

(4) The operator shall respond to signals from the person who is directing the lift or an appointed signal person. When a signal person is not used in the LHE operation, the operator shall ensure he has full view of the load and the load travel paths at all times the load is rigged to the equipment;

(5) Each operator is responsible for those operations under his direct control. Whenever there is a concern as to safety, the operator shall have the authority to stop and refuse to handle loads until a QP has determined that safety has been assured.

b. The operator, qualified lift supervisor and rigger shall jointly ensure:

(1) The LHE is level and, where necessary, blocked;

(2) The load is well secured and balanced in the sling or lifting device before it is lifted more than a few inches;

(3) The lift and swing path is clear of obstructions and adequate clearance is maintained from electrical sources per Table 16-1; and

(4) All persons are clear of the swing radius of the counterweight and housing.

c. When two or more cranes (tandem lift is a critical lift) or LHE are used to lift one load, the lift supervisor shall be responsible for the following:

(1) Analyzing the operation and instruct all personnel involved in the proper positioning, rigging of the load, and the movements to be made;

(2) Making determinations as necessary to reduce crane (LHE) ratings, load position, boom location, ground support, and speed of movement, which are required to safely make the lift;

(3) Ensuring that dedicated personnel are present and equipment is functioning properly. All personnel involved with the crane (LHE) operation shall understand the communication systems and their responsibilities.

16.G.05 Communications.

a. A standard signal system shall be used on all LHE (by hand, voice, audible or comparable signals).

(1) Manual (hand) signals may be used when the distance between the operator and signal person is not more than 100 ft (30.4 m). If using hand signals, Standard Method must be used per Figure 16-1 for Mobile Cranes, Figure 16-4 for Overhead and Gantry.

(2) Radio, telephone, or a visual and audible electrically-operated system shall be used when the distance between operator and signal person is more than 100 ft (30.4 m) or when they cannot see each other.

b. A signal person must be used in the following situations:

(1) When the point of operation, load travel, area near or at load placement, is not in full view of the operator;

(2) When the equipment is traveling and the view in the direction of travel is obstructed;

(3) Due to site-specific safety concerns, either the operator or the person handling the load determines that it is necessary.

c. During LHE operations requiring signals, the ability to transmit signals between the operator and signal person shall be maintained. If that ability is interrupted at any time, the operator shall safely stop operations requiring signals until it is reestablished and a proper signal is given and understood.

d. Only one person gives signals to a LHE operator at a time unless an emergency stop signal is given (which may be given by anyone and must be obeyed by the operator).

16.G.06 Riding on loads, hooks, hammers, buckets, material hoists, or other hoisting equipment not meant for personnel handling is prohibited.

16.G.07 When practical and when their use does not create a hazard, tag lines shall be used to control loads.

16.G.08 Whenever a slack line condition occurs, the proper seating of the rope in the sheaves and on the drum shall be checked prior to further operations.

16.G.09 Power Line Clearance During Assembly and/or Disassembly (up to 350 kV). Before assembling or disassembling LHE, the employer must determine if any part of the LHE, load line, or load (including rigging and lifting accessories) could get closer than 20 ft (6 m) to a power line during this process. If so, one of the following requirements must be met:

a. De-energize and ground. Confirm from the utility owner/operator that the line has been de-energized and visibly grounded at the worksite.

b. 20-ft (6 m) clearance. Ensure no part of the LHE, load line or load gets closer than 20 ft (6 m) to the power line by implementing the following:

(1) Conduct a planning meeting with the assembly/disassembly (A/D) director, operator, A/D crew and the other workers who will be in the area. Review location of the power lines and the control measures to prevent encroachment/or electrocution;

(2) If tag lines are used, they must be non-conductive;

(3) In addition, at least one of the following must be in place:

(a) Use of a dedicated spotter who is in continuous contact with the operator;

(b) A proximity alarm set to give operator sufficient warning;

(c) A device that automatically limits range of movement, set to prevent encroachment;

(d) An elevated warning line, barricade or line of signs in view of the operator, equipped with flags or similar high-visibility markings.

c. Table 16-1 clearance.

(1) Determine the line's voltage and minimum clearance distance permitted under Table 16-1.

(2) Determine if any part of the LHE, load line, or load, could get closer that the minimum clearance distance to the power line permitted. If so, the control measures identified in paragraph b (above) shall be implemented.

16.G.10 Power line clearance – equipment operations (all voltages). The employer must identify the work zone for the LHE in question (work zone is the area 360 degrees around the crane, up to the LHE's maximum working radius). A determination shall be made if any part of the LHE, load line or load (to include rigging and lifting accessories), if operated up to the LHE/crane's maximum working radius in the work zone, could get within 20 ft (6 m) of the power line one of the following must be met:

a. De-energize and ground. Confirm from the utility owner/operator that the power line has been de-energized and visibly grounded at the worksite.

b. Twenty Feet Clearance (20 ft clearance). Ensure no part of the LHE, load line or load gets closer than 20 ft (6 m) to the power line by implementing the following:

(1) Conduct a planning meeting with the site/lift supervisor, signal person/rigger, operator, crew and the other workers who will be in the area. Review location of the power lines and the control measures to prevent encroachment or electrocution.

(2) If tag lines are used, they must be non-conductive;

(3) Erect and maintain an elevated warning line, barricade or line of signs in view of the operator, equipped with flags or similar high-visibility markings, at 20 ft (6 m) from the power line or at a minimum approach distance under Table 16-1.

(4) In addition, at least one of the following must be in place:

(a) Use of a dedicated spotter who is in continuous contact with the operator. The spotter must have a visual aid to assist in identifying the minimum clearance distance (e.g., clearly visible line painted on the ground). The spotter must be positioned to effectively gauge the clearance distance;

(b) A proximity alarm set to give operator sufficient warning;

(c) A device that automatically limits range of movement, set to prevent encroachment.

(d) An insulating link/device installed at a point between the end of the load line (or below) and the load.

c. Table 16-1 clearance.

(1) Determine line's voltage and minimum clearance distance permitted under Table 16-1.

(2) Determine if any part of the equipment, load line, or load, while operating up to the LHE's maximum working radius in the work zone could get closer than the minimum clearance distance to the power line permitted. If so, the control measures identified in paragraph b above shall be implemented.

d. Permanently installed overhead and gantry cranes clearances shall be in accordance with NFPA 70;

e. When working near transmitter/communication towers where the LHE is close enough for an electrical charge to be induced in the LHE or materials being handled, the transmitter must be de-energized or provided with an electrical ground. Taglines, if used, shall be non-conductive.

f. It shall be assumed that all power lines are energized unless the utility owner/operator confirms that the power line has been and will continue to be deenergized and visibly grounded at the worksite.

g. Training. Each operator and crew member assigned to work with the equipment shall have received the following training by a QP:

(1) Procedures to follow in the event there is contact with the power line;

(2) Information regarding the danger of electrocution from the operator simultaneously touching the equipment and the ground;

(3) The importance to the operator's safety of remaining inside the cab except where there is an imminent danger of fire, explosion, or other emergency that necessitates leaving the cab;

(4) The safest means of evacuating LHE that may be energized;

(5) The danger of the potentially energized zone around the LHE;

(6) The need for crew in the area to avoid approaching or touching the LHE and the load;

(7) Safe clearance distance from the power line;

(8) Power lines are presumed to be energized unless the utility owner/operator confirms that the power line is deenergized and visibly grounded;

(9) Power lines are presumed to be uninsulated unless the utility owner/operator or a RPE who is a QP confirms that a line is insulated;

(10) The limitations of an insulating link/device, proximity alarm, and range control (or similar) device if used;

(11) Equipment grounding procedures and the limitations thereof;

(12) Dedicated spotters must be trained to effectively perform their tasks, including the applicable training previously identified herein.

16.G.11 Power line safety - over 350 kV. The requirements of Sections 16.G.09 and 16.G.10 apply to power lines over 350 kV except:

a. For power lines over 350 kV but at or below 1000 kV, wherever the distance “20 feet (6 m)” is specified, the distance “50 feet (15 m)” must be substituted; and,

b. For power lines over 1000 kV, the minimum clearance distance must be established by the utility owner/operator or a RPE who is a QP with respect to electrical power transmission and distribution.

16.G.12 Power Line Safety While Traveling Under or Near Power Lines with NO Load. The employer must ensure that;

a. The boom/mast and its support system are lowered sufficiently to ensure clearances in Table 16-2 are maintained;

b. Effects of speed and terrain on equipment movement (including boom/mast) are considered to ensure clearances in Table 16-2 are maintained;

c. If any part of the LHE, while traveling will get closer than 20 ft (6 m) to the power line, a dedicated spotter who is in continuous contact with the operator is used;

d. When traveling at night, or in conditions of poor visibility, in addition to the above, the employer must ensure that;

(1) the power lines are illuminated, or alternate methods are used to identify location of power lines;

(2) a safe path of travel is identified and used.

16.G.13 Physical clearances.

a. Adequate clearance shall be maintained between moving and rotating structures of the LHE and fixed objects to allow the passage of employees without harm. The minimum adequate clearance is 24 in (61 cm).

b. Accessible areas within the swing radius of the rear of the LHE’s rotating superstructure, either permanently or temporarily mounted, shall be barricaded to prevent an employee from being struck or crushed.

16.G.14 Crane Mats. Where crane mats are required for a stable, level work surface for crane operations, the matting material shall be in good condition and of adequate thickness, width, and length as to completely support the crane. The mats shall be laid perpendicular to the crane travel path, and shall be placed as close to each other as possible. A spotter shall be used to guide the crane when it moves on the mat surface to prevent the crane from traveling beyond the limit of the crane mats.

TABLE 16-1

Minimum Clearance from Energized Overhead Electric Lines

Voltage (nominal, kV, alternating current)	Minimum clearance distance
Up to 50	10 ft (3 m)
51 – 200	15 ft (4.6 m)
201 – 350	20 ft (6 m)
351 – 500	25 ft (7.6 m)
501 – 750	35 ft (10.7 m)
751 – 1000	45 ft (13.7 m)
Over 1,000	(As established by the utility owner/operator or RPE who is a QP with respect to electrical power transmission and distribution).

TABLE 16-2

Minimum Clearance Distance from Energized Overhead Electric Lines While Traveling with No Load

Voltage (nominal, kV, alternating current)	While traveling - minimum clearance distance
Up to 0.75	4 ft (1.2 m)
.76 – 50	6 ft (1.8 m)
51 – 345	10 ft (3.0 m)
326 – 750	16 ft (4.9 m)
751 – 1000	20 ft (6.1 m)
Over 1,000	(As established by the utility owner/operator or RPE who is a QP with respect to electrical power transmission and distribution).

Note: Environmental conditions like fog, smoke or precipitation may require increased clearances.

16.H Critical Lifts.

16.H.01 When using LHE, the following are identified as critical lifts requiring detailed planning and additional or unusual safety precautions. Critical lifts are defined as:

a. Lifts involving hazardous materials (e.g., explosives, highly volatile substances);

b. Hoisting personnel with LHE;

c. Lifts made with more than one LHE;

d. Lifts where the center of gravity could change;

e. Lifts made when the load weight is 75% of the rated capacity of the LHE load chart or more (not applicable to gantry, overhead or bridge cranes);

f. Lifts without the use of outriggers using rubber tire load charts;

g. Lifts using more than one hoist on the same LHE;

h. Lifts involving Multiple Lift Rigging (MLR) Assemblies or other non-routine or technically difficult rigging arrangements;

i. Lifts involving submerged loads.

➢ Exception: lifts that were engineered to travel in guided slots throughout the lift and have fixed rigging and/or lifting beams, i.e., intake gates, tailgates/logs);

j. Lifts out of the operator's view.

➢ Exception: if hand signals used by a signal person in view of the operator or radio communications are available and in use, load does not exceed two tons AND is determined a routine lift by the lift supervisor;

k. Load Tests;

l. When land-based LHE mounted on barges, pontoons or other means of flotation are required to travel while lifting the load. > See Sections 16.L.03 and 16.L.04.

m. Any lift the operator believes should be considered critical.

16.H.02 Critical lift plans. Before making a critical lift, a critical lift plan shall be developed. > See Non-Mandatory, Critical Lift Plan, Form 16-3.

a. By a CP and shall include the LHE operator, lift supervisor, and the rigger and signed by all involved personnel prior to the lift;

b. For a series of lifts on one project or job, as long as the LHE, personnel, type loads and configuration do not differ;

c. Documented with a copy provided to the GDA for acceptance prior to the lift(s) being made;

d. And shall include, as a minimum:

(1) The specific make and model of each piece of LHE, the line, boom, and swing speeds;

(2) The exact size and weight of the load to be lifted and all LHE and rigging components that add to the weight. The manufacturer's maximum load limits for the entire range of the lift, as listed in the load charts, shall also be specified;

(3) The plan shall specify the lift geometry and procedures, including the LHE position, height of the lift, the load radius, and the boom length and angle, for the entire range of the lift;

(4) Site drawing shall be included to identify placement/location(s) of LHE, adjacent equipment and/or facilities, etc;

(5) The plan shall designate the operator, lift supervisor and rigger and include their qualifications;

(6) The plan will include a rigging plan that shows the lift points and describes rigging procedures and hardware requirements;

(7) The plan will describe the ground conditions, outrigger or crawler track requirements, and, if necessary, the design of mats, necessary to achieve a level, stable foundation of sufficient bearing capacity for the lift;

(8) For floating LHE, the plan shall describe the operating base (platform) condition and any potential maximum list / trim;

(9) The plan will list environmental conditions under which lift operations are to be stopped;

(10) The plan will specify coordination and communication requirements for the lift operation;

(11) For tandem LHE lifts, identify the requirements for an equalizer beam if applicable.

16.I Environmental Considerations.

16.I.01 LHE shall not be operated when wind speeds at the site attain the maximum wind velocity based on the surface/load ratio recommendations of the manufacturer.

a. At winds greater than 20 mph (9 m/s), the operator, rigger, and lift supervisor shall cease all crane operations, evaluate conditions and determine if the lift shall proceed. This determination shall be based on wind calculations per manufacturer's recommendations.

b. The determination to proceed or not shall be documented in the LHE/crane operator's logbook.

16.I.02 Operations performed during weather conditions that produce icing of the LHE or reduced visibility shall be performed at reduced functional speeds and with signaling means appropriate to the situation.

16.I.03 When lightning is observed, all LHE operations shall stop. A determination shall be made as to proximity to operation being performed. (Use a lightning detector or once lightning is seen, count the number of seconds until you hear thunder. Divide number of seconds by 5 to get the distance the lightning is away from you). If lightning is 10 miles away or less, work must stop until 30 minutes after the last audible thunder or visible flash of lightning. Plan work activities according to the latest weather forecast and be prepared to stop operations, until bad weather has safely passed. These actions shall be documented (daily report, crane operator's log book, etc.).

16.I.04 For night operations, lighting adequate to illuminate the working areas while not interfering with the operator's vision shall be provided. > See Section 7.

16.J Lattice, Hydraulic, Crawler-, Truck-, Wheel-, and Ringer-Mounted Cranes.

16.J.01 For required operator aids and indicating devices, see Section 16.E.03.

16.J.02 Boom assembly and disassembly. This operation shall be covered in the AHA and CP shall be identified.

a. The manufacturer's boom assembly and disassembly procedures shall be reviewed by the team before starting the assembly or disassembly. The CP shall be present during assembly/disassembly operations.

b. When removing pins or bolts from a boom, workers shall stay out from under the boom. Sections shall be blocked, cribbed, or otherwise secured to prevent them from falling.

c. Blocking, cribbing and other means of securing shall be confirmed, verified and approved by a CP before assembly/disassembly operations are allowed to proceed.

16.J.03 Outriggers.

a. Anytime outriggers are required to be used, they shall be extended or deployed per the crane manufacturer's load/capacity chart specifications, except for locomotive cranes.

b. When partially extended outriggers are used, the following requirements shall be met:

(1) Crane operation with partially extended outriggers shall only be undertaken if approved by the crane manufacturer;

(2) Outriggers shall be set at equal positions that correspond to the load/capacity charts supplied by the manufacturer for those positions. Only the load chart(s) corresponding to the outrigger positions shall be used for operation;

(3) When situations arise where outriggers must be set at unequal positions that correspond to the load/capacity charts corresponding with the individual quadrants of operation. The manufacturer or QP shall be consulted to determine if the capacity reductions, special operating procedures, or limitations are required;

c. Outrigger floats shall be securely attached to the outriggers.

d. Blocking/pads under outrigger floats shall meet the following requirements:

(1) Sufficient strength to prevent crushing, bending, or shear failure;

(2) Such thickness, width, and length as to completely support the float, transmit the load to the supporting surface, and prevent shifting, toppling, or excessive settlement under load. The blocking area size and thickness shall be based on additional items such as soil conditions, soil type, compaction, liquid limits, underground utilities, crane type and capacity, and having the crane within 1% of level.

16.J.04 Unless the manufacturer has specified an on-rubber rating, mobile cranes shall not pick or swing loads over the side of the crane unless the outriggers are down and properly extended.

16.J.05 Unless recommended against by the manufacturer, crane booms shall be lowered to ground level or secured against displacement by wind loads or other outside forces when not in use. If the manufacturer recommends against this practice, the manufacturer's recommended practice shall be followed.

16.J.06 When pick and carry operations occur (Rough Terrain Cranes), the boom must be centered over the front of the crane, the mechanical swing lock engaged, and the load restrained from swinging.

16.K Portal, Tower, and Pillar Cranes.

16.K.01 All load bearing foundations, supports, and rail tracks shall be constructed or installed as determined by a RPE with knowledge in this area, in accordance with the crane manufacturer's recommendations.

16.K.02 Cranes shall be erected/dismantled in accordance with the manufacturer's recommended procedures, (or if manufacturer procedures are not available, in accordance with procedures developed by a RPE with knowledge in this area).

a. When erected/dismantled, written instructions by the manufacturer and/or RPE and a list of the weights of each component shall be kept at the site.

b. Erection and dismantling shall be performed under the supervision of a QP.

c. An AHA shall be developed and procedures established before the erection/dismantling work commences to insure site-specific needs are considered. The analysis will include:

(1) The location of the crane in relation to other tower cranes, adjacent buildings or towers, overhead power and communication lines, underground utilities;

(2) Foundation design and construction requirements; and

(3) When the tower is erected within a structure, clearances between the tower and the structure and bracing and wedging requirements.

d. Wind velocity at the site at the time of erection/dismantling shall be a consideration as a limiting factor that could require suspending the erection/dismantling operation and shall be as determined by the manufactured or if this data is not available, by a QP.

e. Before crane components are erected, they shall be visually inspected for damage. Dented, bent, torn, gouged or otherwise damaged members shall not be erected.

f. Initially and after each climb, the crane shall be plumbed and then held in the plumbed condition by wedges or other means. Cranes shall be plumbed to a tolerance of 1:500 (1 in:40 ft; 2.4 cm:12 m) unless the manufacturer specifies otherwise.

16.K.03 Pre-operation tests shall be performed when cranes are erected and after each climbing operation, before placing the crane in service. All functional motions, motion limiting devices and brakes shall be properly tested for operation in accordance with the manufacturer's recommended procedures and ANSI/ASME B30.3 or B30.4, as applicable:

a. Crane supports;

b. Brakes and clutches, limit and overload switches, and locking and safety devices; and

c. Load hoisting and lowering, boom hoisting and lowering, and swing motion mechanisms and procedures.

16.K.04 Climbing Procedures. Prior to and during, all climbing procedures (to include inside and top climbing), the employer shall:

a. Comply with all manufacturer prohibitions;

b. Have a RPE verify that the host structure is strong enough to sustain the forces imposed through the braces, brace anchorages and supporting floors;

c. Ensure that no part of the climbing procedure takes place when wind velocity at the crane superstructure exceeds the limit set by the manufacturer or a QP, or 20 mph (9 m/s) at the crane superstructure if no such limit has been set. The characteristics of the gusts should be considered for their effect on the climbing operation; and

d. The operator of a hammerhead tower crane shall be present during climbing or telescoping operations.

16.K.05 Safety devices and operational aids. Operations shall not begin unless the operational aids are in proper working order, except where the employer meets the specified temporary alternative measures. In addition to those listed in 16.E.03, the following shall be provided:

➢ Note: The general requirements, as identified in Section 16.E.03 for Operational aids, do not apply to tower cranes. The devices listed in this Section are required on all tower cranes covered by this subpart, unless otherwise specified.

a. Rail clamps, if used, shall have slack between the point of attachment to the rail and the end fastened to the crane. Rail clamps shall not be used as a means of restraining tipping of a crane display magnitude of load on the hook;

b. Hydraulic system pressure limiting device;

c. The following brakes, which shall automatically set in the event of pressure loss or power failure, are required: hoist brake on all hoists, swing brake, trolley brake, rail travel brake;

d. Deadman control or forced neutral return control (hand) levers;

e. Emergency stop switch at the operator's station;

f. Trolley travel limiting device prevents trolley from running into the trolley end stops;

g. Ambient wind velocity device. This device shall be mounted at or near the top of the crane. A velocity readout shall be provided at the operator's station in the cab, and a visible or audible alarm shall be triggered in the cab and at remote control stations when a preset wind velocity has been exceeded;

h. Hoist line pull limiting device (limits lifted load).

16.K.06 Multiple tower crane jobsites. On jobsites where more than one fixed jib (hammerhead) tower crane is installed, the cranes shall be located such that no crane <u>or its load</u> may come in contact with the structure of another crane. Cranes are permitted to pass over one another.

16.K.07 Weathervaning. Tower cranes required to weathervane when out-of-service shall be installed with clearance for boom (jib) and superstructure to swing through a full 360 degree arc without striking any fixed object or other weathervaning crane. The boom shall be taken in the attitude dictated by its wind area balance. Non-weathervaning boom (jibs) shall be taken in the least favorable attitude. Traveling cranes shall also resist design wind level induced sliding.

16.L Floating Cranes/Derricks, Crane Barges, and Auxiliary Shipboard-Mounted Cranes.

16.L.01 The requirements in this Section are supplemental requirements for floating LHE, <u>pile drivers, drill rigs</u>, man-lifts and land LHE on barges, pontoons, vessels or other means of flotation and auxiliary shipboard mounted cranes, unless otherwise specified.

16.L.02 Design & Construction Standards. The lifting equipment on floating cranes, crane barges and on ships (shipboard cranes) shall be designed and constructed in accordance with one of the following standards:

(a) ANSI/ASME B30.8;

(b) American Bureau of Shipping (ABS) Guide for Certification of Cranes, or

(c) American Petroleum Institute (API) Specification 2C.

16.L.<u>03</u> <u>LHE Manufacturer's Floating Service Load Chart</u>.

a. Manufacturer's Floating Service Load Chart. A LHE Manufacturer's Floating Service Load Chart shall be provided. The Load Chart shall be in accordance with all criteria from the selected standard in Section 16.L.02.

(1) The Floating Service Load Chart shall provide a table of rated load vs. boom angle and radius.

(2) The Floating Service Load Chart shall also provide the maximum allowable machine list and trim associated with the tabular loads and radii provided.

b. Floating Service Load Chart if Manufacturer's Floating Service Load Chart is not available, a floating service load chart may be developed and provided by a qualified RPE, competent in the field of floating cranes. The Load Chart shall:

(1) Be in accordance with all criteria from the selected standard in Section 16.L.02;

(2) Provide a table of rated load vs. boom angle and radius;

(3) Provide the maximum allowable machine list and machine trim associated with the tabular loads and radii provided;

(4) Be stamped by a RPE, qualified and competent in the field of floating cranes. The RPE, competent in the field of floating cranes shall, stamp and certify (sign) that the Naval Architectural Analysis (NAA) meets the requirements of Sections 16.L.03.

16.L.04 Stability During Lift Operation.

a. During lift operations, the stability of the floating LHE, or vessel and shipboard crane shall meet the requirements for "lifting" as set forth in 46 CFR 173.005 through 46 CFR 173.025, over the full range of crane slewing angles.

b. During lift operations, the stability of the floating LHE, or vessel and shipboard crane shall limit floating platform heel and trim such that the resultant LHE list and trim over the full range of LHE slewing angles are within the limits identified in the LHE Floating Service Load Chart.

c. A minimum of 12 in (0.3 m) of freeboard shall be maintained during lift operations, over the full range of crane slewing angles.

d. The entire bottom area of the floating platform shall be submerged for all lifts, over the full range of crane slewing angles.

16.L.05 Floating Service Naval Architectural Analysis (NAA). A NAA shall be provided.

a. The NAA shall evaluate the LHE on the floating platform. The LHE Manufacturer's Floating Service Load Chart (Section 16.L.03) shall be validated for:

(1) The stability during lift operation (Sections 16.L.04.a through d), and

(2) The machine list and trim limits for afloat service. The Load Chart shall be de-rated (reduced) as required to meet the requirements for stability during lift operation and for machine list and trim limits for afloat service.

b. The NAA shall include the full 360° (degree) slewing range of the crane, unless specific slewing angle limits are identified.

c. When deck loads are to be carried while lifting, the NAA shall incorporate the deck loading amount, location and deck load center of gravity, and sail area into the stability analysis.

d. The NAA shall incorporate wind loading, into the heel and list calculations with a minimum wind speed of 40 mph (18 m/s).

e. The NAA shall be stamped/certified by an RPE or qualified Naval Architect/Marine Engineer, competent in the field of floating cranes. The RPE or Naval Architect/Marine Engineer shall stamp and/or certify (sign) that the NAA meets the requirements of Sections 16.L.04, and 16.L.05.

16.L.06 Floating Service Structural Analysis.

a. The floating platform structure shall be adequate for the loads applied from lifting over the full crane slewing range.

b. For vessels which are not built for the application, a structural analysis shall be provided to document the structural adequacy of the floating platform in conjunction with applied LHE loads, for the lift amounts as developed in the NAA. Deck loads and environmental loads shall be applied as part of the structural analysis.

c. Where established floating platform design structural capacities, such as allowable deck loads, are available, these may be used in support of the structural analysis.

d. The structural analysis shall be stamped by an RPE, competent in the field of floating LHE. The RPE shall stamp and certify (sign) that the Floating Service Structural Analysis meets the requirements of Sections 16.L.04 and 16.L.05.

e. The lift amounts developed in the NAA shall be reduced if the structural analysis shows insufficient structural capacity at the NAA loads. The amount of reduction shall be as required for the structural capacity.

16.L.07 Floating Service Load Chart, LHE on Floating Platform. The NAA and Floating Service Structural Analyses shall be used to develop the Floating Service Load Chart.

a. The Floating Service Load Chart will define the lift/radius capacity of the LHE on the specific floating platform.

b. The Floating Service Load Chart shall incorporate any de-ratings required by either the NAA or Floating Service Structural Analysis.

c. An RPE or Naval Architect/Marine Engineer, competent in the field of floating crane/derrick design, shall stamp and/or certify (sign) that the Floating Service Load Chart meets the requirements of Sections 16.L.05 and 16.L.06.

d. The load chart certification may be either:

(1) A floating service load chart developed (de-rated) from the Manufacturer's floating service load chart, or

(2) If no de-rating is required, the Crane Manufacturer's Floating Service Load Chart with separate attached certification document.

e. The Floating Service Load Chart and the Floating Service Naval Architect Analysis shall be submitted to the GDA for acceptance prior to start of work.

f. The Floating Service Load Chart shall be posted in the cab or at the operator's station (if no cab). All other procedures applicable to the operation of the equipment (instructions and operators manual, recommended operating speeds, etc.) shall be readily available on board.

g. The Floating Service Load Chart shall, at a minimum, include the following:

(1) Naval Architect's Notes delineating:

(a) Draft limits;

(b) Deck cargo weight and Vertical Center of Gravity above deck;

(c) Maximum wind speed;

(d) Environmental limits;

(e) Vessel heel and trim limits;

(f) LHE Machine list and trim limits, and

(g) Vessel condition (e.g., dry bilges, watertight integrity, etc.).

(2) The LHE Manufacturer's Floating Service Crane Load Chart.

(3) If de-rating of the Crane Manufacturer's Floating Service Crane Load Chart is required, a separate Floating Service Safe Working Load Chart shall be provided with:

(a) Mode of operation;

(b) Table of hook load, boom elevation angle, lift radius (with list/trim considered);

(c) Maximum Machine List and Trim;

(d) Maximum Floating Platform List and Trim;

(e) LHE configuration, to include boom length, amount of counterweight, parts of wire, and block size.

h. The Floating Service Load Chart shall be programmed into the crane LMI.

i. The Floating Service Load Chart shall remain valid so long as no major modifications are made to the LHE or to the floating platform, as documented by a QP.

16.L.08 Land LHE, derricks and mobile auxiliary LHE mounted on barges, pontoons or other means of flotation.

a. All requirements in Sections 16.L.02 through 16.L.07 shall be applicable for land-LHE, derricks and mobile auxiliary LHE mounted on barges, pontoons or other means of flotation.

b. LHE Mats. The need, type, size and location of LHE mats required shall be determined for the type of LHE on the barge.

c. Means of attachment of LHE shall be shall be provided to prevent shifting during lift operations. The attachment method shall not be used to hold down LHE against overturning moment.

16.L.09 LHE Travel.

a. If traveling is required on the barge with no load, the travel area shall be evaluated in the NAA, and identified on the Floating service Load Chart.

b. If traveling is required while lifting the load, the lift shall be deemed a critical lift and a critical lift plan is required.

c. If traveling is required while lifting the load, the requirements in Sections 16.L.02 through 16.L.07 must be satisfied throughout the travel range. The NAA and Structural Analyses shall cover the travel range with load. The travel area shall be evaluated in the in the NAA, and identified on the Floating Service Load Chart.

16.L.10 A-Frame Non-Slewing Anchor Handling Barge/Vessel.

a. A-Frame Non-Slewing anchor handling barge/vessels may be used for anchor handling, low lifting of loads such as anchor buoys/weights, dredge pipe, submerged pipeline and pontoons.

➢ Note: If used for any other lifting application, the work platform will be considered a floating derrick and all other requirements of Section 16 apply.

b. A-Frame Non-Slewing anchor barge/vessels shall also comply with the following:

(1) All deck surfaces of the pontoon or barge shall be above the water;

(2) Means for limiting the applied load, such as mechanical means or marking the draft of the barge corresponding to the rated load, shall be provided. Calculations shall be available and the barge shall be tested to verify rated load;

(3) A ratchet and pawl shall be provided for releasing the load from the hoisting machinery brake;

(4) An operating manual/procedure shall be available for use by the operator. The operator shall be trained in the anchor handling barge systems operation.

c. If additional external load is superimposed above that which can be hoisted with the onboard hoisting machinery, then a chain stopper shall be used to remove the external load from the A-frame and hoist machinery.

16.L.11 Employer-Made Lift Equipment Used on Barges or Pontoons.

a. If lift equipment is employer-made, it shall not be used unless the employer has documents demonstrating that the load charts and applicable parameters for use meet the requirements of one of the standards identified in Section 16.L.02.

b. All requirements in Sections 16.L.02 through 16.L.07 shall be applicable.

16.L.12 Modifications.

a. Weight and Center of Gravity (CG) changes. Any modifications to the Crane and Floating Platform that result in any of the following changes to the crane and floating platform lightship characteristics shall require a new Naval Architect Analysis, and a new Floating Service Load Chart:

(1) An increase in Vertical CG by more than 2 in (5 cm);

(2) A change in the lightship displacement by more than 3° (degrees), or

(3) A shift in Longitudinal CG of more than 1° of floating platform length.

b. Modifications to the crane that result in changes to the crane lift capacity and/or to the crane machine list and trim limits shall require a new NAA, and a new Floating Service Load Chart.

16.L.13 Overhead Bridge Cranes On Floating Platforms.

a. An overhead bridge crane Naval Architectural Heel and Trim Analysis shall be performed for overhead bridge cranes on floating platforms by a RPE or Naval Architect/Marine Engineer, competent in LHE on floating plant.

(1) The Analysis shall determine the maximum vessel heel and trim that can be generated by use of the bridge crane.

(2) The Analysis shall cover the full longitudinal and transverse motion range of the bridge crane, the crane weight, and the crane full rated load.

(3) If floating platform heel and trim not related to the bridge crane operation is present during the bridge crane operation, the non-related heel and trim shall be included in the Bridge Crane Naval Architectural Heel and Trim Analysis.

(4) A RPE or Naval Architect/Marine Engineer, competent in the field of floating crane/derrick design, shall stamp and/or certify (sign) that the Bridge Crane Naval Architectural Heel and Trim meets the Analysis requirements of this Section.

b. Bridge Crane Operation at floating platform heel and trim. The bridge crane manufacturer shall verify that the bridge crane may be safely operated at the vessel heel and trim maximums identified by the Bridge Crane Naval Architectural Analysis.

c. Floating Platform heel and trim indication. A heel and trim indicating device shall be provided on all bridge crane equipped floating platforms. The indicating device shall be visible by the bridge crane operator during bridge crane operation.

16.L.14 Use of Elevating Aerial Work Platforms (AWPs) Onboard Floating Platforms.

a. AWPs shall only be operated in accordance with the manufacturer's recommendations for service on floating platforms.

b. AWPs used on floating platforms shall have a secondary set of controls at ground level.

c. AWPs may not be moved on the platform (driven) during operations with personnel onboard the lift unless it is allowed and addressed in the NAA.

d. Floating Platform Heel and Trim.

(1) When an AWP is to be used on a floating platform, the floating platform heel and trim shall remain within the AWP manufacturer's identified limits for floating operation.

(2) The floating platform shall be ballasted as needed to maintain barge heel and trim within the manufacturer's limits for the AWP operation.

e. Verification of Floating Platform Heel and Trim.

(1) Platform heel and trim shall be verified prior to operations with personnel on the AWP.

(2) The secondary set of platform controls shall be utilized to verify platform heel and trim through the intended range of AWP operations. The test shall incorporate weight on the platform at least equal to the personnel and equipment using the AWP.

f. Operations on Floating Platform during AWP operation. No operations on the floating platform that will affect the platform heel and trim beyond the required limits shall be permitted during the use of the AWP.

16.L.15 Near-Maximum Loads. When loads approach the maximum rating of the crane or derrick, the person responsible for the job shall ascertain that the weight of the load has been determined within +/- 10% before it is lifted.

16.L.16 Safety Devices and Operational Aids. In addition to those required by Section 16.E, the following are required:

a. Machine Heel and Trim indicating device. This device shall be located in the crane cab or at the operator's station (if there is no cab);

b. Boom Angle Indicator within clear view of the operator's station;

c. Floating Platform List and Trim indicating device: as a means for the operator to visually determine the heel and trim of the platform as opposed to the crane;

d. Draft Marks - as a means for monitoring both draft and freeboard;

e. Wind speed and direction indicator must be within clear view of the operator's station;

f. Anti two-block device - see Section 16.E.03.

16.L.17 Portable Remote Controls. If portable remote controls are used for lifting, the operator shall:

a. be directly aware of the vessel heel and trim and the crane machine heel and trim during lift operations, or

b. be in direct communication with a team member who is directly monitoring vessel heel and trim and the crane machine heel and trim during lift operations.

16.L.18 Inspections. In addition to inspection of the crane/derrick per Section 16.D, inspection of the barge, pontoons, vessel or other means of flotation used to support a land crane/derrick by a CP is required.

a. Each shift: the means used to secure/attach the equipment to the vessel/flotation device shall be inspected for proper condition, to include wear, corrosion, loose or missing fasteners, defective welds and (where applicable) insufficient tension.

b. Monthly: In addition to Section 16.L.08.a, the vessel/means of flotation used shall be inspected for the following:

(1) Taking on water;

(2) Deck load for proper securing;

(3) Chain lockers, storage, fuel compartments and battening of hatches for serviceability as a water-tight appliance;

(4) Firefighting and lifesaving equipment in place and functional.

c. If any deficiency is identified, an immediate determination shall be made by a QP as to whether the deficiency constitutes a hazard. If so, the vessel/flotation device shall be removed from service until it has been corrected.

16.L.19 Operations.

a. Operator Lift Planning. Operators shall plan lifts in advance, with particular attention to lift radii & boom angle and machine list & trim. Lift planning shall address the anticipated range of boom angles, LMI response, and expected LMI warning indicators, if any. > See Section 16.L.20.

b. Operators shall monitor the boom tip and the boom angle indicator carefully to ensure that limits of the load chart are not exceeded. The boom angle indicator will respond directly to increasing lift radius resulting from crane trim created by floating platform heel and trim.

c. Operators should be aware that safety devices such as LMIs do not offer protection against loads generated by relative motions between a floating crane and a fixed object to be lifted. The AHA shall address the potential for gross overload and failure mode conditions.

d. Where portable remote controls are used during lifting, the operator shall have procedures to monitor vessel heel and trim and crane machine heel and trim.

e. Whenever practical, crane use during buoy tending shall be limited to lifting the freely suspended buoy clear of the water onto the vessel.

f. Bilges shall be kept as dry as possible to eliminate the adverse effect of free surface (sloshing liquid).

g. Where crane mats are required for a stable, level work surface for crane operations, the matting material shall be in good condition and of adequate thickness, width, and length as to completely support the crane. The mats shall be laid perpendicular to the crane travel path, and shall be placed as close to each other as possible. A spotter shall be used to guide the crane when it moves on the mat surface to prevent the crane from traveling beyond the limit of the crane mats and the NAA.

16.L.20 Standard Lift Plan (SLP).

a. All lifts must be planned to avoid procedures that could result in configurations where the operator cannot maintain safe control of the lift. In addition to the requirements and criteria to be considered in Section 16.A.03 for a written Standard Lift Plan (SLP, non-mandatory Standard Pre-Lift Plan/Checklist, Form 16-2 may be used), the SLP for LHE on floating plant must also consider the following:

b. Lifts shall reflect floating operational parameters such as anticipated boom angles, values for wire leads, unknown load for extractions, and upper limits on crane force.

c. When deck loads are to be carried while lifting, the situation shall be analyzed for modified ratings.

d. When mounted on barges or pontoons, the rated loads and radii of land cranes shall be modified as recommended by the manufacturer or QP. The modification shall be evaluated by the QP specific to the flotation device/platform being used.

e. Load charts in accordance with 16.L.07 shall be posted in the cab or at the operator's station (if no cab). All other procedures applicable to the operation of the equipment (instructions and operators manual, recommended operating speeds, etc.) shall be readily available on board.

f. Procedures to monitor vessel heel and trim and crane machine list and trim, if portable remote controls are used.

16.M Overhead and Gantry Cranes.

16.M.01 The requirements in this Section are supplemental requirements for overhead and gantry cranes whether permanently installed in a facility or not and includes overhead/bridge cranes, semi gantry, cantilever gantry, wall cranes, storage bridge cranes, and others having the same fundamental characteristics whether it travels on tracks, wheels or other means (unless otherwise specified).

16.M.02 All load bearing foundations, anchorages, runways, and rail tracks shall be constructed or installed in accordance with the crane manufacturer's recommendations and ANSI/ASME B30.2 or B30.17, as applicable.

16.M.03 The rated load of the crane shall be plainly marked on each side of the crane.

a. If the crane has more than one hoisting unit, each hoist shall have its rated load marked on it or its load block.

b. Markings on the bridge, trolley, and load block shall be legible from the ground or floor.

16.M.04 Warning device. Except for floor-operated cranes, an alarm or other effective warning signal shall be provided for each crane equipped with a power traveling mechanism.

16.M.05 Clearance shall be maintained between the crane, any structure or object, and any parallel running cranes and cranes operating at different elevations.

16.M.06 Contacts with runway stops or other cranes shall be made with extreme caution. The operator shall do so with particular care for the safety of persons on or below the crane, and only after making certain that any persons on the other cranes are aware of what is being done.

16.M.07 Operators of outdoor cranes shall secure them when leaving.

16.M.08 When the wind-indicating alarm of a cab-operated outdoor crane sounds, crane operations shall be discontinued and the crane shall be prepared and stored for excessive wind conditions.

16.M.09 Hand signals used by signal persons during overhead/gantry crane operations shall be per Figure 16-4.

16.N Monorails and Under Hung Cranes.

16.N.01 Crane runways, monorail tracks, track supports, and track control devices shall be constructed or installed in accordance with the crane manufacturer's recommendations and ANSI/ASME B30.11.

16.N.02 The rated load of the crane shall be plainly marked on each side of the crane.

a. If the crane has more than one hoisting unit, each hoist shall have its rated load marked on it or its load block.

b. Markings on the bridge, trolley, and load block shall be legible from the ground or floor.

16.N.03 Hand signals used by signal persons during monorail/under hung operations shall be per Figure 16-4.

16.O Derricks.

16.O.01 For permanent fixed locations, the following load anchoring data shall be provided to the GDA. For non-permanent installations, this data shall be determined by a QP.

a. Guy derricks.

(1) Maximum horizontal and vertical forces when handling rated loads with the particular guy slope and spacing stipulated for the application, and

(2) Maximum horizontal and vertical forces at the guy when handling rated loads with the particular guy slope and spacing stipulated for the application.

b. Stiffleg derricks.

(1) Maximum horizontal and vertical forces at the mast base when handling rated loads with the particular stiffleg slope and spacing stipulated for the application, and

(2) Maximum horizontal and vertical forces at the stifflegs when handling rated loads with the particular stiffleg arrangement stipulated for the application.

16.O.02 Derrick booms, load hoists, and swinger mechanisms shall be suitable for the derrick work intended and shall be anchored to prevent displacement from imposed loads.

16.O.03 When rotating a derrick, sudden starts and stops shall be avoided and rotational speed shall be such that the load does not swing out beyond the radius at which it can be controlled. A tagline shall be used.

16.O.04 Boom and hoisting rope systems shall not be twisted.

16.O.05 Ropes shall not be handled on a winch head without the knowledge of the operator. When a winch head is being used, the operator shall be within reach of the power unit controls.

16.O.06 When securing the boom, dogs or other positive holding mechanisms on the hoist shall be engaged.

16.O.07 When not in use the derrick boom shall be either:

a. Layed down;

b. Secured to a stationary member as nearly under the head as possible by attachment of a sling to the load block;

c. Lifted to a vertical position and secured to the mast (for guy derricks); or

d. Secured against a stiffleg (for stiffleg derricks).

16.P Handling Loads Suspended from Rotorcraft.

16.P.01 Helicopter cranes shall comply with regulations of the Federal Aviation Administration (FAA).

16.P.02 Before each day's operation, a briefing shall be conducted to set forth the plan of operation for the pilot and ground personnel.

16.P.03 Loads shall be properly slung.

a. Tag lines shall be of a length that will not permit their being drawn up into rotors.

b. Pressed sleeve, swedged eyes, or equivalent means shall be used for all freely suspended loads to prevent hand splices from spinning open or wire clamps from loosening.

16.P.04 All electrically operated cargo hooks shall have the electrical activating device so designed and installed as to prevent inadvertent operation.

a. In addition, these cargo hooks shall be equipped with an emergency mechanical control for releasing the load.

b. The hooks shall be tested prior to each day's operation to determine that the release functions properly, both electrically and mechanically.

16.P.05 Every practical precaution shall be taken to provide for the protection of the employees from flying objects in the rotor downwash. All loose gear within 100 ft (30.5 m) of the place of lifting or depositing the load, and all other areas susceptible to rotor downwash, shall be secured or removed.

16.P.06 The helicopter pilot shall be responsible for the size, weight, and manner in which loads are connected to the helicopter. If, for any reason, the helicopter pilot believes the lift cannot be made safely, the lift shall not be made.

16.P.07 When employees are required to work under hovering craft, safe access shall be provided for employees to reach the hoist line hook and engage or disengage cargo slings. Employees shall not work under hovering craft except to hook, unhook, or position loads.

16.P.08 Static charge on the suspended load shall be dissipated with a grounding device before ground personnel touch the suspended load, or protective rubber gloves shall be worn by all ground personnel touching the suspended load.

16.P.09 The weight of an external load shall not exceed the rated capacity.

16.P.10 Hoist wires or other gear, except for pulling lines or conductors that are allowed to "pay out" from a container or roll off a reel, shall not be attached to any fixed ground structure or be allowed to foul on any fixed structures.

16.P.11 When visibility is reduced by dust or other conditions, ground personnel shall exercise special caution to keep clear of main and stabilizing rotors. Precautions shall also be taken to eliminate reduced visibility.

16.P.12 No unauthorized person shall be allowed to approach within 50 ft (15.2 m) of the helicopter when the rotor blades are turning.

16.P.13 Whenever approaching or leaving a helicopter with blades rotating, all employees shall remain in full view of the pilot and keep in a crouched position. Employees shall avoid the area from the cockpit or cabin rearward unless authorized by the helicopter pilot to work there.

16.P.14 There shall be constant reliable communication between the pilot and a designated employee of the ground crew who acts as a signal person during loading and unloading. This signal person shall be distinctly recognizable from other ground personnel. Hand signals used shall be per ASME B30.12.

16.P.15 Good housekeeping shall be maintained in all helicopter loading and unloading areas.

16.Q Powered Industrial Trucks (PITs)/Telehandlers.

16.Q.01 This equipment may only be used to hoist loads if allowed by the equipment manufacturer. If these procedures are unavailable, you are prohibited from performing this function.

16.Q.02 Operations involving the use of PITs to raise personnel and/or using rigging to transport or hoist loads or personnel require different operator skills and considerations than the standard PIT operations performed with this equipment. When PITs are to be used to transport personnel or hoist loads utilizing hooks, eyes, slings, chains, or other rigging the following requirements shall apply:

a. Proper operating procedures in accordance with the equipment manufacturer's operating manual;

b. Written proof of qualifications of equipment operators, riggers, and others involved in the transporting and hoisting operations;

c. Other personnel may also operate this equipment under the specific conditions as identified in Section 16.B.01.

d. Proper use and on site availability of manufacturer's load rating capacities or charts as related to approved attachments;

e. Proper use of rigging, including positive latching devices to secure the load and rigging;

f. Inspection of rigging;

g. Use of tag lines to control the load;

h. Adequate communications, and

i. An AHA specific to the transporting or hoisting operation must be developed and provided to GDA.

16.R Pile Driving Operations.

16.R.01 Pile driving equipment shall be outfitted with a positive and negative restraint device to prevent accidental hammer disengagement (i.e., preventing the hammer from falling or uncontrolled rising out of the lead, as well as preventing contact with head block or sheaves, if so equipped).

a. The contractor shall comply with all manufacturer's instructions, procedures and recommendations applicable to the operational functions of equipment, including its use with pile driving attachments. The safe operating speeds, lifting capacity, stability under load shall not be exceeded. When manufacturer's instructions are not available, the employer shall develop and ensure compliance with all procedures necessary for the safe operation of the equipment and attachments and

(1) Procedures for the operational controls must be developed by a QP.

(2) Procedures related to the capacity of the equipment must be developed and signed by a RPE familiar with the equipment.

b. For contractor installed pile driving attachments to equipment whose original intent was for a different task, (for example an excavator or forklift modified to drive piling) the attachment must be designed by a RPE with experience designing construction equipment, and comply with 16.R.01.(a).

c. The operator of this type of equipment must comply with the requirements of 16.S.03 and must be trained and authorized to operate the pile driving attachment.

d. A Dedicated Pile-Driver is a machine that is designed to function exclusively as a pile-driver. These machines typically have the ability to both hoist the material that will be pile-driven and to pile-drive that material. This type of equipment and the operator must comply with Sections 16.A through 16.J, 16.L, and 16.R. > See Figures 16-2, Dedicated Pile Driver, and 16-3, Non-Dedicated Pile Driver.

16.R.02 Prior to initiating pile driving or extraction operations, the contractor shall develop a site-specific safety plan. The plan shall identify specific steps for the intended operations, list of hazards, and procedures to minimize or eliminate those hazards. Plans shall include, as a minimum:

a. Identification of utility locations both above and below grade;

b. Designated areas for equipment operations and material storage;

c. Assembly and disassembly sequences for pile driving equipment;

d. Operation of pile driving equipment and handling of pile materials;

e. A geotechnical report identifying subsurface and surface ground conditions;

f. A documented daily inspection requirement to include the hammer, cushion blocks, rigging, fuel lines, pressurized hoses, clamps, welds, hardware, and all other pile driving associated equipment, and

g. Establishment of a controlled work area to prevent access by persons not directly involved in the operation.

16.R.03 With the exception of the pile driver equipment operator (crane/track hoe/forklift), personnel shall not stand under the kicker/spotter or directly under, in front of, or closer than 12 ft (4 m), or greater if manufacturer specifies, of the pile hammer or pile when the pile is being driven.

16.R.04 The crane/track hoe/forklift operator station shall be protected from falling objects.

16.R.05 Cranes and mechanized equipment used only for pile driving and extracting operations (except telescopic boom cranes), are exempt from the requirements for A2B devices. > See Section 16.E.03.c(3).

16.R.06 Guy, outriggers, thrust outs, counter-balances, or rail clamps shall be provided to maintain stability of pile-driver rigs.

16.R.07 Pile-driving leads.

a. Pile driving leads shall be assembled using only the approved fasteners and torque values as required by the manufacturer. The leads shall be of adequate size, length, and strength to safely accommodate the weight and length of the pile driving hammer, the pile to be driven, and the position (vertical or on a batter) in which they will be used.

b. Employees shall be prohibited from remaining on leads or ladders while the pile is being driven.

c. Landings on leads shall not be used for storage of any kind.

d. Pile driving leads shall have stop blocks to prevent the hammer from being raised against the head block, if so equipped.

e. Pile driving leads shall be free of projections or snags to minimize damage and personnel safety hazards.

f. A blocking device, capable of supporting the weight of the hammer, shall be provided for placement in the leads under the hammer at all times while employees are working under the hammer.

➢ Exception: Where it is necessary for an employee to momentarily lean through the leads to guide a pile under the hammer, it is not required that the pile hammer be blocked in the leads.

g. A minimum weekly documented inspection of the pile driving leads shall be conducted. If found to be unsafe, or whenever a deficiency that affects the safe use of pile driving leads is observed, they shall be immediately taken out of service and their use prohibited until unsafe conditions have been corrected.

h. Swinging leads shall have fixed ladders or have bracing located such that its configuration will serve as adequate ladder rungs.

i. Fixed leads shall:

(1) Have fixed ladders and if equipped with decked landings, shall have guardrails, intermediate rails, and toe boards. Fixed ladders or stairs shall be provided for access to landings and head blocks.

(2) Be provided with guardrails or Personal Fall Protection Systems, to include Certified Anchorages, to provide fall protection for any workers exposed to falls of 6 ft (1.8 m) or greater, for work over water, over machinery, or over dangerous operations per Section 21.

(3) Have a crane boom tip connection designed by a RPE that is familiar with the ASME B30 standards.

16.R.08 Dogs, on pile-driver hoist drums, that automatically disengage when the load is relieved or the drum is rotated shall be prohibited.

16.R.09 Guards shall be provided across the top of the head block to prevent wire from jumping out of the sheaves.

16.R.10 All pneumatic or steam hose connections to pile-driver hammers, pile ejectors, or jet pipes shall be securely attached with an adequate length of at least ¼ in (0.6-cm) alloy steel chain, having 3,250 lb (1,500 kg) working load limit, or equal strength wire, to prevent whipping if the joint is broken.

16.R.11 Hydraulic/pneumatic/steam line controls shall consist of two shutoff valves, one of which shall be a quick-acting lever type within easy reach of the hammer operator.

16.R.12 Hoisting and moving pile.

a. All employees shall be kept clear when piling is being hoisted into the leads.

b. Hoisting and driving of piling shall be done by use of a closed shackle or other positive attachment that will prevent accidental disengagement of the rigging.

c. Taglines shall be used for controlling unguided piles and free hanging (flying) hammers.

d. Hammers shall be lowered to the bottom of the leads while the pile driver is being moved.

16.R.13 When driving jacked piles, all access pits shall be provided with ladders and bulk headed curbs to prevent material from falling into the pit.

16.R.14 When it is necessary to cut off the tops of driven piles, pile-driving operations shall be suspended except where the cutting operations are located at least twice the length of the longest pile cut-off from the driver.

16.R.15 Pile extraction.

a. If piling cannot be pulled without exceeding the load rating of equipment, a pile extractor shall be used.

b. When pulling piling, the crane shall be equipped with LMI devices (unless the load can be calculated and is within the load rating chart of the crane) and the booms shall not be raised more than 60° above the horizontal. (This requirement does not apply to vibrating-type pulling devices.)

c. Piling shall not be pulled by tipping the crane, releasing the load brake momentarily, and catching the load before the crane has settled.

d. Rigging. When pulling pile, the hook shall have the positive locking safety latch. This latch shall be secured so rigging gear roll will not occur.

16.R.16 Floating pile drivers. > See Section 16.L.

16.S Hydraulic Excavators, Wheel/Track/Backhoe Loaders Used to Hoist Loads with Rigging.

16.S.01 Personnel shall not work in, pass under, or ride in the buckets or booms of excavators in operation.

16.S.02 Hydraulic excavating equipment shall not be used to hoist personnel. The riding of personnel on loads, hooks, hammers, buckets or any other hydraulic excavating equipment attachment is prohibited.

16.S.03 Excavators used with attachments such as drill rigs, pile driving equipment, etc. shall require training specific to that operation for the operator.

16.S.04 Hydraulic excavating equipment may only be used to hoist loads if allowed by the equipment manufacturer. If these procedures are unavailable, you are prohibited from performing this function.

16.S.05 When hydraulic excavating equipment is to be used to hoist loads utilizing hooks, eyes, slings, chains, or other rigging the following requirements shall apply:

a. Operations involving the use of hydraulic excavating equipment and rigging to hoist loads require different operator skills and considerations than the standard excavating operations routinely performed with hydraulic excavating equipment. An AHA specific to the hoisting operation shall be prepared. The AHA shall include, but not be limited to:

(1) Written proof of qualifications of equipment operators, riggers, and others involved in the hoisting operations;

(2) Other personnel may also operate this equipment under the specific conditions as identified in Section 16.B.01.

(3) Operational testing shall be performed as described in Section 16.S.05.b;

(4) Proper operating procedures in accordance with the equipment manufacturer's operating manual;

(5) Proper use and on site availability of manufacturer's load rating capacities or charts;

(6) Proper use of rigging, including positive latching devices to secure the load and rigging;

(7) Inspection of rigging;

(8) Use of tag lines to control the load;

(9) Adequate communications;

(10) Establishment of a sufficient swing radius (equipment, rigging and load); and

(11) Stability of surfaces beneath the hydraulic excavating equipment.

b. An operational test with the selected hydraulic excavating equipment will be performed in the presence of the GDA.

(1) The operational test shall consist of a demonstration that the test load and selected rigging can be safely lifted, maneuvered, controlled, stopped, and landed.

(2) The operational test shall be representative of the complete cycle of the proposed hoisting operation, including configuration, orientation and positioning of the excavating equipment and the use of identical rigging.

(3) The test load shall be equivalent to the maximum anticipated load, but shall not exceed 100% of the manufacturer's load rating capacity for the excavating equipment as configured. Written documentation of the performance of the operational test outlining test procedures and results shall be maintained at the on-site project office.

c. All rigging and rigging operations shall comply with requirements of Section 15.

d. Hooks, eyes, slings, chains or other rigging shall not be attached to or hung from the teeth of a bucket during the transporting or hoisting of a load by hydraulic excavating equipment.

e. After the completion and acceptance of an operational test described in this Section, if repairs, major maintenance or reconfiguration are required to be performed on the hydraulic excavating equipment or attachments, another operational test shall be performed to demonstrate that the completed repairs are satisfactory and that the test load and selected rigging can be safely lifted, maneuvered, controlled, stopped, and landed.

16.S.06 Loads shall be lifted the minimum height necessary to clear the ground or other obstacles and carried as low as possible when the equipment is traveling.

16.S.07 Loads shall not be lifted over personnel.

16.S.08 Adequate clearances shall be maintained from electrical sources.

16.T LHE-Supported Personnel (Work) Platforms.

16.T.01 LHE-supported personnel platforms are only allowed to be used if the crane manufacturer allows personnel lifting to occur on that equipment. In addition, provisions must be made for lowering of the personnel in the event of a (crane) power failure.

16.T.02 Only LHE with power-operated up and down boom hoists and load lines shall be used to support work platforms. The use of machines having live booms is prohibited (i.e., friction cranes). Platforms shall be lowered under power and not by the brake.

16.T.03 If a LHE-supported work platform is determined to be the safest, most practical method of access, the operation shall be deemed a critical lift (per Section 16.H) and meet the following requirements:

a. The person responsible for the lift shall perform an AHA and attest to the need for the operation in writing.

b. The responsible person shall sign the AHA and submit it to the GDA for acceptance.

c. Personnel shall not be hoisted until the GDA has accepted the AHA.

d. Crane supported work platforms may be used for routine access of employees to underground construction via a shaft.

16.T.04 The work platform and suspension system shall be designed and certified by an RPE with knowledge in this area.

a. The work platform (excluding fall protection systems) shall be capable of supporting, without failure, its own weight and at least five times the maximum intended load. Criteria for fall protection systems are contained in Sections 21 and 16.T.10.

b. The suspension system shall be designed to minimize tipping of the platform due to movement of the employees on the work platform.

c. The system used to connect the work platform to the equipment shall allow the platform to remain within 10 degrees of level, regardless of boom angle.

d. All welding of the work platform and its components shall be performed by an AWS D-1 Certified Welder.

16.T.05 LHE-supported work platforms shall meet the following requirements:

a. The scaffold shall be of metal or metal frame construction with a standard guardrail system and shall be enclosed at least from the toeboard to mid-rail with either solid construction material or expanded metal having openings no greater than ½ in (1.2 cm).

b. A grab rail shall be installed inside the entire perimeter of the personnel platform.

c. Access gates, if installed, shall not swing outward and shall be equipped with a device to prevent accidental opening.

d. Headroom shall be provided which allows employees to stand upright in the platform.

e. Employees shall be protected by overhead protection on the personnel platform when the employee(s) are exposed to falling objects.

f. The platform shall be conspicuously posted with a plate or other permanent marking that indicates the weight of the platform and its rated load capacity or maximum intended load.

16.T.06 Rigging.

a. When a wire rope bridle is used to connect the work platform to the load line, each bridle leg shall be connected to a master link or shackle in such a manner to ensure that the load is evenly distributed among the bridle legs.

b. The hook connection to the platform rigging shall be of a type that can be closed and locked to eliminate the hook throat opening and shall be closed and locked when attached. Alternately, an alloy anchor type shackle with a bolt, nut, and retaining pin, in place OR of the screw type, with the screw pin secured from accidental removal may be used.

c. Wire rope, rigging hardware and hooks shall be capable of supporting, without failure, at least five times the maximum intended load.

d. Where rotation-resistant rope is used the slings shall be capable of supporting without failure at least ten times the maximum intended load.

e. Rope sling suspension systems with mechanically spliced flemish eyes, if used, shall be designed with thimbles in all eyes.

f. Bridles and associated rigging for attaching the platform to the hoist line shall be used only for the platform and the employees, their tools and the materials necessary to do the work and shall not be used for any other purpose when not hoisting personnel.

16.T.07 Work Practices.

a. Before employees enter or exit a hoisted personnel platform that is not landed, the platform shall be secured to the structure, unless securing to the structure creates an unsafe condition.

b. The rated load capacity of the platform shall not be exceeded.

c. The number of employees occupying the work platform shall not exceed the number required for the work to be performed.

d. Work platforms shall be used only for employees, their tools and the materials necessary to do their work. Work platforms shall not be used to hoist only materials or tools when not hoisting personnel.

e. Materials and tools for use during a personnel lift shall be secured to prevent displacement. They shall be evenly distributed within the confines of the platform while it is suspended.

f. No lifts shall be made on another of the crane’s load lines while personnel are suspended on a platform.

g. Employees (except a designated signal personal) shall keep all parts of the body inside the platform during raising, lowering, and positioning.

h. A CP shall observe the operations while personnel are working from the crane supported work platform.

i. Environmental conditions.

(1) Wind. When wind speed (sustained or gusts) exceeds 20 mph (9 m/s) at the work platform, a QP shall determine if, in light of the wind conditions, if it is safe to lift personnel. If not, the lifting operation shall be terminated.

(2) Other weather and environmental conditions. A QP shall determine if, in light of indications of dangerous weather conditions, or other impending or existing danger, it is safe to lift personnel. If not, the lifting operation shall be terminated.

j. Employees being hoisted shall remain in the continuous sight of, and in direct communication with, the LHE operator or signal person. In situations where direct visual contact with the operator is not possible and the use of a signal person would create a greater hazard for that person, direct communication by radio shall be maintained at all times. The equipment operator shall bring all operations to an immediate stop if radio communications are lost.

k. Taglines shall be used to help control the work platform unless the CP determines that their use creates an unsafe condition.

l. The LHE operator shall remain at the controls at all times with the crane engine running whenever the platform is occupied.

m. Hoisting personnel within 20 ft (6 m) of a power line that is up to 350 kV and hoisting personnel within 50 ft (15.2 m) of a power line that is over 350 kV is prohibited, except for Power Transmission and Distribution Work.

16.T.08 Operational Criteria

a. Hoisting of the personnel platform shall be in a slow, controlled, cautious manner with no sudden movements.

b. Load lines shall be capable of supporting, without failure, at least 7 times the maximum intended load, except where rotation resistant rope is used the lines shall be capable of supporting, without failure, at least 10 times the maximum intended load. The required design factor is achieved by taking the current safety factor of 3.5 and applying the 50% de-rating of the crane capacity.

c. A Qualified Person must determine if the footing is sufficiently firm and stable for the operation. The crane shall be uniformly level within 1 degree of level grade and located on firm footing. LHE equipped with outriggers shall have them all equally deployed to load chart criteria following manufacturer's specifications, as applicable, when hoisting personnel.

d. The total weight of the loaded personnel platform and related rigging shall not exceed 50% of the rated capacity for the radius and configuration of the crane.

e. Only LHE with an A2B device that prevents contact between the load block or overhaul ball and the boom tip, or a system that deactivates the hoisting action before damage occurs shall be used.

f. LHE with variable angle booms shall be equipped with a boom angle indicator readily visible to the operator.

g. LHE with telescoping booms shall be equipped with a device to indicate clearly to the operator, at all times, the boom's extended length, or an accurate determination of the load radius to be used during the lift shall be made prior to hoisting personnel.

h. The load line hoist drum shall have a system or device on the power train, other than the load hoist brake, that regulates the lowering rate of speed of the hoist mechanism (controlled lowering). Free-fall is prohibited.

16.T.09 Trial Meeting, Trial Lift and Inspection.

a. Prior to every trial lift, the LHE operator, signal person, employees to be lifted, and the CP shall attend a pre-lift meeting to review the applicable parts of this manual, the AHA, and the details of this particular lift.

b. A trial lift with the unoccupied work platform loaded at least to the anticipated lift weight shall be made from the ground level, or any other location where employees will enter the platform, to each location at which the work platform is to be hoisted and positioned.

c. The trial lift shall be made immediately prior to each shift in which personnel will be hoisted and must be repeated prior to hoisting employees after the LHE is moved and set up at new location or returned to a previously used location, and when the lift route is changed unless the CP determines that the route change is not significant.

d. The operator shall determine that all systems, controls, and safety devices are activated and functioning properly; that no interferences exist; and that all configurations necessary to reach those work locations will allow the operator to remain under the 50% limit of the equipment's rated capacity.

e. Materials and tools to be used during the actual lift may be loaded in the platform (evenly distributed and secured) for the trial lift.

f. After the trial lift and just prior to hoisting employees, the platform shall be hoisted a few inches and inspected to ensure that it is secure and properly balanced.

g. A visual inspection of the LHE, rigging, work platform, and the crane support base shall be conducted by a CP immediately after the trial lift to determine whether the testing has exposed any defect or produced any adverse effect upon any component or structure.

h. Any defects found during inspection which create a safety hazard shall be corrected before hoisting personnel.

i. If the load rope goes slack, the hoisting system shall be re-inspected to ensure that all ropes are properly seated on drums and sheaves.

16.T.10 Proof Testing

a. At each job site, prior to hoisting employees on the work platform, and after any report or modification, the platform and rigging shall be proof tested to 125% of the platform's rated capacity by holding it in a suspended position for 5 minutes with the proof test load evenly distributed on the platform (this may be done concurrently with the trial lift).

b. After proof testing, a CP shall inspect the platform and rigging. Personnel hoisting shall not be conducted until the CP determines that the platform and rigging have successfully passed the proof test.

16.T.11 Personal Fall Protection.

a. For work over water, see Section 21.O for fall protection versus PFD requirements. Lifesaving equipment and safety skiffs meeting the requirements of this manual shall be available.

b. When NOT working over water, all employees occupying the work platform shall use a properly anchored personal fall protection (arrest or restraint) system. The system shall be attached to an allowed anchorage point/structural member within the platform.

(1) The attachment points to which personal fall arrest or restraint systems are attached on the platform must meet the anchorage requirements in Section 21.

(2) Depending on the type of work to be done and the height of the work platform above a lower surface, all workers shall wear a full body harness as part of a fall arrest or fall restraint system. The CP for fall protection on-site will assess each situation and determine which system would best fit the current work requirement and be in accordance with the crane manufacturer's instructions and recommendations. Particular attention should be paid to anchor points and capacities.

(3) Workers working from the platform suspended from LHE are permitted to be tied off to the lower load block or overhaul ball. An AHA shall be developed to details on how work will be safely performed. AHA shall be submitted to the GDA for acceptance.

(4) Anchoring to the load line. A personal fall arrest system is permitted to be anchored to the crane's hook (or other part of the load line). This activity requires a critical lift plan to be developed and implemented, per Section 16.H.01. In addition, the following requirements must be met:

(a) There is no other load on the load line;

(b) A QP has determined that the set-up and rated capacity of the LHE (including the hook, load line and rigging) meets or exceeds the requirements in Section 21. This information shall be placed in/attached to the AHA developed for the activity;

(c) The equipment operator shall be located in or adjacent to the cab, has been informed that the equipment is being used for this purpose, shall remain in contact (verbal, radio, hand signals) with the signal person for the operation and shall remain in direct control of any intended movement of the load line. If the operator is not in the cab, the controls shall be locked/tagged out so that no movement of the load line can occur without his knowledge.

16.T.12 Employees shall not be hoisted unless the following conditions are determined to exist:

a. The load test and proof test requirements are satisfied;

b. Hoist ropes are free of kinks;

c. Multiple part lines are not twisted around one another,

d. The primary attachment is centered over the platform, and

e. The hoisting system is inspected if the load rope is slack to ensure all ropes are properly seated on drums and in sheaves.

16.T.13 Traveling – equipment other than derricks.

a. Hoisting of personnel while the crane is traveling is prohibited, except for equipment that travels on fixed rails or it is demonstrated that there is no less hazardous way to perform the work. This does not apply to rubber-tired equipment.

b. Where employees are hoisted while the equipment is traveling, all of the following criteria must be met:

(1) Crane travel shall be restricted to a fixed track or runway;

(2) Travel shall be limited to the load radius of the boom used during the lift;

(3) The boom must be parallel to the direction of travel, except where it is safer to do otherwise;

(4) A complete trial run shall be performed to test the route of travel before employees are allowed to occupy the platform (this trial run may be performed when the trial lift required in Section 16.T.08 is performed).

16.U Base-Mounted Drum Hoists Used to Hoist Personnel, Guided and Non-Guided Worker's Hoists (Air Tuggers). (Whether Powered by Internal Combustion Engine, Electric Motor or Other Prime Mover).

16.U.01 The use of this equipment to hoist personnel requires the development of a written Standard Operating Procedure (SOP). All personnel involved with the use of this equipment shall assist in the development of this SOP. The SOP shall be maintained for a period of no more than12 months, at which time it shall be reviewed and changed as necessary. All operators that will be hoisting personnel shall have a physical examination per 16.B.05 and shall be trained at a minimum, in the requirements listed in 16.U. and 16.T. > USACE operators shall also be trained as Class II operators per Section 16.C.05.

16.U.02 This equipment shall meet the applicable requirements for design, construction, installation, testing, inspection, maintenance and operations as required by the manufacturer, to include an 8:1 safety factor for the hoist rope. > See ASSE A10.22.

16.U.03 For operations within the scope of the ASSE A10.22 standard, a base mounted drum hoist (rope-guided) or non-rope guided hoists shall be used when hoisting personnel. The hoist shall be used in accordance with the manufacturer's recommendations for these applications.

16.U.04 The hoist machine shall meet all criteria set forth in ASSE A10.22, Chapter 4.

16.U.05 The operator of the hoist shall be qualified and instructed in the proper operation of the hoisting system, in accordance with manufacturer's recommendations.

16.U.06 The hoist may be used to hoist materials or personnel, but not both simultaneously.

16.U.07 An independent lifeline and a full body harness shall be provided and used by any person being transported. Personal fall protection is not required when fully enclosed baskets are used.

16.U.08 Voice communications shall be maintained between the hoist operator and each landing.

16.U.09 A minimum of two guide ropes (for rope-guided hoists) shall be used when transporting personnel in the cage. Splicing of the hoisting and guide ropes shall not be spliced except for the formation of end terminations.

16.U.10 A sign stating capacity in number of persons and rated loading in pounds shall be posted on the cage.

16.U.11 Inspection and Testing.

a. Visual checks shall be conducted daily prior to use (during use).

b. Inspections (no drop test) shall be conducted weekly when hoist is in continuous operation and before reuse following periods of idleness in excess of one week.

c. Documentation at each job location shall be maintained and kept on file for at least 2 years.

16.U.12 Non-Guided Hoist for Personnel/Air tugger hoist. This equipment may be substituted for a base mounted drum hoist and in addition to the requirements above, must meet the following:

a. Hoist shall be secured in position to prevent moving, shifting or dislodgement;

b. Hoist machine may be operated at cable speeds not to exceed 110 ft/min when transporting personnel on a non-guided worker's hoist;

c. An independent lifeline and a full body harness shall be provided and used by any person being transported by a non-guided hoist. Personal fall protection is not required when fully enclosed baskets are used.

d. Rope grabs (fall prevention devices) for connecting a safety harness to the lifeline shall be of a type that can be attached to or detached from the independent lifeline. They shall be compatible with the lifeline size and type of material being used. Attachment to the lifeline shall be maintained at a point above waist height of the person. Other devices that provide equivalent safety may be used;

e. Minimum wire rope diameter shall be 5/16 inch (7.9mm);

f. Non-guided hoist line shall be weighted as necessary to prevent line run of the hoisting rope under the basket.

FORM 16-1 Certificate of Compliance for LHE and Rigging	
This certificate shall be signed by an official of the company that provides LHE/cranes and rigging gear for any application under this contract.	
Contracting Officer's Point of Contact: (Government Designated Representative)	Phone #:
Prime Contractor/Phone #:	Contract Number:
SSHO/QC:	Phone #:
LHE Manufacturer/Type/Capacity:	
LHE Operator(s) Name(s):	
I certify that: 1. The above noted LHE and all rigging gear conform to the EM 385-1-1, applicable OSHA regulations (host country regulations in foreign countries) and applicable ASME standards. 2. The operator(s) noted above has been trained, qualified and designated in accordance with the requirements in Section 16, EM 385-1-1 for the operation of the above noted LHE. 3. The operator(s) noted above has been trained not to bypass safety devices during LHE operations. 4. The operator(s), rigger(s) and company official (staff) are aware that immediate notification to the GDA of any incident or accident involving this equipment is required.	
Company Official Signature:	Date:
Company Official Name/Title:	
Post on Crane/LHE. (In Cab and Contractor's Office for each LHE onto USACE Project/Property)	

FORM 16-2

Standard Pre-Lift Crane Plan/Checklist

DATE: ___/___/_____ Job Number: _____ Location: _____

TIME: _____ Completed By (Competent Person):_____

NOTE: Applies to Cranes, Derricks, Hoists and Power-Operated equipment that can be used to hoist, lower and/or horizontally move a suspended load (includes excavators, forklifts, Rough Terrain equipment, etc., when used with rigging).

Crane Considerations		Yes	No
1	Are the lifts within the crane's rated capacities? (based on boom height, radius)		
2	Boom deflections considered?		
3	Have all potential crane boom obstructions been identified?		
4	Have Environmental Considerations been addressed? (Wind, Weather-Lightning)		
5	Have electrical hazards been addressed (Overhead / Underground) - Clearance distances established? - Is a spotter required? - Public Utility contact required?		
6	Crane swing radius properly barricaded and personnel advised of hazards?		

Comments:

Load		Yes	No
1	Weights and Centers of Gravity (COG) have been Determined?		
2	Anything Inside / Outside the loads that could shift during the lift?		
3	Determine if the rigging needs protection from the loads?		
4	All anchor bolts, hold downs, or fasteners have been removed?		
5	Potential for binding – are load cells required to verify the loads are free?		
6	Attachment points rated to take load weight?		
7	Are the loads structurally capable of being lifted? (bending & twisting issues)		
8	Is a critical lift plan required per the EM section 16.H?		

Comments:

FORM 16-2 (cont'd)

Standard Pre-Lift Crane Plan/Checklist

Rigging		Yes	No
1	All rigging has been inspected by a Qualified Rigger?		
2	Have sling angles been calculated?		
3	Are shackles correctly sized for the sling eyes?		
4	Are softeners needed?		

Comments:

Personnel		Yes	No
1	The roles, responsibilities and qualifications for personnel have been defined? (Operator, Lift Supervisor, Rigger, Signal Person)		
2	A Pre-Lift meeting has been conducted?		
3	Personnel trained per the EM?		

Comments:

Area Preparation		Yes	No
1	The locations for the load landings has been selected and prepared?		
2	Blocking and or Cribbing is available to set the loads on?		
3	Travel paths have been determined and cordoned off?		
4	Other personnel in the area have been notified of the lifts?		
5	Have ground bearing support questions been addressed?		

Comments:

Crane Operator: _____ Date: _____

Riggers: _____ Date: _____

Signal Person: _____ Date: _____

Others: _____ Date: _____

FIGURE 16-1

Crane Hand Signals

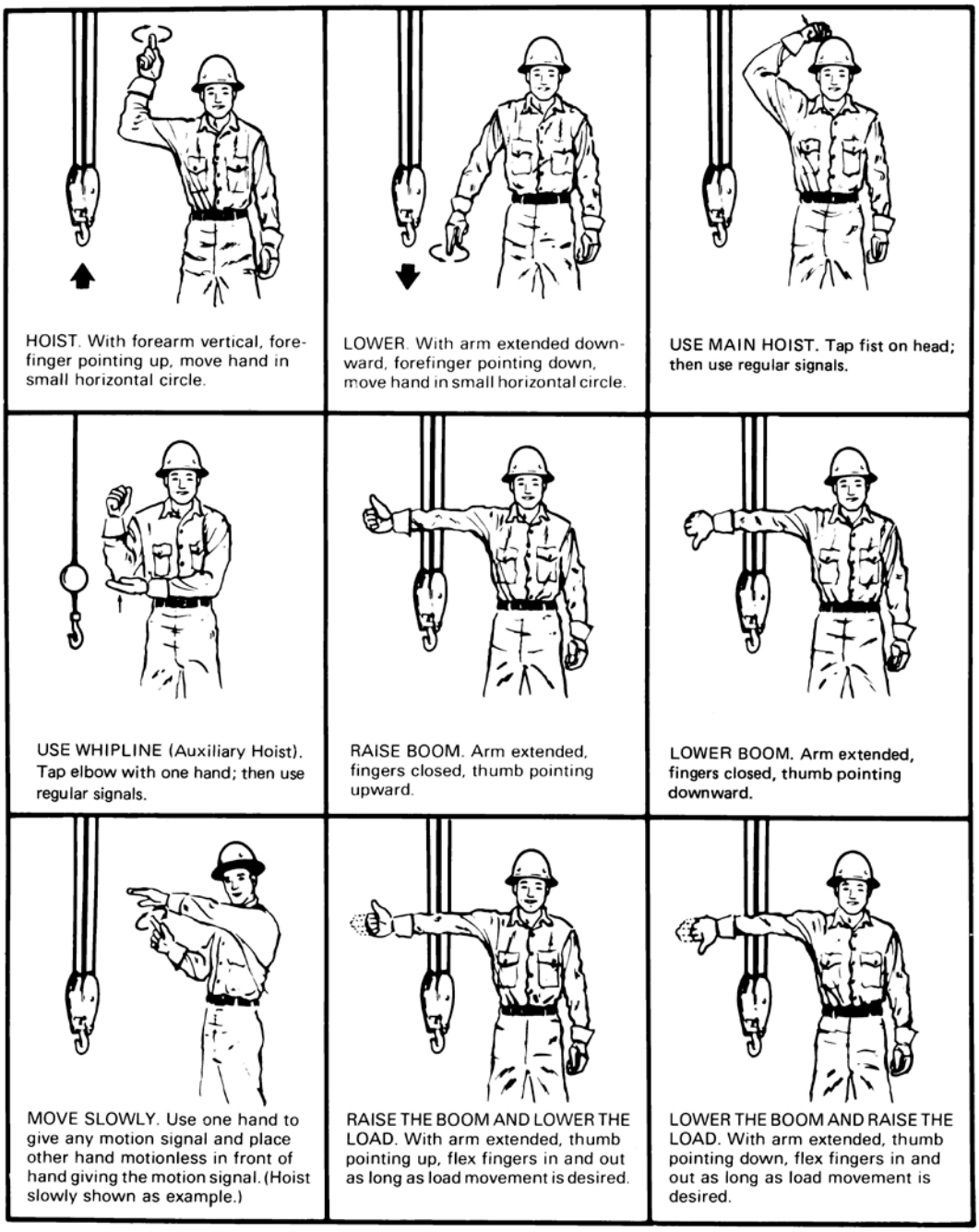


FIGURE 16-1 (Continued)

Crane Hand Signals

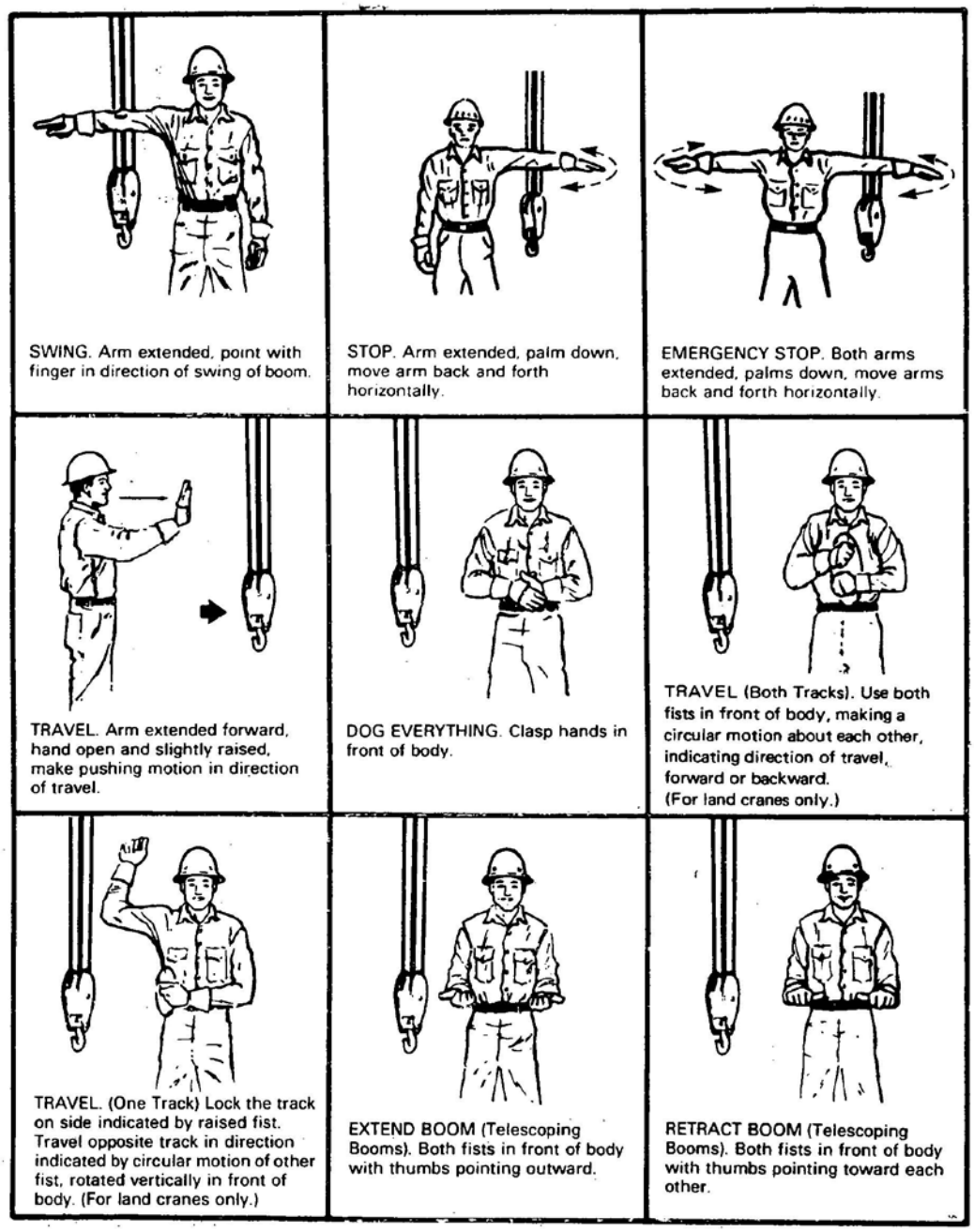
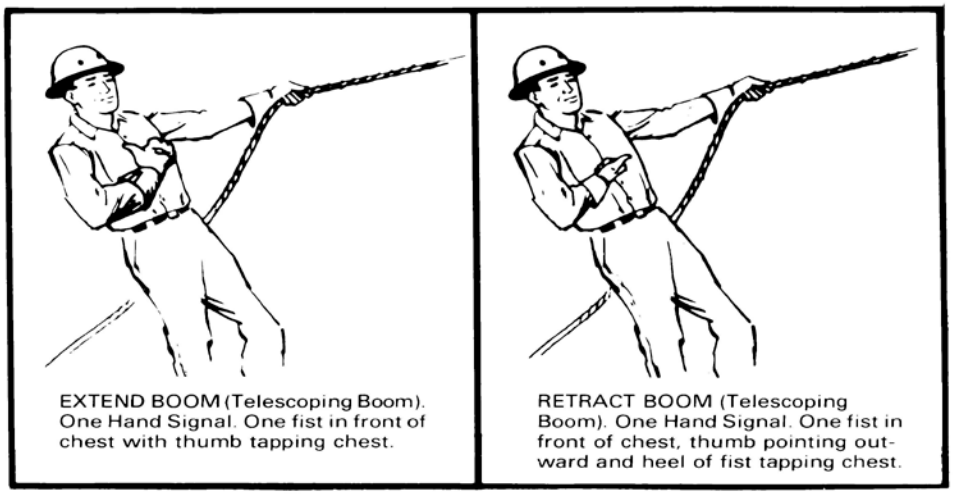


FIGURE 16-1 (Continued)

Crane Hand Signals



FORM 16-3

Critical Lift Plan

U.S. Army Corps of Engineers
CRITICAL LIFT PLAN
For use of this form, see EM 385-1-1, Section 16. Proponent agency is Crane HHWG.

Date:	**Prepared By:**
Location:	**USACE District:**

A "critical lift" can be defined as any non-routine crane lift requiring detailed planning and additional or unusual safety precautions. Critical lifts include lifts made where the load weight is greater than 75% of the rated capacity of the crane; lifts which require the load to be lifted, swung or placed out of the operator's view (except Change 6 exemption) ; lifts made with more than one crane; lifts involving non-routine or technically difficult rigging arrangement; hoisting personnel with a

A. TOTAL LOAD

1. Load Weight		lbs
2. Wt. of Aux. Block		lbs
3. Wt. of Main Block		lbs
4. Wt. of Lifiting Beam		lbs
5. Wt. of Sling/Shackles		lbs
6. Wt. of Jib/Ext. (erected/stowed)		lbs
7. Wt. of Hoist Rope		lbs
8. Other:		lbs
TOTAL WEIGHT		

Note: Source of load weight (Drawings, Calcs, etc.) must be attached on Page 2.

B. CRANE

1. Type of Crane Mobile Hydraulic Truck
2. Maximum Crane Capacity _____ lbs.
3. Radius (Maximum) _____ ft.
4. Radius (Minimum) _____ ft.
5. Boom Length (Maximum) _____ ft.
6. Boom Length (Minimum) _____ ft.
7. Crane Capacity (Max Radius) _____ lbs.
8. Crane Capacity (Min Radius) _____ lbs.
9. Boom Angle (Maximum) _____ deg.
10. Boom Angle (Minimum) _____ deg.
11. Gross Load of Crane _____ lbs.
12. Lift is _____ % of the Crane's rated capacity
13. If Jib/Ext. is to be used:
    Length _____ ft.
    Offset _____ ft.
14. Rated Capacity of Jib/Ext. lbs

C. HOIST ROPE

	Main	*Aux 1*	*Aux 2*
1. # of Parts			
2. Rope Diamter			
3. Capacity			

D. RIGGING

1. Hitch Type(s) _____
2. No. of Slings: _____ Size: _____
3. Sling Type: _____
4. Sling Assembly Capacity: _____ lbs.
5. Shackle Size(s): _____
6. Shackle Rated Capacity(s) _____ lbs.

E. CRANE PLACEMENT ***(Mobile Cranes Only)***

1. Maximum Bearing Pressure _____ PSF
   Note: Bearing Pressure Calculations must be attached on Page 3.
2. Ground Conditions Suitable for Load? _____ YES / NO
   Note: Ground Condition Calculations must be attached on Page 3.
3. High Voltage or Electrical Hazards? _____ YES / NO
   Note: If Elelctrical Hazards are present they must be shown on Page 4.
4. Obstructions to Lift or Swing? _____ YES / NO
   Note: If Obstructions are present they must be shown on Page 4.
5. Travel with Load Required? _____ YES / NO
6. Other? _____

F. OPERATOR QUALIFICATIONS

1. Certified Operator? _____ YES / NO
2. Option? _____
3. Certified for Type, Class & Capacity? _____ YES / NO
4. Designated in writing by emp _____

G. PRE-LIFT CHECKLIST	*(YES)*	*N/A*	*(NO)*
1. Crane Inspected			
2. Rigging Inspected			
3. Crane Set-up			
4. Overhead Hazard Check			
5. Swing Check			
6. Counterweight Check			
7. Operator Qualifications			
8. Signal Person Qualifications			
9. Rigger Qualifications			
10. Load Chart in Crane			
11. Load Test			
12. Tag Lines			
13. Wind Conditions			
14. Traffic Hazard Check			
15. Site Control			
16. Signatures			

H. SIGNATURES

1. Crane Operator _____
2. Rigger _____
3. Signal Person _____
4. Lift Supervisor _____
5. Other _____
6. Other _____

U.S. Army Corps of Engineers

CRITICAL LIFT PLAN

For use of this form, see EM 385-1-1, Section 16. Proponent agency is Crane HHWG.

LOAD CALCULATIONS

Show here or attach calculations, drawings, etc.

U.S. Army Corps of Engineers

CRITICAL LIFT PLAN

For use of this form, see EM 385-1-1, Section 16. Proponent agency is Crane HHWG.

BEARING PRESSURES & GROUND CONDITIONS

Show here or attach calculations, drawings, etc.

U.S. Army Corps of Engineers

CRITICAL LIFT PLAN

For use of this form, see EM 385-1-1, Section 16. Proponent agency is Crane HHWG.

LOAD CHART

Show here or attach load chart

U.S. Army Corps of Engineers

CRITICAL LIFT PLAN

For use of this form, see EM 385-1-1, Section 16. Proponent agency is Crane HHWG.

OPERATOR, RIGGER, SINGAL PERSON QUALIFICATIONS

Show here or attatch operator qualifications

U.S. Army Corps of Engineers

CRITICAL LIFT PLAN

For use of this form, see EM 385-1-1, Section 16. Proponent agency is Crane HHWG.

SITE PLAN

Show here or attach site plan and sequencing

Figure 16-2

Dedicated Pile Driver, Example

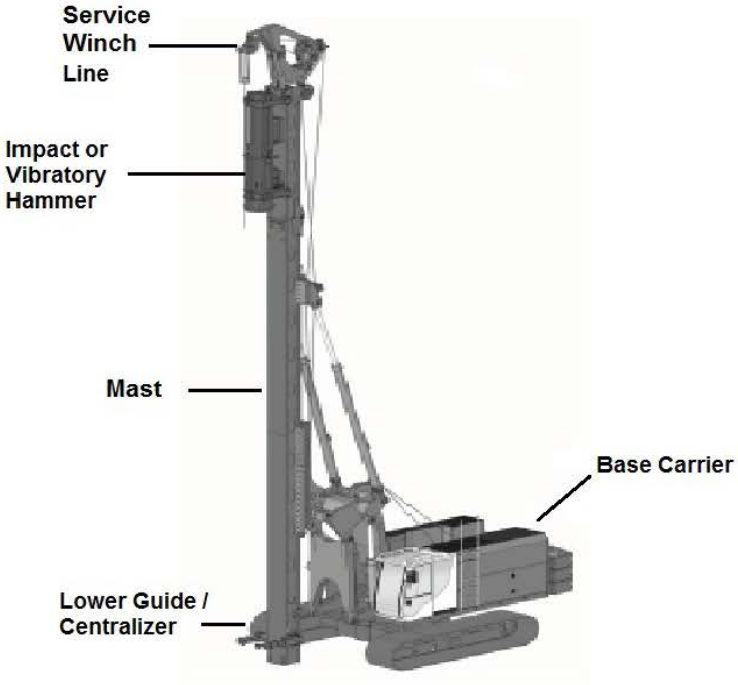


FIGURE 16 - 2, DEDICATED PILE DRIVER (EXAMPLE)

Figure 16-3

Non-Dedicated Pile Driver, Example

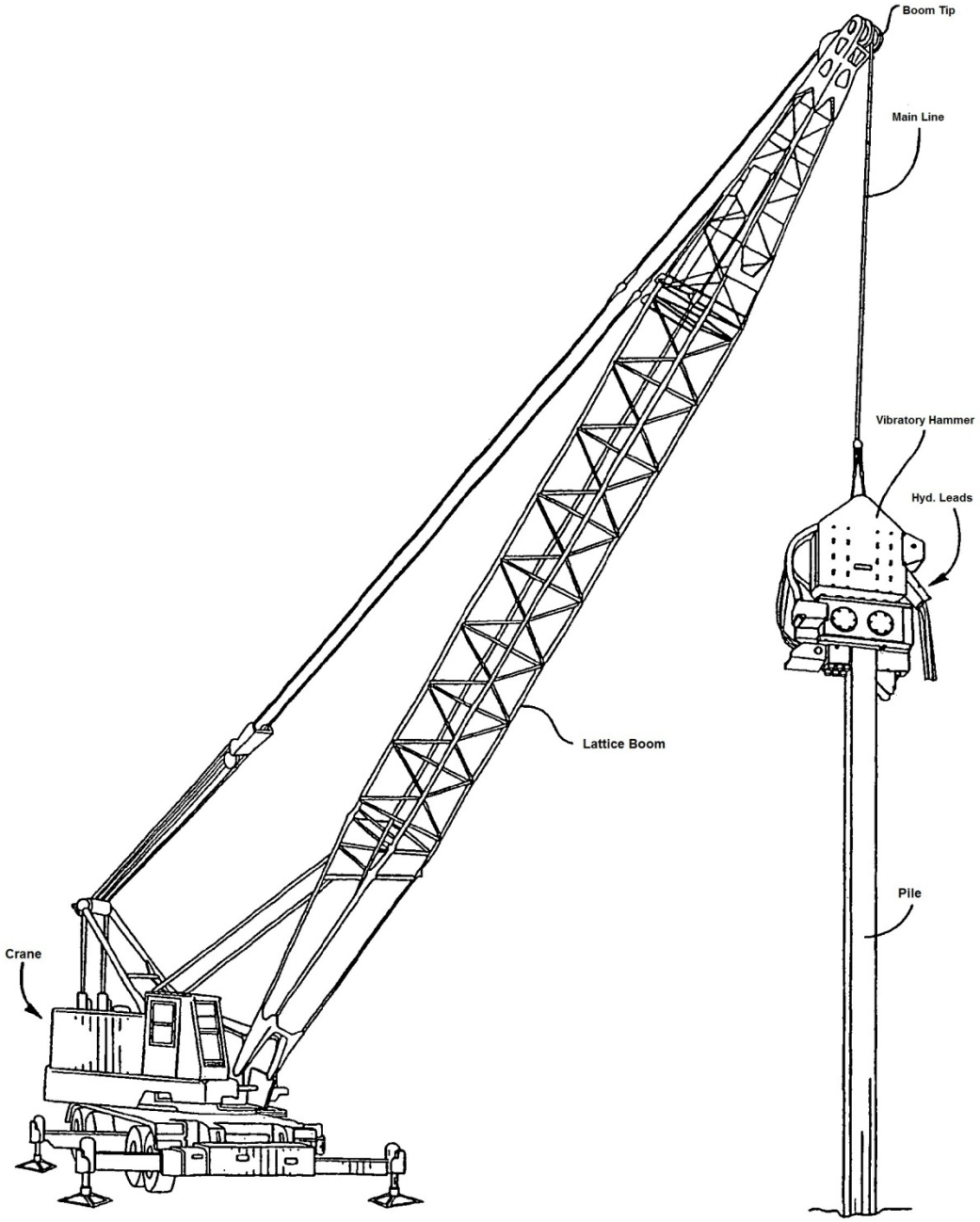
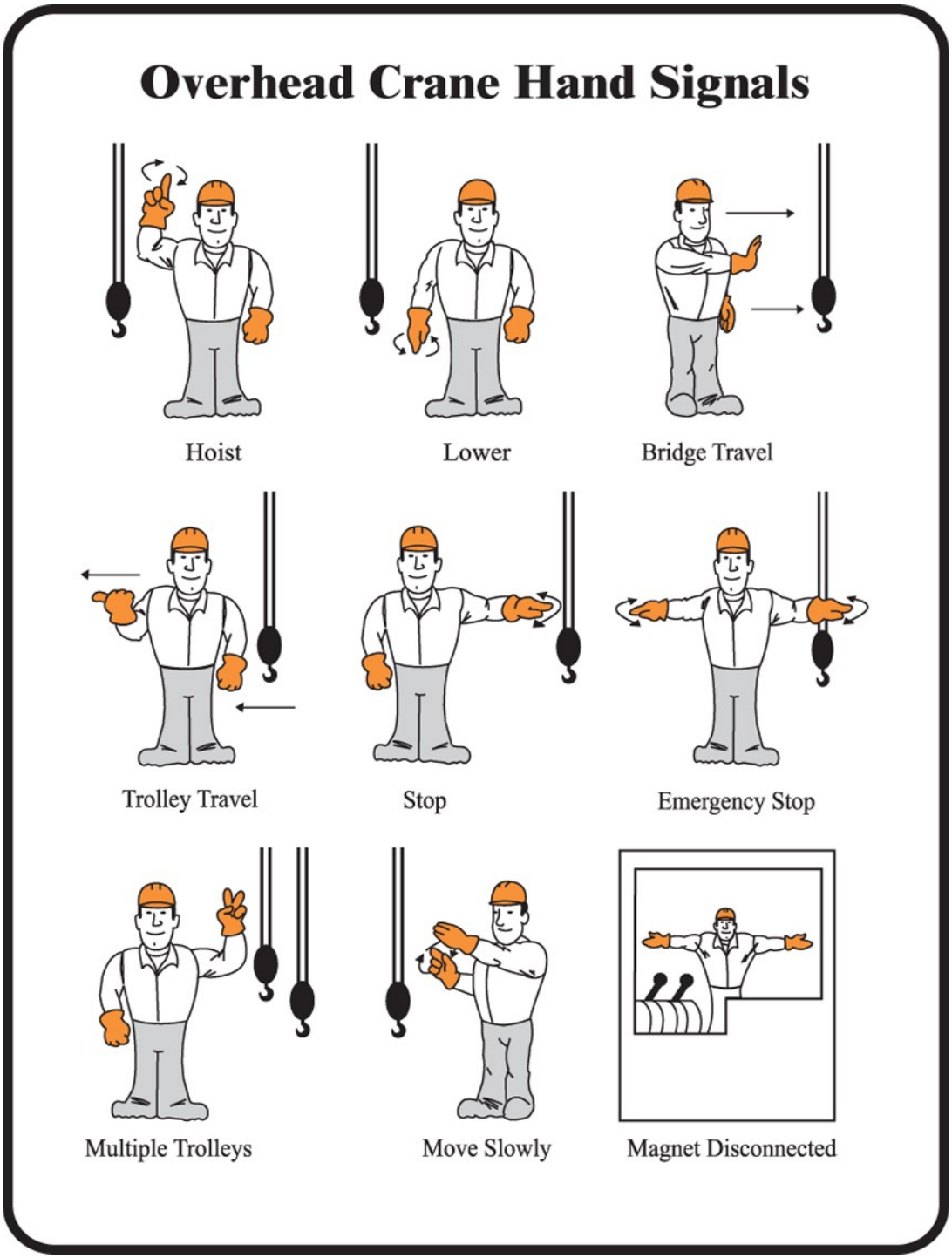


FIGURE 16 - 3, NON-DEDICATED PILE DRIVER (EXAMPLE)

FIGURE 16-4

Crane Hand Signal – Overhead and Gantry



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Section 17
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Conveyors

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SECTION 17

Conveyors

17.A General. Conveyor systems shall be constructed and installed in accordance with the manufacturer's recommendations.

17.A.01 Inspection, maintenance, and repair. These activities shall be performed in accordance with the manufacturer's recommendations by a Qualified Person (QP). The entire system shall be visually inspected daily before start up.

a. No maintenance shall be performed when a conveyor is in operation except for the following:

(1) If lubrication is to be done while the conveyor is in motion, lubrication points shall be accessible through guard openings which are small enough that fingers cannot reach the hazardous locations. Only trained personnel who are aware of the hazards of the conveyor in motion shall be allowed to lubricate a conveyor that is operating; and

(2) When adjustments or maintenance is required while the conveyor is in operation, only trained personnel who are aware of the hazards shall be permitted to make the adjustment or maintenance. If guards need to be removed for the adjustment or maintenance, the conveyor MUST be locked out prior to removing the guards.

b. Hazardous Energy Control Procedures shall be used for maintenance and servicing other than lubrication which is done without removing guards. > See Section 12.

c. Safe access shall be provided to permit inspection, lubrication, repair and maintenance activities.

17.A.02 Safety devices.

a. On all conveyors where reversing or runaway are potential hazards or the effects of gravity create a potential for hazardous uncontrolled lowering, anti-runaway devices, brakes, backstops, or other safeguards shall be installed to protect persons from injury and property from damage.

b. Conveyor systems shall be equipped with a time-delay audible and visual warning signal to be sounded immediately before starting of the conveyor. On overland conveyor systems, the devices shall be required only at the transfer, loading, and discharge points and those points where personnel are normally stationed.

c. Safety devices shall be arranged to operate in such a manner that if power failure or a failure of the device occurs a hazardous condition would not result. The safety devices shall be designed to prevent the conveyor from restarting until the safety device is manually reset.

17.A.03 All exposed moving machinery parts that present a hazard shall be mechanically or electrically guarded or guarded by location.

a. Nip and shear points shall be guarded.

b. Take-up mechanisms may be guarded as an entity by placing standard railings or fencing, and warning signs, around the area in lieu of guarding each nip and shear point.

c. In the case of a trolley conveyor when mechanical or electrical guarding would render the conveyor unusable, prominent and legible warnings shall be posted in the area or on the equipment and, where feasible, areas barricaded or lines marked on the ground to indicate the hazard area.

d. Guards shall be provided at points where personnel could contact cables, chains, belts, and runaways of exposed bucket conveyors.

e. Unless guarded by location, those sections of chain conveyors that cannot be enclosed without impairing the function shall be provided with warning signs or personnel barriers.

f. Trolley conveyors shall be provided with spill guards, pan guards, or the equivalent if there is a potential for material to fall off the conveyor and endanger personnel or equipment.

g. At transfer, loading, and discharge points, unconfined and uncontrolled free fall of material that may result from flooding, ricocheting, overloading, trajectory, leakage, or a combination thereof, shall be prevented if the material would create a hazard to personnel.

➢ Note: In the absence of a guard specifically erected to protect personnel, warnings shall be provided to restrict unauthorized personnel from entering such hazardous areas.

h. At all points along the conveyor, except at points where loads are removed from or placed on a conveyor or where a conveyor discharges to or receives material from another conveyor, provisions shall be made to eliminate the possibility of loads or material being dislodged from the conveyor.

i. The build-up of excess material shall be removed from all points along the conveyor.

17.A.04 Access.

a. Crossovers or underpasses with safeguards shall be provided for passage over or under all conveyors: crossing over or under conveyors is prohibited except where safe passageways are provided.

b. Whenever conveyors pass adjacent to, or over, work areas, roadways, highways, railroads, or other public passageways, protective guards shall be installed. The guards shall be designed to catch and hold any load or material that may fall off or become dislodged from the system.

c. Where conveyors are operated in tunnels, pits, and similar enclosures, ample room shall be provided to allow safe access and operating space for all personnel.

17.A.05 Operating controls.

a. Unless the design, construction, and operation of a conveyor is clearly non-hazardous to personnel, emergency stop buttons, pull cords, limit switches, or similar emergency devices shall be provided at the following locations:

(1) Operator stations;

(2) Loading arms;

(3) Transfer points; and

(4) Other potentially hazardous locations on the conveyor path not guarded by location or guards.

b. Emergency stop buttons shall be red in color, easily identifiable and readily accessible. They shall not be protected with collars or other devices which might make it difficult to activate.

c. Emergency stop devices shall act directly on the control of the conveyor concerned and shall not depend on the stopping of any other equipment. If a multi-conveyor system, the emergency stop shall stop all conveyors that are tied together.

d. Emergency stop devices shall be installed so that they cannot be overridden from other locations.

e. Starting controls shall be GREEN in color and protected from accidental activation.

f. All controls shall be clearly labeled to identify their function.

g. Conveyor controls shall be arranged so that in case of an emergency stop, manual reset or restart is required at the location where the emergency stop was initiated to resume conveyor operations.

17.A.06 Control stations shall be arranged and located so that the operation of the equipment is visible from them.

17.A.07 Gates and switches.

a. Power-positioned gate and switch sections shall be provided with devices that will prevent these sections from falling in case of power failure.

b. Means shall be provided on all gates and switch sections to prevent conveyed material from discharging into the open area created by lifting of the gate or switch.

17.A.08 Counterweights.

a. When counterweights are supported by belts, cables, chains, or similar means, the weights shall be confined in an enclosure to prevent the presence of personnel beneath the counter-weight, or the arrangement shall provide a means to restrain the falling weight in case of failure of the normal counterweight support.

b. When counterweights are attached to lever arms they shall be securely fastened.

17.A.09 When two or more conveying systems are interfaced, special attention shall be given to the interfaced area to ensure the presence of adequate guarding and safety devices.

17.A.10 Hoppers and chutes.

a. All openings to the hopper and chutes shall be guarded to prevent persons from accidentally stepping into them. If guards are not practical, warning signs shall be posted.

b. Dump hoppers having the hopper flush with the floor and which by their use cannot be guarded shall be equipped with grating having a maximum opening of 4 in (10 cm) and heavy enough to withstand any load which may be imposed on it. If the openings in the grating are larger or if no grating is provided, temporary railing shall be placed around ground level hoppers when dumping operation are not in progress. During dumping operation, warning signs shall be placed in conspicuous locations warning personnel of an open pit.

17.A.11 Mobile conveyors.

a. Mobile conveyors shall be provided with brakes or other position locking devices for each degree of motion where movement would present a hazard.

b. Mobile conveyors shall be designed to be stationary against runaway and stable against overturning under normal conditions of operation.

c. When an operator is required on a mobile conveyor, a platform or cab shall be provided for his/her protection.

17.A.12 Portable conveyors.

a. The raising and lowering mechanism for the boom of a portable conveyor shall be provided with a safety device that will hold the boom at any rated angle of inclination.

b. Portable conveyors shall be stable so that the conveyor will not topple when used with the manufacturer's rating and in a manner in which it was intended or when being moved.

17.A.13 Screw Conveyors.

a. Screw conveyors shall not be operated unless the conveyor housing completely encloses the conveyor moving elements and power transmission guards are in place, except that if the conveyor must have an open housing as a condition of use, the entire conveyor shall then be guarded by railing, fence, or by location.

b. Feed openings for shovel, front-end loader, or other manual or mechanical equipment shall be constructed in such a way that the conveyor screw is covered by grating. If the nature of the material is such that grating cannot be used, then the exposed section of the conveyor shall be guarded by a railing and warning signs shall be posted.

17.A.14 Conveyors shall be properly grounded before use and all connections, switches and cables shall conform to the National Electric Code (NEC).

17.B Operation.

17.B.01 Conveyor equipment shall be used to convey only those materials for which it was designed and within the rated capacities and speeds.

17.B.02 Flight and apron conveyors shall be "jogged" or hand run through at least one complete revolution at installation to check design clearances prior to running under automatic power.

17.B.03 A conveyor that could cause injury when started shall not be started until all personnel in the area are alerted by a signal or by a designated person that the conveyor is about to start.

17.B.04 When a conveyor that could cause injury when started is automatically controlled or must be controlled from a remote location, an audible warning device shall be provided. The device shall be clearly audible at all points along the conveyor where personnel may be present.

a. The warning device shall be activated by the controller device that starts the conveyor and shall continue for a period of time before the conveyor starts. A flashing light or similar visual warning shall be used with the audible device.

b. If a conveyor system is not exposed to the public, and if function of the system would be seriously hindered or adversely affected by the required time delay or where the intent of the warning may be misinterpreted, clear, concise, and legible warning signs shall be provided and indicate that the system may be started at any time, that danger exists, and that personnel must keep clear. These warnings signs shall be provided along the conveyor at areas that are not guarded or protected by their location.

17.B.05 Before restarting a conveyor that has been stopped because of an emergency, an inspection of the conveyor shall be conducted and the cause of the emergency stop determined.

17.B.06 The area around loading and unloading points shall be kept clear of obstructions that could create a hazard.

17.B.07 Applying a belt dressing or other foreign material to a rotating drive pulley or conveyor belt shall be avoided.

17.B.08 Flight and apron conveyors handling sticky materials that tend to build up shall be cleaned as often as required for safe operation.

17.C Training.

17.C.01 Only trained personnel shall be permitted to operate a conveyor. Training shall include instruction in operation under normal conditions and in emergencies.

17.C.02 Riding on conveyors is prohibited.

17.C.03 Personnel working with or near a conveyor shall be:

a. Instructed as to the location and operation of pertinent stopping devices; and

b. Prohibited from wearing loose or baggy clothing, jewelry or long hair.

17.C.04 Only trained personnel shall track a conveyor belt that must be done while the conveyor is operating.

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Section 18
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SECTION 18

Vehicles, Machinery and Equipment

18.A General. The requirements in this Section apply to the operation of all motor vehicles, machinery and mechanized equipment, All-Terrain Vehicles (ATVs), Utility Vehicles (UVs), and other specialty vehicles. Operators must also comply with state and host nation regulations as applicable to the above listed equipment.

18.A.01 Every person operating machinery and mechanized equipment, ATVs, UVs or other specialty vehicles, shall be properly trained (as described in this Section), qualified (license/certificate/permit) and designated by the employer in writing to operate such equipment.

18.A.02 Every person operating a motor vehicle, machinery and mechanized equipment, ATV, UV, or other specialty vehicles, shall possess, at all times while operating such vehicle/equipment, a license/permit (proof of qualification) valid for the equipment being operated. Licensing requirements will be as per Service regulation for military personnel and State regulations for civilian personnel, to include contractors. The operator must present the license/permit to the GDA upon request. Failure to do so will result in the immediate prohibition of the operator to operate motor vehicles.

➢ Note 1: USACE vehicle/equipment operators: In lieu of a license/permit for each piece of equipment, an Operator Equipment Qualification Record (OF Form 348 or similar type of documentation) may be maintained on file at the employee's project office for all USACE vehicle/equipment operators.

➢ Note 2: Government personnel may be required to carry the OF 346, Motor Vehicle Operator's License and Driving Record on military bases in addition or in lieu of a state driver's license (check local bases for requirements).

18.A.03 Inspections, tests, maintenance, and repairs.

a. Inspections, tests, maintenance and repairs shall be conducted by a qualified person in accordance with the manufacturer's recommendations.

b. Before initial use, vehicles not otherwise inspected by State or local authorities, shall be inspected by a qualified mechanic and found in safe operating condition and in compliance with all required published vehicle safety standards. This one-time inspection shall be documented and available for inspection on the work site.

c. When dump trucks are brought onto a USACE job site, they shall be inspected and found in compliance with the requirements of this Section before they are placed in service. This inspection shall be documented on a checklist.

d. All vehicles/equipment shall be inspected on a scheduled maintenance program.

e. Prior to each use, but not more often than daily, vehicles/equipment shall be checked by the operator to assure that the following parts, equipment, and accessories (as applicable) are in safe operating condition and free of apparent damage that could cause failure while in use:

(1) Service brakes, including trailer brake connections;

(2) Parking system (hand brake);

(3) Emergency stopping system (brakes);

(4) Tires;

(5) Horns;

(6) Steering mechanism;

(7) Coupling devices;

(8) Seat belts;

(9) Operating controls;

(10) Safety devices (e.g., back-up alarms and lights, fire extinguishers, first-aid kits, etc.), and

(11) Accessories including lights, reflectors, windshield wipers and defrosters where such equipment is necessary.

f. Inspection, test, repair, and maintenance records shall be maintained at the site available on request to the GDA.

18.A.04 Vehicles/equipment not meeting safe operating conditions shall be immediately removed from service, its use prohibited until unsafe conditions have been corrected, and re-inspected before being placed in service again.

18.A.05 Whenever visibility conditions warrant additional light, all vehicles or combinations of vehicles, in use shall be equipped with:

a. Two headlights, one on each side in the front;

b. At least two red taillights and one red or amber stoplight on each side of the rear;

c. Directional signal lights (both front and back); and

d. Three emergency flares, reflective markers, or equivalent portable warning device.

18.B Guarding and Safety Devices.

18.B.01 Reverse signal (back-up) alarm.

a. All self-propelled construction and industrial equipment, dump trucks and cargo trucks, whose trailer/body permanently block the view to the rear, whether moving alone or in combination, shall be equipped with a back-up alarm.

➢ Note: Equipment designed and operated so that the operator is always facing the direction of motion does not require a back-up alarm.

b. Back-up alarms shall be audible and sufficiently distinct to be heard above the surrounding noise level.

c. Alarms shall operate automatically upon commencement of backward motion. Alarms may be continuous or intermittent (not to exceed 3-second intervals) and shall operate during the entire backward movement.

d. Commercial cargo vehicles such as pick-up trucks, utility cargo/tool trucks, and flat-bed cargo trucks intended for use on public highways with a normally clear view through the rear window are not required to have back-up alarms. If the view to the rear is temporarily obstructed by a load or permanently blocked by a utility/tool box or other modification, then a signal person may be used, if the value outweighs the risk as determined by an AHA. In lieu of a signal person, a back-up alarm must be installed.

e. The removal or disabling of any back-up alarm is strictly prohibited.

18.B.02 A warning device shall be provided where there is danger to persons from moving equipment, swinging loads, buckets, booms or similar. A signal person may be used in lieu of a warning device if the value outweighs the risk, as determined by an AHA.

18.B.03 Guarding.

a. All belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating, or moving parts of equipment shall be guarded when exposed to contact by persons or when they otherwise create a hazard.

b. All hot surfaces of equipment, including exhaust pipes or other lines, shall be guarded or insulated to prevent injury and fire.

c. All equipment having a charging skip shall be provided with guards on both sides and open end of the skip area to prevent persons from walking under the skip while it is elevated.

d. Platforms, foot walks, steps, handholds, guardrails, and toe boards shall be designed, constructed, and installed on machinery and equipment to provide safe footing and access ways.

e. Equipment shall be provided with suitable working surfaces of platforms, guardrails, and hand grabs when attendants or other employees are required to ride for operating purposes outside the operator's cab or compartment. Platforms and steps shall be of nonskid material.

f. Substantial overhead protection shall be provided for the operators of forklifts and similar material handling equipment. > See also Section 18.G.29.

18.B.04 Brake systems.

a. All vehicles, except trailers having a gross weight of 5,000 lb (2,268 kg) or less, shall be equipped with service brakes and manually-operated parking brakes.

b. Service and parking brakes shall be adequate to control the movement of, to stop, and to hold the vehicle under all conditions of service.

c. Service brakes on trailers and semi-trailers shall be controlled from the driver's seat of the prime mover.

d. Braking systems on every combination of vehicles shall be so designed as to be in approximate synchronization on all wheels and develop the required braking effort on the rear-most wheels first. The design shall also provide for application of the brakes by the driver of the prime mover from the cab. Exceptions to this are vehicles in tow by an approved tow bar hitch.

18.B.05 Fuel tanks shall be located in a manner that will not allow spills or overflows to run onto engine, exhaust, or electrical equipment.

18.B.06 Exhaust or discharges from equipment shall be so directed that they do not endanger persons or obstruct the view of the operator.

18.B.07 A safety tire rack, cage, or equivalent protection shall be provided and used when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings of similar devices. > See Section 18.G.22.

18.B.08 No guard, safety appliance, or device shall be removed from machinery or equipment, or made ineffective, except for making immediate repairs, lubrications, or adjustments, and then only after the equipment has been de-energized and Hazardous Energy Control Program (lockout/tagout procedures) implemented. All guards and devices shall be replaced immediately after completion of repairs and adjustments and before power is turned on. > See Section 12.

18.B.09 Seat belts and anchorages meeting the requirements of 49 CFR 571 shall be installed and worn in all motor vehicles (installation and usage on buses is optional).

a. Two-piece seat belts and anchorages for construction equipment shall comply with applicable Federal specifications or Society of Automotive Engineers (SAE) Standard J386.

b. All construction equipment equipped with seat belts must have the seat belts worn by the operator, unless specified otherwise in the manufacturer's operating manual and justified in an AHA and accepted in writing by the GDA.

18.B.10 All high-lift PITs shall be equipped with overhead guards that meet the structural requirements defined in ANSI/ASME B56.1.

18.B.11 Suitable protection against the elements, falling or flying objects, swinging loads, and similar hazards shall be provided for operators of all machinery or equipment. Glass used in windshields or cabs shall be safety glass.

18.B.12 Falling object protective structures (FOPS).

a. All bulldozers, tractors, or similar equipment used in clearing operations shall be provided with guards, canopies, or grills to protect the operator from falling and flying objects as appropriate to the nature of the clearing operations.

b. FOPS for other construction, industrial, and grounds-keeping equipment will be furnished when the operator is exposed to falling object hazards.

c. FOPS will be certified by the manufacturer or a licensed engineer as complying with the applicable recommended practices of SAE Standards J231 and J1043.

18.B.13 Rollover Protective Structures (ROPS).

a. In addition to the requirements of Sections 18.B.09 and 18.B.11, seat belts and ROPS shall be installed on:

(1) Crawler and rubber-tire tractors including dozers, push and pull tractors, winch tractors, and mowers;

(2) Off-the-highway self-propelled pneumatic-tire earth movers (i.e., trucks, pans, scrapers, bottom dumps, and end dumps);

(3) Motor graders;

(4) Water tank trucks having a tank height less than the cab; and

(5) Other self-propelled construction equipment such as front-end loaders, backhoes, rollers, and compactors.

b. ROPS are not required on:

(1) Trucks designed for hauling on public highways;

(2) Crane-mounted dragline backhoes;

(3) Sections of rollers and compactors of the tandem steel-wheeled and self-propelled pneumatic-tired type that do not have an operator's station;

(4) Self-propelled, rubber-tired lawn and garden tractors and side-boom pipe laying tractors operated solely on flat terrain (maximum 10° slope; 20° slope permitted when off-loading from a truck) not exposed to rollover hazards; and

(5) Cranes, draglines, or equipment on which the operator's cab and boom rotate as a unit.

c. ROPS may be removed from certain types of equipment when the work cannot be performed with the ROPS in place and when ROPS removal is justified and delineated in an AHA and accepted in writing by the GDA.

d. The operating authority shall furnish proof from the manufacturer or certification from a licensed engineer that the ROPS complies with applicable SAE Standards (i.e., J167, J1040, J1042, J1084, and J1194).

e. ROPS shall also be acceptable if they meet the criteria of any State that has a Department of Labor-approved OSHA program or meets Water and Power Resources Service requirements.

f. The following information permanently affixed to the ROPS is acceptable in lieu of a written certification:

(1) Manufacturer’s or fabricator's name and address;

(2) ROPS model number, if any; and

(3) Machine make, model, or series number that the structure is designed to fit.

g. Field welding on ROPS shall be performed by welders who are certified, per Section 10.A.07.

18.B.14 All points requiring lubrication during operation shall have fittings so located or guarded to be accessible without hazardous exposure. > See also Section 12.

18.B.15 All machinery or equipment and material hoists operating on rails, tracks, or trolleys shall have positive stops or limiting devices either on the equipment, rails, tracks, or trolleys to prevent overrunning safe limits.

18.B.16 Under the following circumstances, long-bed end-dump trailers used in off-road hauling should be equipped with a rollover warning device. The device should have a continuous monitoring display at the operator station to give the operator a quick and easily read indicator and audible warning of an unsafe condition:

a. The material being dumped is subject to being stuck or caught in the trailer rather than exiting the bed freely, and

b. The dumpsite cannot be maintained in a nominally level condition (lateral slope less than 1° - 2°).

18.C Operating Rules.

18.C.01 General. For the purpose of this paragraph, a government-owned motor vehicle is any vehicle (government-owned; POV or Rental Car if being used while on-duty in lieu of government-owned vehicle) used to transport Government employees.

a. Operators of Government and Contractor motor vehicles being used on USACE projects may only use cellular telephones with hands-free devices while the vehicle is in motion.

(1) Prior to using a hand-held cellular phone, drivers shall find a safe place to bring their vehicle to a stop.

(2) Text messaging by the operator is strictly prohibited while operating motor vehicles.

b. The use of any other portable headphones, earphones, or other listening devices (except for hands–free cellular phones) while operating Government or contractor motor vehicles on USACE projects is prohibited. > See AR 190-5.

c. Operators of government-owned motor vehicles (whether government- or contractor-operated, GOGO or GOCO) shall not eat, drink alcohol, or smoke while the vehicle is in motion.

d. GPS Systems.

(1) GPS systems shall be mounted within the vehicle so that they do not create sight hazards for the operator.

(2) Programming of GPS systems while driving is prohibited.

(3) The use of non-mounted GPS systems may only be used by the vehicle operator while the vehicle is in a stopped position.

18.C.02 Defensive Driving. The principles of defensive driving shall be practiced. Operators (government and contractor) of government-owned vehicles shall complete Defensive Driver Training initially and every four years thereafter. Contractor operators of government-owned vehicles shall provide documentation of completion of a suitable Defensive Driving Course to the GDA initially and upon request.

18.C.03 Seat belts shall be installed and worn per Section 18.B.09. Buses are exempt from this requirement.

18.C.04 At all times, the operator must have the vehicle under control and be able to bring it to a complete stop within a safe stopping distance.

18.C.05 Vehicles may not be driven at speeds greater than the posted speed limit, with due regard for weather, traffic, intersections, width and character of the roadway, type of motor vehicle, and any other existing condition.

18.C.06 Headlights shall be on from sunset to sunrise, during fog, smoke, rain, or other unfavorable atmospheric conditions, and at any other time when there is not sufficient light for the vehicle to be seen or the operator to see on the highway at a distance of 500 ft (150.4 m), unless local regulations prohibit.

18.C.07 Vehicles shall not be driven on a downgrade with gears in neutral or clutch disengaged.

18.C.08 Railroad crossings and drawbridges.

a. Upon approaching a railroad crossing or drawbridge, vehicles shall be driven at such a speed as to permit stopping before reaching the nearest track or the edge of the draw bridge and shall proceed only if the course is clear.

b. Vehicles transporting 15 or more persons, explosives, or flammable or toxic substances shall stop at railroad crossings and drawbridges and shall not proceed until the course is clear, except at a railroad crossing or drawbridge protected by a traffic officer or a traffic signal giving a positive indication for approaching vehicles to proceed.

18.C.09 Vehicles shall not be stopped, parked, or left standing on any road, or adjacent thereto, or in any area in a manner as to endanger the vehicle, other vehicles, or personnel using or passing that road or area. Operator will ascertain safest exit path before exiting vehicle.

18.C.10 Vehicles shall not be left unattended until the motor has been shut off, the key removed (unless local regulations prohibit), parking brake set, and gear engaged in low, reverse, or park.

18.C.11 Vehicles carrying loads that project beyond the sides or rear of the vehicle shall carry a red flag, not less than 144 in^2 (929 cm^2), at or near the end of the projection. At night or when atmospheric conditions restrict visibility, a warning light shall be used in lieu of the red flag. Drivers will assure the load does not obscure vehicle lights and/or reflectors.

18.C.12 Employees shall not be permitted to get between a towed vehicle and towing vehicle except when hooking or unhooking.

18.C.13 No vehicle or combination of vehicles hauling unusually heavy loads or equipment shall be moved until the driver has been provided with the required permits, the correct weights of the vehicles and load, and a designated route to be followed.

18.C.14 When maneuvering or performing back-up operations, operators will take the applicable precautions outlined in Section 08.B.04. If a signal person or spotter is not used, operators will walk behind their vehicle to view the area for possible hazards before performing back-up operations with their vehicle.

18.C.15 When a bus, truck, or truck-trailer combination is parked or disabled on a highway or the adjacent shoulder, yellow flashing lights and other traffic warning devices (e.g., cones, flags, signs, etc.) per 49 CFR 571.5 shall be used during the daytime and reflectors, flares, electric lights or other effective means of identification shall be displayed at night.

18.C.16 Loading vehicles.

a. Drivers of trucks and similar vehicles shall leave the cab while the vehicle is being loaded when they are exposed to danger from suspended loads or overhead loading equipment, unless the cab is adequately protected.

b. Vehicles shall not be loaded in a manner that obscures the driver's view ahead or to either side or which interferes with the safe operation of the vehicle.

c. The load on every vehicle shall be distributed, chocked, tied down, or secured. Loads shall be covered when there is a hazard of flying/falling dirt, rock, debris, or material. Tail gates shall not be removed without implementing a positive means to prevent material from falling out of the back of the vehicle and may be done only with the acceptance of the GDA.

18.C.17 Maintenance Vehicles. All maintenance vehicles that are used at USACE recreational areas (or projects) shall be provided with two 28 in (0.7 m) day glow/high-visibility orange traffic cones. Vehicle operators that operate maintenance vehicles in USACE recreational areas shall place a cone in front and behind the vehicle when parked, remove and place in vehicle prior to departure.

18.D Transportation of Personnel.

18.D.01 The number of passengers in passenger-type vehicles shall not exceed the number that can be seated.

18.D.02 Trucks used to transport personnel shall be equipped with a securely anchored seating arrangement, a rear end gate, and guardrail. Steps or ladders, for mounting and dismounting, shall be provided.

18.D.03 All tools and equipment shall be guarded, stowed, and secured when transported with personnel.

18.D.04 No person will be permitted to ride with arms or legs outside of a vehicle body, in a standing position on the body, on running boards, seated on side fenders, cabs, cab shields, bed of the truck, or on the load.

18.D.05 All vehicles transporting personnel during cold or inclement weather shall be enclosed. Passengers shall be protected from inclement weather elements.

18.D.06 Explosives, flammable materials (excepting normal fuel supply), or toxic substances may not be transported in vehicles carrying personnel.

18.D.07 Vehicles transporting personnel shall not be moved until the driver has ascertained that all persons are seated and the guardrails and rear end gates are in place or doors closed.

18.D.08 Getting on or off any vehicle while it is in motion is prohibited.

18.D.09 All motor vehicles shall be shut down prior to and during fueling operations. > See Section 18.G.10.

18.E Motor Vehicles (for Public Roadway Use).

18.E.01 For the purposes of the Section, a motor vehicle is defined as a sedan, van, SUV, truck, motorcycle, or other mode of conveyance intended for use on public roadways. This includes construction equipment that is driven on public highways. Other types of equipment such as machinery and mechanized equipment, ATVs, UVs and other specialty vehicles are addressed later in this Section.

18.E.02 Every motor vehicle shall have:

a. An operable speedometer;

b. An operable fuel gage;

c. An operable audible warning device (horn);

d. An adequate rearview mirror or mirrors;

e. A power-operated starting device;

f. A windshield equipped with an adequate windshield wiper;

g. An operable defrosting and defogging device;

h. Non-slip surfaces on steps; and

i. Cabs, cab shields, and other protection to protect the driver from the elements and falling or shifting materials;

➢ Note: Items f through i do not apply to motorcycles. Gloves, a DOT-approved motorcycle helmet with full faceshield or goggles, sturdy footwear, long sleeved shirt or jacket, long trousers, full fingered gloves, and high-visibility garments (bright color for day and retroreflective for night), shall be worn at all times while operating or riding as a passenger on motorcycles.

18.E.03 Glass in windshields, windows, and doors shall be safety glass. Any cracked or broken glass shall be replaced.

18.E.04 All buses, trucks, and combinations of vehicles with a carrying capacity of 1.5 tons (1,360.8 kg) or over, when operated on public highways, shall be equipped with emergency equipment required by State laws but not less than:

a. One red flag not less than 12 in^2 (77.4 cm^2) with standard and three reflective markers that shall be available for immediate use in case of emergency stops;

b. Two wheel chocks for each vehicle or each unit of a combination of vehicles;

c. At least one 2A:10B:C fire extinguisher (at least two properly rated fire extinguishers are required for flammable cargo).

18.E.05 All rubber-tired motor vehicles shall be equipped with fenders, and tires shall not extend beyond fenders. Mud flaps may be used in lieu of fenders whenever motor vehicle equipment is not designed for fenders.

18.F Trailers.

18.F.01 All towing devices used on any combinations of vehicles shall be structurally adequate for the weight drawn and shall be properly mounted.

18.F.02 A locking device or double safety system shall be provided on every fifth-wheel mechanism and tow bar arrangement to prevent the accidental separation of towed and towing vehicles.

18.F.03 Every trailer shall be coupled with safety chains or cables to the towing vehicle. Such chain or cable shall prevent the separation of the vehicles in case of tow bar failure.

18.F.04 Trailers equipped with power brakes shall be equipped with a breakaway device that effectively locks the brakes in the event the trailer separates from the towing vehicle.

18.F.05 All vehicle/equipment operators required to pull a trailer must be properly trained, evaluated, qualified and designated to perform this operation.

18.G Machinery And Mechanized Equipment.

18.G.01 For the purposes of the Section, machinery and mechanized equipment is defined as mobile, stationary, self-propelled or towed equipment intended for use on construction sites or industrial sites. This equipment is NOT intended for operation on public highways. Equipment such as dump trucks, cargo trucks, and other vehicles that may also travel on public roadways must also meet the requirements of Section 18.E.

18.G.02 Before any machinery or mechanized equipment is placed in use, it shall be inspected and tested in accordance with the manufacturer's recommendations and requirements of this manual.

a. Inspections will be documented on either a manufacturer-, government-supplied or contractor-generated checklist. The Competent Person (CP) is required to sign the checklist designating that it meets the manufacturer's recommendations and requirements of this manual.

b. All checklists will be submitted to the GDA upon completion of the inspection and will become a part of the project file.

c. All safety deficiencies noted during the inspection shall be corrected prior to the equipment being placed in service at the project.

d. Re-inspection. Subsequent re-inspections will be conducted at least annually thereafter. Any time the machinery or mechanized equipment is removed and subsequently returned to the project (other than equipment removed for routine off-site operations as part of the project), it shall be re-inspected and recertified prior to use.

e. The Contractor shall provide the GDA ample notice in advance of any equipment entering the site so that the Contractor's inspection process may be observed and so that spot checks may be conducted.

18.G.03 No modifications or additions that affect the capacity or safe operation of machinery or equipment shall be made without the manufacturer's written approval.

a. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.

b. In no case shall the original safety factor of the equipment be reduced. > See Section 18.G.30.

18.G.04 Daily/shift inspections and tests.

a. All machinery and equipment shall be inspected daily (when in use) to ensure safe operating conditions. The employer shall designate CPs to conduct daily inspections and tests. These inspections and tests shall be documented by the CP to include as a minimum, the date, name of the inspector; specific items inspected, and "PASS/FAIL" indication. Copies of the inspections will be provided to the GDA upon request.

b. Tests shall be made at the beginning of each shift during which the equipment is to be used to determine that the brakes and operating systems are in proper working condition and that all required safety devices are in place and functional.

18.G.05 Whenever any machinery or equipment is found to be unsafe, or whenever a deficiency that affects the safe operation is observed, the equipment shall be immediately taken out of service and its use prohibited until unsafe conditions have been corrected.

a. A tag indicating that the equipment shall not be operated, and that the tag shall not be removed, shall be placed in a conspicuous location on the equipment. Where required, lockout procedures shall be used. > See Section 12.

b. The tag shall remain in its attached location until it is demonstrated to the individual dead-lining the equipment that it is safe to operate.

c. When corrections are complete, the machinery or equipment shall be retested and re-inspected before being returned to service.

18.G.06 Machinery and mechanized equipment shall be operated only by designated, qualified personnel.

a. Machinery or equipment shall not be operated in a manner that will endanger persons or property nor shall the safe operating speeds or loads be exceeded.

b. Getting off or on any equipment while it is in motion is prohibited.

c. Machinery and equipment shall be operated in accordance with the manufacturer's instructions and recommendations.

d. The use of headphones for entertainment purposes (e.g., radio, CD, music, books, etc.,) while operating equipment is prohibited except for communication directly related to operating the machinery or equipment.

e. The use of cell phones or any other electronic device that may cause distraction is prohibited while operating equipment.

f. All operator training and evaluation shall be conducted by persons who have the knowledge, training, and experience to train the equipment operators and evaluate their competence.

(1) These examiners may not license themselves, but instead, must be licensed by another qualified examiner.

(2) All qualification/licensing of equipment operators by examiners must include, at a minimum, requirements of this Section, the manufacturer’s instructions and recommendations as well as observation of a practical operating examination on the equipment.

18.G.07 When the manufacturer's instructions or recommendations are more stringent than the requirements of this manual, the manufacturer's instructions or recommendations shall apply.

18.G.08 Inspections or determinations of road and shoulder conditions and structures shall be made in advance to assure that clearances and load capacities are safe for the passage or placing of any machinery or equipment.

18.G.09 Equipment requirements.

a. An operable fuel gage;

b. An operable audible warning device (horn);

c. Adequate rearview mirror or mirrors;

d. Non-slip surfaces on steps;

e. A power-operated starting device;

f. Seats or equal protection must be provided for each person required to ride on equipment (unless standing is permitted by the equipment manufacturer);

g. Whenever visibility conditions warrant additional light, all vehicles, or combinations of vehicles, in use shall be equipped with at least two headlights and two taillights in operable condition;

h. All equipment with windshields shall be equipped with powered wipers. Vehicles that operate under conditions that cause fogging or frosting of windshields shall be equipped with operable defogging or defrosting devices. Glass in windshields, windows, and doors shall be safety glass. Cracked or broken glass shall be replaced;

i. Mobile equipment, operating within an off-highway job site not open to public traffic, shall have a service brake system and a parking brake system capable of stopping and holding the equipment while fully loaded on the grade of operation.

j. It is recommended that heavy-duty hauling equipment have an emergency brake system that will automatically stop the equipment upon failure of the service brake system. This emergency brake system should be manually operable from the driver's position.

18.G.10 Mechanized equipment shall be shut down before and during fueling operations. Closed systems, with an automatic shut-off that will prevent spillage if connections are broken, may be used to fuel diesel powered equipment left running.

18.G.11 Bulldozer and scraper blades, end-loader buckets, dump bodies, and similar equipment shall be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the engines stopped and brakes set, unless work being performed on the machine requires otherwise.

18.G.12 Stationary machinery and equipment shall be placed on a firm foundation and secured before being operated.

18.G.13 All mobile equipment and the areas in which they are operated shall be adequately illuminated while work is in progress.

18.G.14 Equipment powered by an internal combustion engine will not be operated in or near an enclosed area unless adequate ventilation is provided to ensure the equipment does not generate a hazardous atmosphere.

18.G.15 All vehicles that will be parked or are moving slower than normal traffic on haul roads shall have a yellow flashing light or four-way flashers visible from all directions.

18.G.16 No one shall be permitted in the truck cab during loading operations except the driver, and then only if the truck has a cab protector. > See also Section 18.C.16.a.

18.G.17 All machinery or equipment operating on rails, tracks, or trolleys (except railroad equipment) shall be provided with substantial track scrapers or track clearers (effective in both directions) on each wheel or set of wheels.

18.G.18 Steering or spinner knobs shall not be attached to the steering wheel unless the steering mechanism prevents road reactions from causing the steering handwheel to spin. When permitted, the steering knob shall be mounted within the periphery of the wheel.

18.G.19 Safeguards (i.e., bumpers, railings, tracks, etc.,) shall be provided to prevent machinery and equipment operating on a floating plant from going into the water.

18.G.20 The controls of loaders, excavators, or similar equipment with folding booms or lift arms shall not be operated from a ground position unless so designed.

18.G.21 Personnel shall not work in, pass under, or ride in the buckets or booms of loaders in operation.

18.G.22 Tire service vehicles shall be operated so that the operator will be clear of tires and rims when hoisting operations are being performed. Tires large enough to require hoisting equipment will be secured from movement by continued support of the hoisting equipment unless bolted to the vehicle hub or otherwise restrained. > See also Section 18.B.07.

18.G.23 Each bulldozer, scraper, dragline, crane, motor grader, front-end loader, mechanical shovel, backhoe, and other similar equipment shall be equipped with at least one dry chemical or CO_2 fire extinguisher with a minimum rating of 10-B:C.

18.G.24 Fill hatches on water haul vehicles shall be secured or the opening reduced to a maximum of 8 in (20.3 cm).

18.G.25 Maintenance and repairs.

a. Maintenance, including preventive maintenance, and repairs shall be in accordance with the manufacturer's recommendations and shall be documented. Records of maintenance and repairs conducted during the life of a contract shall be made available upon request of the GDA.

b. All machinery or equipment shall be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done. Equipment designed to be serviced while running are exempt from this requirement.

c. All repairs on machinery or equipment shall be made at a location that will protect repair personnel from traffic.

d. Heavy machinery, equipment, or parts thereof that are suspended or held apart by slings, hoist, or jacks also shall be substantially blocked or cribbed before personnel are permitted to work underneath or between them.

18.G.26 Dump trucks.

a. All dump trucks shall be equipped with a physical holding device to prevent accidental lowering of the body while maintenance or inspection work is being done.

b. All hoist levers shall be secured to prevent accidental starting or tripping of the mechanism.

c. All off-highway end-dump trucks shall be equipped with a means (plainly visible from the operator's position while looking ahead) to determine whether the dump box is lowered.

d. Trip handles for tailgates on all dump trucks shall be arranged to keep the operator in the clear.

18.G.27 Parking.

a. Whenever equipment is parked, the parking brake shall be set.

b. Equipment parked on an incline shall have the wheels chocked or track mechanisms blocked and the parking brake set.

c. All equipment left unattended at night, adjacent to a highway in normal use or adjacent to construction areas where work is in progress, shall have lights or reflectors, or barricades equipped with lights or reflectors, to identify the location of the equipment.

18.G.28 Towing.

a. All towing devices used on any combination of equipment shall be structurally adequate for the weight drawn and securely mounted.

b. Persons shall not be permitted to get between a towing vehicle and the piece of towed equipment until both have been completely stopped with all brakes set and wheels chocked on both vehicle and equipment.

18.G.29 Powered Industrial Trucks (PITs)/Forklifts and Telehandlers. All PITs and telehandlers shall meet the requirements of design, construction, stability, inspection, testing, maintenance, and operation (as defined in ANSI/ASME B56.1).

➢ Note: When PITs or Telehandlers are configured to hoist and lower (by means of a winch or hook and/or with rigging) and horizontally move a suspended load, refer to Sections 16.A.01 and 16.Q.

a. All PITs, lift trucks, stackers, and similar equipment shall have the rated capacity posted on the vehicle so as to be clearly visible to the operator. When the manufacturer provides auxiliary removable counterweights, corresponding alternate rated capacities also shall be clearly shown on the vehicle. The ratings shall not be exceeded.

b. Only trained, qualified/certified and designated operators shall be permitted to operate a PIT. Qualification shall be in writing via a license, permit or other documentation.

(1) Training must be both classroom and practical operation and in accordance with OSHA Standard 29 CFR 1910.178. It must be on the same type of truck the operator uses on the job.

(2) The employer must certify that the operator has been trained and evaluated as required by the standard. The certification shall include the name of the operator, the date of the training, the date of the evaluation, and the identity of the person(s) performing the training or evaluation.

(3) Refresher training in relevant topics shall be conducted at least once every three (3) years including an evaluation of each powered industrial truck operator's performance. In addition, refresher training shall be provided to the operator when the operator:

(a) has been observed to operate the vehicle in an unsafe manner;

(b) has been involved in a mishap;

(c) has received an evaluation that reveals that the operator is not operating the truck safely;

(d) is assigned to drive a different type of truck; or

(e) a condition in the workplace changes in a manner that could affect safe operation of the truck.

c. When a PIT is left unattended, load engaging means shall be fully lowered, controls shall be neutralized, power shall be shut off, and brakes shall be set. Wheels shall be blocked if the truck is parked on an incline.

d. An overhead guard shall be used as protection against falling objects. It should be noted that an overhead guard is intended to offer protection from the impact of small packages, boxes, bagged material, etc., representative of the job application, but not to withstand the impact of a falling capacity load.

e. Dock board or bridge plates shall be properly secured before they are driven over. Dock board or bridge plates shall be driven over carefully and slowly and their rated capacity shall never be exceeded.

f. Under all travel conditions the PIT shall be operated at a speed that will permit it to be brought to a stop in a safe manner.

g. On all grades the load and load engaging means shall be tilted back if applicable, and raised only as far as necessary to clear the road surface.

h. When ascending or descending grades in excess of 10%, loaded PITs shall be driven with the load upgrade.

i. Multi-purpose machines, material handling equipment (i.e. Rough-Terrain Forklifts, Lulls, etc.), and construction equipment used to lift loads suspended by rigging equipment shall:

(1) Have proof or authorization from the manufacturer that the machine is capable of making lifts of loads suspended by rigging equipment;

(2) Demonstrate that the equipment is properly configured to make such lifts, and

(3) The machine/equipment must be equipped with a load chart.

j. Contractor must provide certification that the operator is trained, qualified and designated for the operation of the machine (multi-purpose, material handling and construction equipment) being utilized to lift loads suspended by rigging equipment.

18.G.30 Floating Equipment. All equipment placed or operating on barges, pontoons, vessels or other means of flotation must be evaluated by a Qualified Person (QP) for safe placement, transport and operating conditions. At a minimum, the evaluation shall include: proper operating procedures per the manufacturer; stability and structural assessment of equipment and barge/pontoon; if required, where and how the equipment will be secured to address positively secured positioning of the equipment (no movement/tipping), and environmental restrictions.

(1) If the QP determines that the equipment can safely operate under the anticipated conditions, within the manufacturer's operating procedures, the evaluation shall be documented in writing by the QP in the AHA and provided to GDA prior to work beginning.

(2) If the equipment cannot safely operate under the anticipated conditions, within the manufacturer's operating procedures, or the QP determines that it is not safe to do so, then the use of this equipment in this capacity is not allowed.

(3) If there are no manufacturer's operating procedures, an RPE with knowledge and experience with this type of equipment must develop the safe operating procedures. The QP can then perform the evaluation of the equipment and barge/pontoon. This evaluation shall be documented in writing by the QP in the AHA and provided to GDA prior to work beginning.

➢ Note: If this equipment is mechanized equipment used in conjunction with rigging to lift a load, it is considered Load Handling Equipment. > See Section 16.L.

18.H Drilling Equipment.

18.H.01 Applicability. The requirements of this Section are in addition to other requirements identified in Section 18 and are applicable to rock, soil, and concrete drilling operations.

18.H.02 Drilling equipment shall be operated only by qualified (training, evaluation and experience) personnel who are designated by their respective employer to operate subject equipment.

a. The drilling equipment shall be operated, inspected, and maintained as specified in the manufacturer's operating manual.

b. A copy of the manual will be available at the job site.

18.H.03 AHA Development. Prior to initiating rock, soil, and/or concrete drilling operations, the contractor shall develop an AHA for the intended operations. AHA shall include, as a minimum:

a. Location of all overhead electrical lines/hazards;

b. Location of any possible unexploded ordnance or hazardous agents in the soil;

c. Location of utilities both above and below grade;

d. Designated areas for equipment operations and material storage;

e. Assembly and disassembly sequences for rock, soil, and concrete drilling equipment;

f. Operation of rock, soil, and concrete drilling equipment and handling of associated materials;

g. A geotechnical survey report identifying subsurface and surface ground conditions. The findings of this survey and the controls for all potential hazards shall become a part of the AHA;

h. A hard copy of the Safety Data Sheet (SDS) for the drilling fluids, if required;

i. The AHA meets the requirements of Section 01.A.14 or 01.A.15, and

j. AHA shall be reviewed at the preparatory meeting, when the plan has been completed.

18.H.04 Training. Members of drilling crews shall be provided training based on the equipment operating manual and the AHA. This training shall include, at a minimum:

a. The operation, inspection, and maintenance of the equipment;

b. The safety features and procedures to be used during operation, inspection, and maintenance of the equipment; and

c. Overhead electrical line and underground hazards.

18.H.05 Drilling equipment shall be equipped with two easily accessible emergency shutdown devices, one for the operator and one for the helper.

a. Only one emergency shutdown switch is required on a pier-hole rig.

b. Rigs must be shut down before any helpers enter a barricaded area.

c. Auger heads must be in the hole or a cover placed over the hole before workers enter the barricaded area.

➢ Note: If infeasible due to type of drill equipment being used, a risk assessment shall be performed by a Competent Person (CP), and documented in the AHA as to why this requirement is not practical. Identification of additional precautions and/or controls shall be identified to insure an equal level of safety is being accomplished.

18.H.06 Clearance from electrical sources shall be as specified in Table 11-1.

a. Drilling equipment shall be posted with signs warning the operator of electrical hazards.

b. The equipment operator shall assure proper clearance before moving equipment. Clearance shall be monitored by a spotter or by an electrical proximity warning device.

18.H.07 Moving equipment.

a. Before drilling equipment is moved, the travel route shall be surveyed for overhead and terrain hazards, particularly overhead electrical hazards.

b. Earth drilling equipment shall not be transported with the mast up. The exception is movement of the equipment required in drilling a series of holes, such as in blasting, if the following conditions are satisfied:

(1) Movement is over level, smooth terrain;

(2) The path of travel has been inspected for stability and the absence of holes, other ground hazards, and electrical hazards;

(3) The travel distance is limited to short, safe distances; and

(4) Travel with mast up may only be performed according to manufacturer's recommendations and/or specification.

18.H.08 Equipment set-up.

a. Equipment shall be set-up on stable ground and maintained level. Cribbing shall be used when necessary.

b. Outriggers shall be extended per the manufacturer's specifications.

c. When drilling equipment is operated in areas with the potential for classification as a confined space, the requirements of Section 34 shall be followed.

18.H.09 When drilling equipment is parked or disabled on a highway or the adjacent shoulder, yellow flashing lights and other traffic warning devices (cones, flags, signs, etc) per 49 CFR 571.5 shall be used during the daytime and reflector, flares, electric lights or other effective means of identification shall be displayed at night.

18.H.10 Equipment operation.

a. Weather conditions shall be monitored. Operations shall cease during electrical storms or when electrical storms are imminent. > See Sections 01.E.

b. Drill crewmembers shall not wear loose clothing, jewelry, or equipment that might become caught in moving machinery. High visibility vests used on drilling rigs, if required, must be of the break-away type.

c. Auger guides shall be used on hard surfaces. If infeasible due to type of drill rig being used, a risk assessment shall be performed by a CP, and documented in the AHA as to why this requirement is not feasible. Identification of additional precautions and/or controls shall be identified to insure an equal level of safety is being accomplished).

d. The operator shall verbally alert employees and visually ensure employees are clear from dangerous parts of equipment before starting or engaging equipment.

e. The discharge of drilling fluids shall be channeled away from the work area to prevent the ponding of water.

f. Hoists shall be used only for their designed intent and shall not be loaded beyond their rated capacity. Steps shall be taken to prevent two-blocking of hoists.

g. The equipment manufacturer's procedures shall be followed if rope becomes caught in, or objects get pulled into, a cathead.

h. Drill rods shall not be run or rotated through rod slipping devices. No more than 1 ft (0.3 m) of drill rod column shall be hoisted above the top of the drill mast. Drill rod tool joints shall not be made up, tightened, or loosened while the rod column is supported by a rod-slipping device.

i. Dust shall be controlled. When there is potential for silica exposure, the requirements contained in Section 06.N shall be implemented.

j. Augers shall be cleaned only when the rotating mechanism is in neutral and the auger stopped. Long-handled shovels shall be used to move cutting from the auger.

k. Open boreholes shall be capped and flagged. Open excavations shall be barricaded.

l. Means shall be provided to guard against employee contact with the auger (e.g. guard around the auger; barricade around the perimeter of the auger; electronic brake activated by a presence-sensing device).

➢ Note: If infeasible due to type of drill equipment being used, employees must maintain a safe, clear distance while the drilling equipment is operating. Only when the drill has stopped rotating, the controls returned to the neutral position, and a clear signal has been given by the operator and understood by the helper that it is safe, shall the employee proceed to approach the drill. A risk assessment shall be performed by the CP, and documented in the AHA as to why this requirement is not practical. Identification of additional precautions and/or controls shall be identified to insure an equal level of safety is being accomplished.

m. The use of side-feed swivel collars on drill rods are restricted to those collars that are retained by either a manufacturer-designed stabilizer or a stabilizer approved by a professional engineer.

18.I All Terrain Vehicles (ATVs). ATVs are vehicles intended for off-road use that travel on four low pressure tires with a seat designed to be straddled by the operator and should not be confused with utility vehicles. > See Section 18.J.

18.I.01 Every ATV operator shall have completed a nationally-recognized accredited ATV training course (such as provided by the Specialty Vehicles Institute of America or by in-house resources that have been certified as trainers by an accredited organization) prior to operation of the vehicle.

a. The operator must pass an operating skills test prior to being allowed to operate an ATV. Proof of completion of this training shall be made available to the GDA upon request.

b. The in-house trainer, certified by an accredited organization, must perform at least 1 training session every 3 years to maintain certification. If the accrediting agency requires

the trainer to return for refresher training to maintain certification, this shall be in addition to the 1 training session taught every 3 years.

18.I.02 All ATVs shall be equipped with:

a. An adequate audible warning device (horn) at the operator's station in operable condition (if determined necessary for the work being performed); and

b. Brake lights in operable condition (regardless of light conditions).

c. Operable rear view mirror(s).

18.I.03 Whenever visibility conditions warrant the need for additional light, all vehicles or combinations of vehicles in use, shall be equipped with at least two headlights and two taillights in operable condition.

18.I.04 The manufacturer's recommended payload/passenger limitations shall not be exceeded at any time.

18.I.05 Gloves and a DOT-approved motorcycle helmet with full-face shield or goggles shall be worn at all times while operating ATVs. When required for operators, passengers shall wear an approved motorcycle helmet with full faceshield or goggles.

18.I.06 ATVs will not be driven on public roadways except to cross the roadway, and may only be driven on public roadways at designated crossing points or with a road guard (no paved road use unless allowed by the manufacturer).

18.I.07 Only ATVs with four or more wheels may be used.

18.I.08 A copy of the operator’s manual will be kept on the vehicle and protected from the elements (if practicable).

18.I.09 Tires shall be inflated to the pressures recommended by the manufacturer.

18.I.10 ATVs shall be equipped with mufflers.

18.I.11 All ATVs shall be equipped with spark arresters.

18.J Utility Vehicles. For the purposes of the Section, utility vehicles are defined as specialty vehicles designed to perform off-road utility tasks such as passenger and cargo transportation (e.g., rangers, rhino, m-gators, gators, mules, etc.) and shall not be confused with ATVs. > See Section 18.I.

18.J.01 Utility vehicle operators shall be trained.

a. They must be familiar with the use of all controls and understand proper moving, stopping, turning and other operating characteristics of the vehicle.

b. Operators must review all training materials provided by the manufacturer for the specific vehicles, and training should be in accordance with appropriate manufacturer recommendations. At a minimum, training shall be documented and shall address:

(1) Basic riding tips from the manufacturer's published literature for each vehicle;

(2) Reading terrain;

(3) Climbing hilly terrain;

(4) Descending a hill;

(5) Traversing a slope;

(6) Riding through water;

(7) Cargo carriers and accessories;

(8) Loading and unloading;

(9) Troubleshooting;

(10) Proper preventative maintenance (i.e., oil levels, tire pressure requirements and scheduled maintenance requirements according to the manufacturer's guidelines).

18.J.02 A copy of the operator's manual shall be kept on the vehicle at all times and protected from the elements.

18.J.03 Utility vehicles shall be equipped with:

a. An adequate audible warning device (horn), in operable condition, at the operator's station; and

b. Brake lights in operable condition regardless of light conditions.

c. Operable rear view mirror(s).

18.J.04 Whenever visibility conditions warrant additional light, all vehicles, or combinations of vehicles, in use shall be equipped with at least two headlights and two taillights in operable condition, a yellow flashing light or equivalent.

18.J.05 Occupancy in utility vehicles is limited to manufacturer designated seating that has built-in seat belts. Passengers may not ride in the vehicles back cargo area unless the vehicle is otherwise equipped.

- Note: When used for emergency response, medical litters may be placed in the back cargo area but must be secured as described in Section 18.J.07.

18.J.06 The manufacturer's recommended load carrying capacity, personnel capacity, or maximum safe vehicle speed shall not be exceeded at any time.

18.J.07 Cargo items will be secured as necessary to prevent movement/tipping. All loads over 50 lbs (22.7 kg) - to include medical litters - must be securely strapped to cargo tie-downs in the rear and to the cargo shelf in the front.

18.J.08 Manufacturer-installed safety equipment will be maintained in working order and used in compliance with the requirement of this regulation and in accordance with manufacturer’s recommendations.

18.J.09 Seat belts and anchorages meeting the requirements of 49 CFR Part 571 (DOT, Federal Motor Vehicle Safety Standards) shall be installed in all utility vehicles and will be worn by operators and passengers.

18.J.10 Operators and passengers shall wear goggles at all times when a utility vehicle, not equipped with a windshield, is in motion.

18.J.11 Utility vehicles will not normally be driven on public roadways except to cross the roadway, and will only be driven on a public roadway at designated crossing points or with a road guard.

18.J.12 Utility vehicles that are allowed to operate outside a controlled work area and/or on public roads will meet the minimum vehicle safety standards in accordance with 49 CFR 571.5, to include ROPs, seat belts, and placement of “Slow Moving Vehicle” emblems where required.

18.J.13 When not equipped with ROPS, operators and passengers of utility vehicles will wear approved head protection (helmet) that at a minimum conforms to DOT 218 standards or equivalent and protective goggles or face shield.

18.K Specialty Vehicles. For the purposes of the Section, specialty vehicles are defined as all other vehicles not meeting any of the definitions above and may include cargo or personnel carriers or custom vehicles (i.e., Taylor-Dunn/Cushman, golf carts, Segway-type vehicles, snow machines, etc.).

18.K.01 A driver qualification and training program specific to the specialty vehicle shall be established.

18.K.02 An AHA/SOP that includes at a minimum, the safe operations, limits of operational work areas, required PPE and vehicle safety equipment requirements shall be established for the use of all specialty vehicles.

18.K.03 Whenever visibility conditions warrant additional light, all vehicles, or combinations of vehicles, in use shall be equipped with at least one headlight and one taillight in operable condition.

18.K.04 The manufacturer's recommended load carrying capacity, personnel capacity, and maximum safe vehicle speed shall not be exceeded at any time.

18.K.05 Specialty vehicles shall not be used for other than their manufactured purpose. Manufacturer-installed safety equipment will be maintained in working order and used in compliance with the requirement of this regulation and in accordance with manufacturer's recommendations.

18.K.06 Cargo items will be secured as necessary to prevent movement/tipping.

18.K.07 Specialty vehicles shall not be operated on unimproved surfaces.

18.K.08 For Segway HT, the minimum head protection standard is an approved bicycle helmet.

18.K.09 A snow machine is any vehicle designed to travel over ice and snow using mechanical propulsion in conjunction with skis, belts, cleats, or low-pressure tires.

a. All state and local laws and regulations shall be observed. Snow machines may be used on public roadways only where authorized by state and local regulations or in an emergency.

b. Operator training for snow machines will include:

(1) Hand signals;

(2) Riding positions;

(3) Towing of a sled;

(4) Surface conditions and types (e.g. snow, ice, tundra, etc.);

(5) Proper apparel while riding;

(6) Dangers to avoid.

c. The following minimum equipment is required on all snow machines:

(1) Brakes that will work under normal driving conditions and when loading;

(2) A throttle in which, when released by hand, will return engine speed to idle, close the carburetor, and disengage the clutch;

(3) A rear snow flap to deflect material or objects thrown by the track;

(4) A protective shield over all moving parts;

(5) Reflectors on the sides or side cowling (must meet Society of Automotive Engineers Standards);

(6) A rigid drawbar that is no longer than 10 ft (30 m) when towing;

(7) Operable rear view mirror(s).

d. When working from snow machines, two machines are the minimum (the buddy system). When working more than five miles from support base, a track vehicle for support will be used to support the operation.

e. Passengers are not authorized on personal snow machines (snowmobiles) except in case of an emergency (i.e., a broken-down machine).

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SECTION 19

Floating Plant and Marine Activities

19.A General.

19.A.01 Floating plant inspection and certification.

a. All floating plant regulated by the USCG shall have required USCG documentation that is current before being placed in service. A copy shall be posted in a public area on board the vessel. A copy of any USCG Form 835 issued to the vessel in the preceding year shall be available to the GDA and a copy shall be on board the vessel.

b. All dredges and quarter boats not subject to USCG inspection and certification or not having a current ABS classification shall be inspected in the working mode annually by a marine surveyor accredited by the National Association of Marine Surveyors (NAMS) or the Society of Accredited Marine Surveyors (SAMS) and having at least 5 years experience in commercial marine plant and equipment.

(1) All other plant shall be inspected before being placed in use and at least annually by a qualified person.

(2) The inspection shall be documented, a copy of the most recent inspection report shall be posted in a public area on board the vessel, and a copy shall be furnished to the GDA upon request.

(3) The inspection shall be appropriate for the intended use of the plant and shall, as a minimum, evaluate structural condition and compliance with NFPA 302.

c. Periodic inspections and tests shall assure that a safe operating condition is maintained.

d. Records of inspections shall be maintained at the site and shall be available to the GDA.

e. Floating plant found in an unsafe condition shall be taken out of service and its use prohibited until unsafe conditions have been corrected.

19.A.02 Personnel qualifications.

a. Officers and crew shall be in possession of a current, valid USCG license, which shall be posted in a public area on board the vessel, or correctly endorsed document as required by the USCG.

b. Government operators shall be licensed or certified in accordance with the requirements outlined in ER 385-1-91. A qualified individual designated as the USACE Command's marine licensing official will perform licensing and certification in accordance with the requirements of ER 385-1-91.

c. Officers and crew of government floating plant shall be licensed and/or documented by the USCG when the plant is subject to one or more of the following criteria:

(1) The vessel is inspected and certified by USCG in accordance with EP 1130-2-500, Appendix L;

(2) The vessel is normally engaged in or near a channel or fairway in operations that restrict or affect navigation of other vessels and is required by law to be equipped with radio-telephones of the 156-162 band frequency; or

(3) Floating plant is engaged in the transfer of oil or hazardous material in bulk.

d. A USCG Radar Observers endorsement on licenses is required for Operators of Uninspected Towing Vessels and Masters and Pilots on radar-equipped vessels 26 ft (7.9 m) or more in length. Endorsements must be issued from a USCG-approved training facility.

19.A.03 Severe weather precautions.

a. Where floating plant, boats or other marine activities may be endangered by severe weather (including sudden and locally severe weather, storms, high winds, hurricanes, and floods) plans shall be made for removing or securing plant and evacuation of personnel in emergencies. > See Section 01.E. This plan shall be part of the APP and shall include at least the following:

(1) A description of the types of severe weather hazards the plant may potentially be exposed to and the steps that will be taken to guard against the hazards;

(2) The time frame for implementing the plan (using as a reference the number of hours remaining for the storm to reach the work site if it continues at the predicted speed and direction), including the estimated time to move the plant to safe harbor after movement is started;

(3) The name and location of the safe location(s);

(4) The name of the vessel(s), type, capacity, speed, and availability that will be used to move any non-self-propelled plant;

(5) River/tide gage readings at which floating plant must be moved away from dams, river structures, etc., to safe areas;

(6) Method for securing equipment if not moved.

b. Extended movement of floating plant and tows shall be preceded by an evaluation of weather reports and conditions by a responsible person to ascertain that safe movement of the plant and tow can be accomplished.

c. Work or task orders shall be preceded by an evaluation of weather reports and conditions by a responsible person to ascertain that safe working conditions exist and safe refuge of personnel is assured.

d. USCG approved personal flotation devices (PFDs) - Types I, II, III, or V - shall be worn by all personnel on decks exposed to severe weather, regardless of other safety devices used. USCG-approved Type V automatic inflatable PFDs rated for commercial use may be worn by workers on USACE sites per Section 05.J.02.

e. A sufficient number of vessels of adequate size and horsepower, each designed, outfitted, and equipped for towing service, shall be available at all times to move both self- and non-self-propelled plant against tides, current, and winds during severe weather conditions.

f. Contractors working in an exposed marine location shall monitor the National Oceanic and Atmospheric Administration (NOAA) marine weather broadcasts and use other commercial weather forecasting services as may be available.

g. The floating plant shall be capable of withstanding whatever sea conditions may be experienced in the work area during the time period the work is being performed (i.e., seaworthiness, or good “sea keeping” qualities).

19.A.04 Emergency planning.

a. Plans shall be prepared for response to marine emergencies such as fire, sinking, flooding, severe weather, man overboard, hazardous material incidents, etc. (Fire: USCG-approved fire plans meet this requirement). > See Section 01.E.

b. A station bill, setting forth the special duties and the duty station of each crewmember for various emergencies, shall be prepared and posted in conspicuous locations throughout the vessel.

c. Each crewmember shall be given a written description of, and shall become familiar with, his/her emergency duties and shall become familiar with the vessel's emergency signals.

d. "Abandon ship/boat" and "person overboard" procedures shall include instructions for mustering personnel.

e. On all floating plant that have a regular crew or on which people are quartered, the following drills shall be held at least monthly during each shift (unless the vessel is required, under USCG regulations, to be drilled more frequently): abandon ship/boat drills, fire drills, and person overboard or rescue drills.

(1) The first set of drills shall be conducted within 24 hours of the vessel's occupancy or commencement of work.

(2) Where crews are employed or quartered at night, every fourth set of drills shall be at night; the first set of night drills shall be conducted within the first 2 weeks of the vessel's occupancy.

(3) Drills shall include, where appropriate, how to handle a pump shell or pipe rupture or failure within the hull (proper shutdown procedures, system containment, etc.) and how to handle leaks or failures of the hull or portions of it (what compartments to secure, how to handle power losses, pulling spuds to move to shallow water, etc.).

f. Person overboard or rescue drills shall be held at least monthly at boat yards, locks, dams, and other locations where marine rescue equipment is required.

g. Emergency lighting and power systems shall be operated and inspected at least monthly to ensure proper operation.

(1) Internal combustion engine driven emergency generators shall be operated under load for at least 2 hours each month.

(2) Storage batteries for emergency lighting and power systems shall be tested at least once every 2 months.

h. A record of all drills and emergency system checks, including any deficiencies noted in equipment and corrective action taken, shall be made in the station log.

19.A.05 Equipment requirements.

a. Fenders shall be provided to prevent damage and sparking and to provide safe areas for workers exposed to pinching situations caused by floating equipment.

b. Axes or other emergency cutting equipment shall be sharp and provided in accessible positions on all towing vessels for use such as freeing lines. On other floating plant (i.e., work barges, and floating cranes) emergency cutting equipment shall be provided in accessible positions.

c. Signal devices shall be provided on all vessels to give signals required by the navigation rules applicable to the waters on which the vessel is operated.

d. All controls requiring operation in cases of emergency (i.e., boiler stops, safety valves, power switches, fuel valves, alarms, and fire extinguishing systems) shall be located so that they are protected against accidental operation but are readily accessible in an emergency.

e. Electric lights used on or around gasoline and oil barges or other marine locations where a fire or explosion hazard exists shall be explosion-proof or approved as intrinsically safe.

f. General alarm systems shall be installed and maintained on all floating plant where it is possible for either a passenger or crewman to be out of sight or hearing from any other person.

(1) Where general alarm systems are used they shall be operated from the primary electrical system with standby batteries on trickle charge that will automatically furnish the required energy during an electrical-system failure.

(2) A sufficient number of signaling devices shall be placed on each deck so that they can be distinctly heard/seen above the normal background noise at any point on the deck.

(3) All signaling devices shall be so interconnected that actuation can occur from at least one strategic point on each deck.

g. Smoke alarms are required for all living quarters on floating plant; smoke alarms, if wired, should use the same electrical system as that of the electrical alarms.

h. For floating plant with internal combustion engines, marine quality listed CO monitors shall be installed and maintained in all enclosed occupied spaces (crew quarters, pilot houses, etc.).

i. All doors shall be capable of being opened from either side and provided with positive means to secure them in both the open and closed position.

j. Escape hatches and emergency exits shall be marked on both sides with letters, at least 1 in (2.5 cm) high, stating "EMERGENCY EXIT - KEEP CLEAR."

k. Each prime mover (engine, turbine, motor) driving a dredge pump shall be capable of being stopped by controls remote from the prime mover locations.

l. Shore power receptacles shall have a grounding conductor to prevent potential difference between the shore and the vessel.

m. All 120-, 208-, and 240-volt systems in toilet/shower spaces, galley, machinery spaces, weather deck, exterior, or within 3 ft (0.9 m) of any sink shall be grounded and fitted with Ground Fault Circuit Interrupter (GFCI) protection.

(1) Cord connected equipment used in any of the above areas shall be connected to an outlet with GFCI protection.

(2) Ground-fault protected receptacles shall be conspicuously marked “GFCI PROTECTED”.

n. Where appropriate, vessels should have watertight compartments readily identified and properly maintained in a watertight condition (i.e., sealable doors in place and fully functional). Penetrations shall be maintained in a watertight condition.

o. All reciprocating, rotating and moving parts of winch gears and other equipment shall be properly guarded.

19.A.06 Fuel systems and fuel transfers. The provisions of the Oil Pollution Act of 1990, as amended, shall apply to floating plant operations as applicable.

a. Gauge glasses or try cocks shall not be installed on fuel tanks or lines unless they meet the requirements of 46 CFR 58.50-10.

b. A shutoff valve shall be installed at the fuel tank connection: arrangement shall be made for operating this valve from outside the compartment in which the tank is located and from outside the engine compartment and outside the house bulkheads at or above the weather deck of the vessel.

c. A shutoff valve shall be installed at the engine end of the fuel line unless the length of the supply pipe is 6 ft (1.8 m) or less.

d. All carburetors on gasoline engines shall be equipped with a backfire trap or flame arrestor.

e. All carburetors, except down-draft type, shall be provided with a drip pan, with flame screen, that is continuously emptied by suction from the intake manifold or by a waste tank.

f. Fuel and lubricant containers and tanks shall be diked, curbed or controlled by other means complying with USCG requirements to contain the tank contents in case of leakage in accordance with 46 CFR 98.30-15, and 33 CFR 155.320.

g. Fuel oil transfers for floating plant shall be in accordance with the provisions of USCG regulations, 33 CFR 155, and/or 33 CFR 156. For uninspected vessels, USCG regulations in 33 CFR 156.120 and 33 CFR 155.320 for fuel coupling devices and fuel oil discharge containment apply.

h. All decks, overheads, and bulkheads, serving as fuel oil tank boundaries shall indicate the tank boundary with contrasting paint and be labeled “FUEL OIL TANK - NO HOT WORK”.

19.A.07 Safe practices.

a. Obstructing cables/lines that cross waterways between floating plant or between plant and mooring shall be clearly marked.

b. On floating plant where people are quartered, one person shall be on watch at all times to guard against fire and provide watch person service. In lieu of a watch person, an automatic fire detection and fire and emergency warning system(s) may be used.

c. Provisions shall be made to prevent accumulation of fuel and grease on floors and decks and in bilges.

d. Swimming and/or diving shall be prohibited for all personnel, except certified divers in the performance of their duties, unless necessary to prevent injury or loss of life.

e. Wading is permitted only when there are no severe underwater hazards such as sudden drop-offs, heavy surf above 3 ft (1 m), dangerous aquatic life, etc. Personnel wading shall wear an approved PFD and shall be monitored by personnel who are nearby and equipped to conduct a rescue if needed. Wading shall be discontinued when the person’s feet cannot easily touch bottom, regardless of depth.

f. A person in the water shall be considered as a person overboard and appropriate action shall be taken.

g. When barriers or blanks are installed in piping systems as a lock-out procedure, positive means (such as protruding handles) shall be used to easily recognize their presence. Barriers shall be marked (including name of installer, name of inspector, and date of installation) and accounted for prior to installation and subsequent to removal.

h. Deck loading will be limited to safe capacity. Loads will be secured and holdbacks or rings will be provided to secure loose equipment during rough weather.

i. Deck openings and other fall hazards not addressed by Section 19.C shall be protected in accordance with Section 21.

j. Safeguards such as barriers, curbs, or other structures shall be provided to prevent front-end loaders, bulldozers, trucks, backhoes, track hoes, and similar operating equipment on floating equipment from falling into the water. Whenever this equipment is operating on deck, deck surfaces of floating plant shall remain above water and the entire bottom area of a floating plant shall remain submerged

k. Projection and tripping hazards shall be removed, identified with warning signs, or distinctly marked with safety yellow.

l. Deck cargo carried on fuel barges shall be placed on dunnage.

m. When two or more pieces of floating plant are being used as one unit, they shall be securely fastened together to prevent openings between them or the openings shall be covered or guarded.

n. When three or more floating plant are configured for stationary work, a competent person shall identify any openings between decks of stationary vessels or vessels and other structures that create fully enclosed water areas (duck ponds) into which personnel can fall. If such openings are detected, means shall be taken to protect personnel from the hazard.

(1) When practical, duck pond protection will consist of guardrails, nets or other physical barriers to prevent employees from falling into the openings.

(2) When physical barriers are not practical, ladders and life rings shall be installed in each enclosed water area to allow personnel to self-rescue. Ladders may be a rigid type or Jacob's ladder, and must be securely anchored to the vessel or structure. Life rings shall have a sufficient length of rope to allow them to float on the water surface and the rope shall be securely anchored to the vessel. The number and placement of ladders and life rings shall be sufficient so that the maximum swimming distance to them is no more than 25 ft (7.9 m). Ladders and life rings may be retracted during reconfiguration or movement of plant.

o. Anchor points shall be clearly identified and shall be inspected prior to applying a load or putting cables under tension. Anchor points not structurally sound shall be cut out, removed, and/or welded over to preclude usage. Visual checks and "all clear" warnings shall be made prior to tensioning cables.

p. Provisions shall be made to protect persons being transported by water from the elements.

q. Plant fleeting areas will be designated in which all idle plant shall be moored. Such areas shall have warning buoys, signs, and lights in prominent locations.

r. The Contractor or, for Government-conducted operations, the GDA, shall provide information to the local USCG Office identifying the marine activity and hazards.

s. Open or pelican hooks may be used for lifting anchor buoys.

t. Mechanical means such as securing pins shall be used to hold spuds safely in place before transiting from one site to another.

19.A.08 Work Inside Confined and Enclosed Spaces in Ships and Vessels. > See Section 34.B.

19.A.09 When there is a potential for marine activities to interfere with or damage utilities or other structures, including those underwater, a survey shall be conducted to identify the utilities or structures in the work area, analyze the potential for interference or damage, and recommend steps to be taken to prevent the interference or damage.

19.A.10 Ventilation.

a. Motor vessels or boats powered by internal combustion engines having electric spark ignition systems or having auxiliary engines of this type in cabins, compartments, or confined spaces shall be equipped with an exhaust fan(s) for ventilating engine space and bilges.

b. At least two ventilators fitted with fans capable of ventilating each machinery space and fuel tank compartment, including bilges, shall be provided to remove any flammable or explosive gases, except those vessels constructed with the greater portions of the bilges open or exposed to the natural atmosphere at all times.

➢ Note: this requirement does not apply to diesel engines.

c. Other compartment spaces within a vessel, not covered in this Section, may be naturally vented.

d. Living spaces, including the galley, shall be adequately ventilated in a manner suitable to the purpose of the space.

e. For launches and motorboats having diesel power plants not equipped with fans, ventilating shall be by natural draft through permanently open inlet and outlet ducts extending into the bilges. Inlet and exhaust ducts shall be equipped with cowls or exhaust heads.

f. For launches, motorboats (survey boats), and skiffs having deck-mounted internal combustion engines (such as generators, jigger pumps) and not equipped with fans, exhaust piping shall be located away from personnel spaces to minimize CO infiltration in the work space.

g. Vent and ventilator requirements.

(1) Fans shall be rated for Class I hazardous locations and located as remotely from potential explosive areas as practical. > See Section 11.H.

(2) The vent intake shall extend to within 1 ft (0.3 m) of the bottom of the compartment.

(3) Means shall be provided for stopping fans in ventilation systems serving machinery components and for closing doorways, ventilators, chases, and annular spaces around tunnels and other openings from outside these spaces in case of fire.

h. Engines shall not be started until the engine space and bilges have been ventilated to remove fuel vapor.

19.A.11 The most current, pertinent information published by the USCG regarding aids to navigation shall be maintained aboard self-propelled vessels 26 ft (7.9 m) or more in length.

19.B Access.

19.B.01 General.

a. Means of access shall be properly secured, guarded, and maintained free of slipping and tripping hazards. > See Section 24.

b. Non-slip surfaces shall be provided on working decks, stair treads, ship ladders, platforms, catwalks, and walkways, particularly on the weather side of doorways opening on deck.

c. Double rung or flat tread type Jacob's ladders shall be used only when no safer form of access is practical. When in use, they shall hang without slack and be properly secured.

d. Vertical ladders shall comply with ASTM F1166-95a.

e. Ladders shall not be climbed by more than one person at a time between the same set of rails.

19.B.02 Access to/from vessels.

a. Safe means for boarding or leaving a floating plant shall be provided and guarded to prevent persons from falling or slipping thereon. Walking on rip-rap should be avoided where practical.

b. A stairway, ladder, ramp, gangway, personnel hoist or other safe means of access shall be provided at personnel points of access with breaks of 19 in (48.2 cm) or more in elevation.

c. Ramps for access of equipment and vehicles to or between vessels shall be of adequate strength, be provided with sideboards, and be well maintained.

d. Gangways and ramps shall be:

(1) Secured at one end by at least one point on each side with lines or chains to prevent overturning;

(2) Supported at the other end in such a manner to carry them and their normal load during use in the event they slide off their supports;

(3) Placed at an angle no greater than that recommended by the manufacturer; and

(4) Provided with a standard guardrail (toe boards are optional depending on their usefulness and the hazard involved).

19.B.03 Access on vessels.

a. Vertical access shall be provided between various decks by means of stairs, ramps, or vertical ladders installed in accordance with ASTM F1166.

b. Employees shall not be permitted to pass fore and aft, over, or around deck loads unless there is a safe passage.

c. If cargo or materials are stored on deck of barges, scows, floats, etc., the outboard edge shall not be used as a passageway unless at least 2 ft (0.6 m) of clearance is maintained.

d. Vessel loads shall be limited so that access and passageways in use will remain above the waterline. Decks and passageways shall not be used for access if submerged or subject to constant breaking waves, except in an emergency.

19.B.04 Emergency access.

a. Vessels, except those easily boarded from the water, shall be equipped with:

(1) At least one portable or permanent ladder of sufficient length to allow a person to self-rescue by boarding the ladder from the water, and

(2) Other methods or means designed to assist in the rescue of an incapacitated person overboard.

b. Two means of escape shall be provided for normal work, assembly, sleeping, and messing areas on floating plants.

c. Means of access shall be maintained as safe and functional.

19.B.05 Access on floating pipelines.

a. Floating pipelines used as access ways shall be equipped with a walkway and handrail on at least one side.

b. Walkways shall be at least 20 in (50.8 cm) wide and anchored to the pipeline.

c. PFDs must be worn at all times by anyone on pipelines. > See Section 05.J.

d. When walkways and handrails are not provided (i.e., the pipeline is not intended for access), the pipeline shall be barricaded at both ends to prevent access by any person.

19.C Marine Fall Protection Systems.

19.C.01 On decks or work surfaces 6 ft (1.8 m) or more above the main deck or 6 ft or more above adjacent vessel decks, docks, or other hard surfaces, Railing Type A or Type B, as described in Section 19.E., or bulwarks, coamings, or other structures meeting the height and strength requirements of these railing systems shall be provided except as excluded in Sections 19.C.03 and 19.C.04.

19.C.02 Deck edge toe boards not less than 3.5 in (8.8 cm) high for Type A and 2 in (5 cm) high for Type B railings shall be provided when the railings are used for fall protection. Toe boards shall meet the strength requirements in Section 21.F.01.f. Scuppers and/ or drainage holes may be installed as needed as long as the top edge of the toeboard is intact and the strength requirements are retained.

19.C.03 Personal fall protection systems meeting the requirements of Section 21.I may be used when railing systems are not installed.

19.C.04 Railing systems and personal fall protection systems are not considered feasible on the main deck of vessels that perform duty cycle material loading and unloading operations from barges, scows or other vessels alongside.

19.D Main Deck Perimeter Protection. New vessels built or purchased for USACE use shall meet these requirements upon delivery or prior to first use.

19.D.01 Main deck perimeter protection systems are intended to provide protection against falling overboard. Main deck perimeter protection is required on all manned vessels, except where excluded in Section 19.D.05. Unmanned vessels do not require perimeter protection, however, fall protection shall be provided where the vessel configuration and operation exposes personnel to falls onto a hard surface from vertical distances greater than 6 ft (1.8 m). The design parameters for the different types of main deck railing systems listed in this Section are in Section 19.E unless otherwise noted.

a. Manned vessels are vessels that operate with crews, or quartered personnel, or that have work areas that are occupied by assigned personnel during normal work activities.

b. Unmanned vessels are typically those that carry cargo such as materials, supplies, equipment, or liquids, and do not have personnel on board except during loading and unloading and during short term operations such as tie-down, inspections, etc.

19.D.02 Manned vessels over 26 ft (7.9 m) in length operating in unprotected or partially protected waters (as defined in 46 CFR) shall have Type B Railings provided around the deck edge, except where excluded in Section 19.D.05.

19.D.03 Manned vessels over 26 ft (7.9 m) in length operating in rivers or protected waters shall have Type B or Type C Railings provided around the deck edge, except where excluded in Section 19.D.05.

19.D.04 Type D Grab rails shall be provided on all manned vessels in the following instances:

a. On deckhouses or other similar permanent structures more than 48 in (1.2 m) from deck edge rail systems;

b. On deck houses or similar permanent structures that are within 8 ft (2.5 m) of the deck edge in areas where the deck edge rail has been omitted or may be temporarily removed in accordance with Section 19.D.05.

19.D.05 The following are main deck areas where perimeter protection may be omitted or temporarily removed:

a. Deck perimeter rails may be omitted from deck work areas specifically intended for line handling, working over the side of the vessel, load handling operations and designated boarding areas. Railings in these areas may obstruct work or access and present additional hazards such as pinch points against railings. Such deck edge areas may include those for line handling, fleeting scows, mooring vessels, towing, pile driving activities, and handling or placing of construction materials and equipment pipelines, and anchors.

b. Deck Perimeter rails may be omitted from main deck areas where the overall walkway width is less than 2 ft (0.6 m) between deck structures/permanent equipment and the deck edge.

c. Removable perimeter rail sections may be installed in areas where activities such as working over the side of the vessel or loading operations are not normally performed. These rails shall be maintained in place when vessel operations do not include activity in these areas or during periods of tie-up or inactivity.

19.D.06 When deck-edge perimeter protection is not present, standard operating procedures, AHAs, or other documents shall be developed to address the hazards involved. These documents shall be reviewed by all crew during initial orientation and at regular intervals afterward. The following operational procedures shall be followed:

a. PFD's must be worn by personnel in areas where deck perimeter protection is not present. Such areas may be used by crew to transit or access areas of the boat, but when doing so, all other requirements of this Section must be met. Areas where railings are removed shall be blocked off from access by a suitable barrier, or shall be clearly marked as PFD- required areas by signage, deck markings, or other means;

b. Continuous sight and verbal/radio contact shall be maintained between personnel in the non-protected deck perimeter areas and the vessel operator or a designated crew member who is in sight and verbal/radio contact with the operator, and who will monitor the workers in the area;

c. A safety skiff or equivalent rescue vessel shall be readily available throughout the duration of these activities in accordance with Section 05.K.

19.D.07 Boats with length 26 ft (7.9 m) or less shall be provided with integrated combinations of two or more of the below listed items to provide continuous perimeter protection around the vessel: Cockpits; Coamings; Handholds; Toe Rails; Life Rails; Deck Rails; Stern Rails and Bow Rails. The installations shall be in accordance with either ABYC Standards or ISO Standard 15085, as demonstrated by a manufacturer's certificate, label or other documentation.

19.E Marine Railing Types.

19.E.01 Allowable types of railings on vessels (A, B, C, & D) are identified below. Specific requirements for the vessel types and areas where each may be used are delineated in Sections 19.G and 19.H. > See Appendix F.

19.E.02 Railing Type A: Two-Tier Rigid Fall Protection Rail. This railing is comprised of rigid vertical stanchions and two rigid horizontal tiers in accordance with Section 21.F.01. Minimum top rail height is 42 in +/- 3 in (106.6 cm +/- 7.6 cm) and the lower horizontal tier is at half height.

19.E.03 Railing Type B: Three-Tier Marine Rigid or Tensioned Railing. This railing is comprised of rigid vertical stanchions and three rigid or tensioned horizontal tiers. The following parameters apply:

a. Clear spacing between tiers shall be no greater than 9 in (22.8 cm), 15 in (38 cm) and 15-in respectively. The 9-in space is closest to the deck surface. Minimum height from deck to the top tier may not be less than 39 in (99 cm).

b. The 9-in, 15-in and 15-in tier spacing above may not be exceeded.

c. The bottom tier may be omitted in way of deck fittings or in order to facilitate line handling. The space resulting from the removed lower tier may not extend more than 2 ft (0.6 m) beyond either side of the deck fitting.

d. Vertical stanchions may be pipe or structural sections. Horizontal tiers may be constructed from rigid (pipe or structural sections) or non-rigid (wire rope or chain) components, or from combinations of these components. Non-rigid tiers must be tensioned with turnbuckles or similar components.

e. Railings may be either fixed or removable in sections. All vertical stanchions must be adequate to withstand a 200 lbs (60.9 kg) load applied horizontally at the top of the stanchion. Stanchion spacing may not exceed 8 ft (2.4 m).

f. Pipe or structural section rail components shall be sized appropriately to meet the performance criteria of Section 21.F.01.

g. Chain or wire rope together with all connecting fittings shall have minimum breaking strength of 4,000 lbs (1814.3 kg).

h. Chain or wire rope horizontal tiers shall be tensioned so that:

(1) There is no slack;

(2) Sag does not exceed 1/4 in (.62 cm) at any point between stanchions, and

(3) The lowest point from deck to the top of the upper rail may not be less than 39 in (1 m) at any point between the stanchions. Tensioned railing tiers shall not deflect more than 1 in (2.5 cm) under a load of 200 lbs (60.9 kg).

i. Solid bulwarks or coamings providing equal perimeter protection to a height of 39 in (1 m) may also be provided. Bulwarks may be constructed of structural plate and shapes. Bulwarks must meet all strength/deflection/open spacing requirements presented above for railings.

19.E.04 Railing Type C: Non-Tensioned Railings and Flexible or Swing-Away Railings shall consist of rigid vertical stanchions with horizontal non-tensioned chain, wire rope or rigid tiers that clip to the verticals.

a. Non-Tensioned Railings shall consist of horizontal tiers constructed from chain, wire rope, pipe or structural sections or combinations of these components. Vertical stanchions shall be pipe or structural sections. Vertical support spacing shall not exceed 8 ft (2.4 m).

b. Flexible or Swing-Away Rails shall consist of chain or wire rope tensioned vertical support lines with non-tensioned chain, wire rope or clip-on rigid horizontal tiers. Vertical support line spacing shall not exceed 6 ft (1.8 m).

c. Pipe or structural section rail components shall be sized appropriately to meet the performance criteria of Section 21.F.01. Chain or wire rope together with all connecting fittings shall have minimum breaking strength of 4,000 lbs (1800 kg).

d. For Non-Tensioned Railings and Flexible or Swing-Away Railings, sag of horizontal tiers shall not exceed 3 in (10 cm) between vertical supports.

e. Non-Tensioned Railings and Flexible or Swing-Away Railings shall be configured with four or more horizontal tiers. The number of horizontal tiers shall be sufficient to meet the following requirements:

(1) Effective clear spacing between the deck and bottom tier shall be no greater than 9 in (22.8 cm).

(2) Effective clear spacing between all tiers above the bottom tier shall be no greater than 15 in (38.1 cm).

(3) Effective minimum height from deck to the top tier may not be less than 39 in (1 m).

f. The effective tier spacing identified above includes the effect of the increased spacing associated with sag in the tiers, applied either up or down. Clear spacing measurements shall be made with the railing tiers spread to form the largest opening.

g. Railing height is reduced by the amount of sag in the tiers. Railing minimum height shall be measured at the lowest point in the rail.

h. The bottom tier may be omitted in way of deck fittings or in order to facilitate line handling. The space caused by the removed lower tier may not extend more than 2 ft (0.6 m) beyond either side of the deck fitting.

i. The top tier may not deflect to a height less than 39 in (1 m) above the deck under a force of 200 lbs (60.9 kg), applied vertically. In addition, the top tier may not deflect more than 12 in (30.4 cm) horizontally under a force of 200 lbs applied horizontally.

j. Tensioning springs in the vertical support lines, if provided, must be of the compression with drawbar type.

19.E.05 Railing Type D: Grab Rails are railing sections mounted to deckhouse sides or to the sides of other permanent structures.

a. Grab rail height shall match the height of the deck top rail/tier. Where there is no top rail near the grab rail, grab rail height shall be 39 in (1 m).

b. Grab rail strength shall be adequate to withstand a 200 lb (60.9 kg) load applied in any direction.

c. Grab rails shall be sized dimensionally comparable to 1.5 in (3.8 cm) pipe. Clear distance between the rail and house side may not be less than 3 in (7.6 cm).

19.F Launches, Motorboats and Skiffs.

19.F.01 Crew requirements.

a. In the following circumstances a qualified employee shall be assigned to assist with deck duties:

(1) When extended trips including overnight trips are made from the work site;

(2) When conditions of navigation make it hazardous for an operator to leave the wheel while underway;

(3) When operations being performed, other than tying-in, require the handling of lines;

(4) When operating at night or during inclement weather;

(5) When towing; or

(6) While a vessel is transporting crew or passengers.

b. A qualified employee is any individual who has established, to the satisfaction of the operator of the vessel that he/she is physically and mentally capable of adequately performing the deck duties to which he/she may be assigned.

19.F.02 Personnel and cargo requirements.

a. The maximum number of personnel and weight that can safely be transported shall be posted on all launches, motorboats, and skiffs. The number of personnel (including crew) shall not exceed the number of PFDs aboard.

b. Each boat shall have sufficient room, freeboard, and stability to safely carry the cargo and number of persons allowed with consideration given to the weather and water conditions in which it will be operated.

c. Launches, motorboats and skiffs less than 20 ft (6 m) in length shall meet 33 CFR 183 requiring level floatation after flooding or swamping.

d. All open cabin launches or motorboats shall be equipped with “kill (dead man) switches”.

19.F.03 Fire protection.

a. The minimum number and rating of fire extinguishers that shall be carried on all launches and motorboats, including outboards, are shown in Table 19-1:

b. All launches and motorboats having gasoline or liquid petroleum gas power plants or equipment in cabins, compartments, or confined spaces shall be equipped with a built-in automatic CO^2 fire extinguishing system meeting the requirements of 46 CFR 25.30-15.

TABLE 19-1

Fire Extinguisher Requirements for Launches/Motorboats

Length	Extinguisher
Less than 26 ft (7.9 m)	One 1-A:10-B:C
26 ft (7.9 m) or more	Two 1-A:10-B:C

19.F.04 Float Plans. Float plans shall be prepared by the operator of a launch or motorboat when engaged in surveying, patrolling, or inspection activities that are remote and are expected to take longer than 4 hours or when the operator is traveling alone. The plan shall be filed with the boat operator’s supervisor and shall contain the following, as a minimum:

a. Vessel information (make/model or local identifier);

b. Personnel on-board;

c. Activity to be performed;

d. Expected time of departure, route, and time of return;

e. Means of communication (adequate means of communication shall be provided).

19.F.05 All motorboat operators shall complete and document the following training:

a. A boating safety course meeting the criteria of the USCG Auxiliary, National Association of Safe Boating Law Administrators (NASBLA), or equivalent;

b. Motorboat handling training, based on the type of boats they will operate, provided by qualified instructors (in-house or other). Operators must pass a written and operational test;

c. Current USCG licensed personnel are exempt from the boating safety training, but they shall complete the written exam and operational test;

d. Government employees shall complete a USACE-approved 24-hour initial boating safety course and refresher as prescribed in ER 385-1-91.

19.F.06 USACE launches, motorboats, skiffs and boat trailers shall be inspected, tested, repaired and maintained in accordance with ER 385-1-91 and the manufacturer's recommendations.

a. Inspection shall be conducted by a qualified person (QP), documented and retained for a period of 5 years.

b. Boats and boat trailers shall be inspected:

(1) Prior to each use, and

(2) Periodically, in accordance with manufacturer's recommendations and USACE requirements.

19.G Dredging.

19.G.01 Prior to repair or maintenance on the pump, suction or discharge lines below the water line, or within the hull, the ladder (or drag arm) shall be raised (above the waterline) and positively secured. This provision is in addition to the normal securing of hoisting machinery. Blank or block plates shall also be set in suction or discharge lines as appropriate.

19.G.02 Dredge pipelines that are floating or supported on trestles shall display appropriate lights at night and in periods of restricted visibility in accordance with USCG regulations and 33 CFR 88.15.

19.G.03 Submerged and floating dredge pipeline.

a. Submerged pipeline and any anchor securing the pipeline shall rest on the channel bottom where a pipeline crosses a navigation channel. The depth of the submerged pipeline will be provided to the USCG for publication.

(1) Whenever buoyant or semi-buoyant pipeline is used, the dredge operator will assure that the pipeline remains fully submerged and on the bottom. Whenever it is necessary to raise the pipeline, proper clearances shall be made and maintained and the entire length of the pipeline will be adequately marked.

(2) Submerged pipelines shall be marked in accordance with local USCG requirements and as approved by the GDA.

(a) Unless otherwise specified by the USCG, submerged pipelines are considered to require special marks and shall have a USCG-approved flashing yellow light.

(b) Indicators, such as signs or buoys that state “DANGER SUBMERGED PIPELINE” will be placed at the beginning and end of the pipeline. In addition, indicators are required

(c) Beginning in areas which reduce the charted depth by more than 10%, and, as a minimum, every 1000 ft (304.8 m) to clearly warn of the pipeline length and course.

(d) If barges or other vessels are used to anchor the beginning and/or end of the submerged pipeline, they shall be lighted in accordance with 33 CFR 88.13.

(e) Within a navigation channel, each end of the pipeline shall be identified with a regulatory marker buoy.

(f) Lengths of submerged pipeline located outside of the navigation channel, which reduce the charted depth by more than 10 percent, will be identified with high visibility buoys marked with 360 degree visibility retro-reflective tape, such as orange neoprene buoys, placed at an interval not to exceed 500 ft (152.4 m) to clearly show the pipeline length and course.

(3) Routine inspections of the submerged pipe shall be conducted to ensure anchorage.

(4) All anchors and related material shall be removed when the submerged pipe is removed.

b. Floating pipeline is any pipeline that is not anchored on the channel bottom. Pipelines shall not be permitted to fluctuate between the water surface and the channel bottom.

c. Pipelines shall be marked with the owner's name for positive identification in the event of loss (adrift) or damage to vessels operating in the area.

19.G.04 Dredges shall be designed so that a failure or rupture of any of the dredge pump components, including dredge pipe, shall not cause the dredge to sink. Data or plans supporting this capability must be available to the GDA upon request.

19.G.05 Mobilization, demobilization, and relocation of dredges, support barges, support tenders, tugs, and heavy equipment shall be by qualified persons under the direct supervision of a responsible individual.

19.G.06 Hopper dredges shall offer a safe means and process to load and unload personnel.

19.G.07 Any dredge that has a dredge pump below the waterline shall have a bilge alarm or shutdown interface.

19.G.08 Covers of "stone boxes" shall be secured with at least two positive means when the boxes are working under positive pressure.

19.G.09 Dredge disposal sites.

a. Drinking water. An adequate supply of drinking water shall be provided at all dredge disposal sites. Cool water shall be provided during hot weather. Portable drinking dispensers shall comply with Section 2 of this manual.

b. Toilet facilities. Toilet facilities shall be provided in accordance with and meet the requirements of Section 2 of this manual.

c. Medical and first-aid requirements. All disposal area watchmen shall be certified in first aid and CPR in accordance with Section 03. At least one 16-unit first-aid kit complying with ANSI Z308.1 shall be provided onsite at all times. The first-aid kit shall be protected from the environment.

d. Amphibious excavators will only be operated in accordance with the manufacturer's operating instructions. A copy of the operator's manual will be readily available on the equipment.

e. Lighting. Lighting shall be provided as required by Section 7 of this manual. The minimum lighting level in the vicinity of the disposal site shelter (dump shack) shall be 5 foot-candles.

f. Disposal site shelters (Dump Shacks).

(1) Disposal site shelters (dump shacks) shall be provided as a means of protecting personnel from inclement weather and environmental hazards. The shelter shall be of a size to accommodate a minimum of four workers. The shelter shall have adequate seating for the workers, heating equipment, water cooler, and space to store all hands tools and personal protective equipment. The shelter shall be weather tight with operable windows and screens for ventilation.

(2) All electrical systems shall comply with the NEC. All flexible electrical cords shall be hard usage or extra-hard usage. All frayed, patched, oil-soaked or worn shall be taken out of service.

(3) Portable generators used for lighting shall comply with the requirements of Section 11 of this manual and shall be located downwind of shelters.

(4) Fossil fuel heating is prohibited.

(5) All rigid insulation shall be covered with a non-combustible material to prevent accidental ignition.

(6) All shelters shall be equipped with a minimum of one multi-purpose fire extinguisher.

19.H Scows and Barges.

19.H.01 Scows dumping in open ocean waters should be equipped with remote opening devices to preclude the transfer of personnel between the vessels.

19.H.02 A safe means for transferring personnel between the towing vessels and scow shall be provided in accordance with Section 19.B.02.

19.H.03 The Contractor shall identify general and site-specific adverse weather and sea conditions (e.g., currents) under which the towing of scows or cargo barges is prohibited.

19.H.04 All barges and scows that are used as deck cargo barges shall comply with 46 CFR 174.010 through 174.020 for intact stability of deck cargo barges.

19.H.05 Personal fall protection devices or other fall protection as listed in Sections 21 and 19.C shall be used on all scows and open barges to prevent personnel transiting between the stern and bow of the vessel from falling into the hopper or falling off the side of the vessel to structures (e.g. dock, vessels) located 6 ft (1.8 m) or more below.

19.I Navigation Locks and Vessel Locking.

19.I.01 Smoking, open flames, or other ignition sources shall be prohibited on lock structures within 50 ft (15.2 m) of vessels containing hazardous cargos of flammable or other hazardous materials ("Red Flag" vessels) during approach and lockage.

a. When construction, maintenance, and other non-navigational related activities are taking place on or adjacent to the lock structure, the Lock Master will relay information to supervisory personnel in these activities regarding the approach and passage of Red Flag vessels.

b. The Lock Master or Work Crew supervisor may suspend hot work at their discretion during the approach and passage of Red Flag vessels.

c. Prior to the start of work on these activities, the Work Crew Supervisor will establish safe zones that maintain at least the minimum 50 ft (15.2 m) required distance between Red Flag vessels and sources of ignition such as hot work and smoking areas.

(1) The minimum distance shall be calculated vertically and horizontally throughout a lock chamber when the chamber is pumped out for maintenance.

(2) These zones shall be marked, barricaded, or otherwise designated so personnel can easily distinguish them.

(3) The location of and restricted activities within these zones shall be included in the activity AHA and discussed with workers prior to start of work.

19.I.02 Pleasure and commercial recreational craft shall not be locked through a lock chamber with Red Flag vessels.

19.I.03 Lockage Of Red Flag Vessels.

a. Simultaneous lockage of two Red Flag Vessels or tows or simultaneous lockage of another vessel or tow carrying non-dangerous cargoes and vessel or tow carrying dangerous cargoes, shall not be permitted when river traffic in the approach to a lock is light.

b. When the river approach to a lock is congested, simultaneous lockage of the aforementioned vessels or tows, other than pleasure craft, shall be permitted provided:

(1) The first vessel or tow entering and the last vessel or tow exiting are secured before the other enters or leaves;

(2) Any vessel or tow carrying dangerous cargoes is not leaking; and

(3) All masters involved have agreed to the joint use of the lock chamber.

19.I.04 Vessels with flammable or highly hazardous cargo will be passed separately from all other vessels. Hazardous materials are described in 49 CFR 171; flammable materials are defined in the National Fire Code of the NFPA.

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SECTION 20

Pressurized Equipment and Systems

20.A General.

20.A.01 Inspections and Tests - General.

a. Pressurized equipment and systems shall be inspected and performance tested before being placed in service AND after any repair or modification.

b. Frequency. Unless State or local codes specify more frequent inspection, temporary or portable pressurized equipment and systems shall be inspected at intervals of not more than 6 months and permanent installations shall be inspected at least annually.

c. New pressure vessels. Inspections of pressure vessels prior to being placed in service shall be in accordance with the ASME “Boiler and Pressure Vessel Code”.

d. In-service pressure vessels. Inspections of pressure vessels shall be in accordance with the National Board of Boiler and Pressure Vessel Inspectors (NBBI), “National Board Inspection Code.”

e. Qualified Inspectors. Inspections and tests will be performed by personnel qualified in accordance with the ASME Code or the NBBI.

20.A.02 Hydrostatic testing of In-Service Pressure Vessels.

a. Unless otherwise specified by State or local codes, hydrostatic testing of in-service, unfired pressured vessels shall be performed:

(1) After any repairs or modifications that may affect the integrity of the system, or its ability to maintain stored pressure, as determined by the qualified inspector, and

(2) In accordance with the manufacturer's recommendations, and/or a qualified inspector’s recommendations after consultation with the manufacturer, which may include:

(a) When vessels are installed;

(b) When vessels are placed in service after lay-up;

(c) Every 3 years, (starting at the time of installation);

(d) If the vessel shows any rust or other deterioration; and/or

(e) When conditions found during inspections warrant tests.

b. The following unfired vessels are exempt from this requirement:

(1) Vessels designed for a maximum allowable pressure not exceeding 15 psi (103.4 kPa);

(2) Vessels having an internal volume of 5 ft^3 (0.14 m^3) or less and a maximum pressure of 100 psi (689.4 kPa);

(3) Compression tanks containing water under pressure not exceeding 100 psi (689.4 kPa) and temperatures not exceeding 200°F (93.3°C);

(4) Compression tanks containing water and fitted with a permanent air charging line subject to pressures not exceeding 15 psi (103.4 kPa) and temperatures not exceeding 200°F (93.3°C);

(5) Fire extinguishers. > See Section 9.

(6) For vessels with inspection doors (such as oil-filled (governor) pressure tanks), hydrostatic tests need only be performed on repaired, modified, or deteriorated tanks. Inspections to determine deterioration will be made every 2 years for external condition and every 4 years for internal condition.

20.A.03 Records of the inspections and tests shall be available for review on request. A certificate shall be posted and maintained near the vessel controls prior to operation of the equipment.

20.A.04 Testing using Pressurized Gases/Air.

a. Tests for structural integrity or leaks using pressurized gases, such as air, are prohibited, except for:

(1) Testing of bulk petroleum, oil, and lubricant (POL) storage tanks under API standards, or

(2) Testing when permitted by all applicable manufacturers' specifications or when specified by an applicable code.

b. Testing with pressurized air or gases must be conducted within the limits of the specific codes or standards specified by the manufacturer's recommendations using detailed test procedures that have been prepared by a Competent Person (CP), submitted to and accepted by the GDA. A CP shall be responsible for supervision of the testing procedures and all workers performing the testing shall be knowledgeable of the procedures, hazards and controls. Quality assurance/control measures shall assure strict enforcement of all requirements.

c. If interim or final acceptance testing is anticipated to occur 2 or more months after the initial pipe or system installation preparatory meeting, a supplemental preparatory meeting shall be held immediately prior to the testing to review the test procedures and AHA.

20.A.05 Any pressurized equipment or system found to be in an unsafe operating condition shall be tagged "UNSAFE PRESSURIZED SYSTEM - DO NOT USE" at the controls and its use shall be prohibited until the unsafe conditions have been corrected.

20.A.06 Pressurized equipment and systems shall be operated and maintained only by qualified, designated personnel.

20.A.07 The normal operating pressure of pressurized equipment and systems shall not exceed the design pressure.

20.A.08 No safety appliance or device shall be removed or made ineffective, except for making immediate repairs or adjustments, and then only after the pressure has been relieved and the power shut off using proper lockout/tagout procedures. > See Section 12.

20.A.09 Repairs or adjustments to equipment or systems under pressure require a written safe clearance procedure.

20.A.10 The discharge from safety valves, relief valves, and blowoffs shall be located so that it is not a hazard to personnel.

20.A.11 Master valves and controls shall be either located or equipped to permit operation from the floor level or they shall be provided with safe access.

20.A.12 A pressure gauge shall be provided on all pressurized equipment and systems and shall be in good operational condition.

20.A.13 Safety and relief valves shall be provided on all pressurized equipment and systems.

a. A safety relief valve setting not more than 10% over working pressure is recommended. In no case shall the safety relief valve setting be higher than the maximum allowable pressure of the receiver or the system.

b. No valve shall be placed between the pressure vessel or generating equipment and a safety or relief valve or between the safety or relief valve and the atmosphere.

c. Adjustments and settings of safety relief valves must be made by a qualified mechanic with equipment designed for valve adjustment. Valves shall be sealed after adjustment.

d. In the event that the pressure registers above the maximum allowable working pressure on the gauge without the safety or relief valve operating, the pressure gauge shall be checked immediately. If such check indicates that the safety or relief valve is inoperative, the equipment shall be removed from service until the safety or relief valve has been adjusted or replaced.

20.A.14 Piping shall meet requirements of the ASME B31.

20.A.15 Pressurized manual equipment, subject to whipping or rotation if released, shall be provided with an automatic shut-off or control of the dead-man type.

20.A.16 Except where automatic shutoff valves are used, safety lashings or suitable double action locking devices shall be used at connections to machines of high pressure hose lines and between high pressure hose lines.

20.A.17 Connections with high pressure hoses must be secured with a safety lashing/whip check:

a. Safety lashings shall consist of two metal hose clamps connected by a flexible lacing: the metal hose clamps shall be attached to the hose ends separate from the quick makeup connection;

b. The flexible lacing shall be suitably strong cables, chains, or wires. Wires or pins through the quick makeup connection are not acceptable for use as safety lashings.

20.A.18 All pressurized cylinders, actuating booms, outriggers, or other load supporting appliances shall be equipped with pilot check valves, holding valves, or positive mechanical locks to prevent movement in case of failure in the pressure system. Replacement of pressure system fittings shall be with new parts equivalent to the manufacturer's standards.

20.B Compressed Air and Gas Systems.

20.B.01 Standards.

a. Air receivers shall be constructed in accordance with the ASME “Code for Unfired Pressure Vessels.”

b. All safety valves used shall be constructed, installed, tested, and maintained in accordance with the ASME “Code for Unfired Pressure Vessels.”

20.B.02 Access and guarding.

a. Compressors and related equipment shall be located to provide safe access to all parts of the equipment for operation, maintenance, and repairs.

b. Safety appliances, such as valves, indicating devices, and controlling devices, shall be constructed, located, and installed so that they cannot be readily rendered inoperative by any means, including the elements.

20.B.03 Air hose, pipes, valves, filters, and other fittings shall be pressure rated by the manufacturer and this pressure shall not be exceeded. Defective hose shall be removed from service.

20.B.04 Hose shall not be laid over ladders, steps, scaffolds, or walkways to create a tripping hazard.

20.B.05 Compressed air for cleaning.

a. The use of compressed air for blowing dirt from hands, face, or clothing is prohibited.

b. Compressed air shall not be used for other cleaning purposes except where reduced to less than 30 psi (206.8 kPa) and then only with effective chip guarding and PPE (face shield and safety glasses). This 30 psi requirement does not apply for concrete forms, mill scale, and similar cleaning purposes.

20.B.06 When used on tools and equipment such as track drills, all airlines exceeding 0.5 in (1.2 cm) inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.

20.B.07 Governors.

a. A speed governor, independent of the unloaders, shall be installed on all air compressors except those driven by electrical induction or electrical synchronized motors.

b. If the air compressor is engine or turbine driven, an auxiliary control to the governor shall be installed to prevent racing when the unloader operates.

20.B.08 Every air compressor shall automatically stop its air-compressing operation before the discharge pressure exceeds the maximum working pressure allowable on the weakest portion of the system.

a. If this automatic mechanism is electrically operated, the actuating device shall be so designed and constructed that the electrical contact or contacts cannot lock or fuse in a position that will cause the compressor to continue its operation.

b. An air bypass and alarm may be used as an alternative.

20.B.09 Provisions shall be made to exclude flammable materials and toxic gases, vapors, or dusts from the compressor and compressor intake and to prevent steam, water, or waste being blown or drawn into a compressor intake.

20.B.10 No valve shall be installed in the air intake pipe to an air compressor with an atmospheric intake.

20.B.11 The air discharge piping from the compressor to the air receiver shall be at least as large as the discharge opening on the air compressor.

20.B.12 A stop valve shall be installed between the air receiver and each piece of stationary utilization equipment at a point convenient to the operator, and a stop valve shall be installed at each outlet to which an air hose may be attached.

20.B.13 If a stop valve is installed between the compressor and the receiver, spring-loaded safety valves shall be installed between the air compressor and the stop valve.

a. The capacity of safety valves shall be sufficient to limit pressure in the air discharge piping to 10% above the working pressure of the piping.

b. Stop valves should be of the gate type. If a globe valve is used, it shall be installed so that the pressure is under the seat and that the valve will not trap condensation.

20.B.14 Provisions shall be made in compressed air and gas systems for expansion and contraction and to counteract pulsation and vibration.

20.B.15 Piping shall be equipped with traps or other means for removing liquid from the lines.

20.B.16 Air discharge piping shall be installed to eliminate possible oil pockets.

20.B.17 Installation and location of air receivers.

a. Air receivers shall be installed so that all drains, hand holes, and manholes are accessible.

b. Air receivers should be supported with sufficient clearance to permit a complete external inspection and to avoid corrosion of external surfaces.

c. Air receivers shall not be buried underground or located in inaccessible places.

d. The receiver should be located to keep the discharge pipe as short as possible.

e. The receiver should be located in a cool place to facilitate condensation of moisture and oil vapors.

20.B.18 A drain valve shall be installed at the lowest point of every air receiver for the removal of accumulated oil and water.

20.B.19 Automatic traps may be installed in addition to drain valves.

20.B.20 The drain valve on the air receiver shall be opened and the receiver drained often enough to prevent the accumulation of excessive liquid in the receiver.

20.B.21 No tool change or repair work shall be done until the stop valve in the air line supplying the equipment is closed.

20.B.22 Soapy water or any suitable non-toxic, non-flammable solution may be used for cleaning the system.

20.B.23 Hose and hose connections used for connecting compressed air to utilization equipment shall be designed for the pressure and service to which they are subjected and utilized in accordance with the manufacturer's specifications.

20.C Boilers and Systems.

20.C.01 Provisions of the ASME "Boiler and Pressure Vessel Code" shall apply in the construction, operation, maintenance, and inspection of steam boilers and pressure vessels.

20.C.02 Inspection.

a. Inspections shall be made to assure that all safety devices affecting operation of the firing equipment are installed in such a location that they cannot be isolated from the heat source by the closing of a valve.

b. Boilers that have undergone major structural repairs or that have been relocated during the 12 calendar months for which certification has been made shall be re-inspected and a new certificate posted before being put into operation.

20.C.03 When any boiler is being placed in service or restored to service after repairs to control circuits or safety devices, an operator shall be in constant attendance until controls have functioned through several cycles or for a period of 24 hours whichever is greater. A report of the operating test shall be provided to the GDA and include the following specific information: time, date, and duration of test; water pressure at boiler; boiler make, type, and serial number; design pressure and rated capacity; gas pressure at burner; flue gas temperature at boiler outlet; and the surface temperature of the boiler jacket. All indicating instruments shall be read and recorded at half-hour intervals.

20.C.04 Fusible plugs shall be provided on all boilers, other than those of the water tube type.

a. Replacement of fusible plugs shall coincide with the inspections recommended by the ASME Boiler and Pressure Vessel Code.

b. When necessary to replace fusible plugs between inspections, a written report covering the circumstances and providing make and heat number of plugs removed and inserted shall be forwarded to the responsible boiler inspector.

20.C.05 All boilers shall be equipped with water columns, gauge glass, and try cocks approved by a nationally-recognized testing laboratory.

a. Gauge glasses and water columns shall be guarded.

b. When shutoffs are used on the connections to a water column, they shall be of an approved locking or sealing type.

20.C.06 All boilers shall be equipped with blowoff cocks or valves approved by a nationally-recognized testing laboratory. The blowoff line shall be arranged so that leakage can be observed by the operator.

20.D Compressed Gas Cylinders.

20.D.01 Compressed gas cylinders shall be visually inspected in accordance with 49 CFR 171 through 179, CGA C6, and CGA C8.

20.D.02 All Government-owned cylinders shall be color coded and the gas contained identified by name in accordance with Military Standard (MIL-STD) 101B.

20.D.03 Storage. > See also Section 20.D.10.

a. Cylinders shall be stored in well-ventilated locations.

b. Cylinders containing the same gas shall be stored in a segregated group. Empty cylinders shall be labeled as empty and stored in the same manner.

c. Cylinders in storage shall be separated from flammable or combustible liquids and from easily ignitable materials (such as wood, paper, packaging materials, oil, and grease) by at least 40 ft (12 m) or by a fire resistive partition having at least a 1-hour rating.

d. Cylinders containing oxygen or oxidizing gases shall be separated from cylinders in storage containing fuel gases by at least 20 ft (6 m) or by a fire resistive partition having at least a 1-hour rating.

e. Areas containing hazardous gas in storage shall be appropriately placarded.

➢ Exception: If it is reasonably anticipated that gas will be drawn from the cylinders within 24 hours, they are considered “in service” and these storage requirements do not apply.

20.D.04 Smoking shall be prohibited wherever cylinders are stored, handled, or used.

20.D.05 Cylinders shall be protected from physical damage, electric current, and extremes of temperature. The temperature of cylinders shall not be allowed to exceed 125°F (51.7°C).

20.D.06 Cylinders containing oxygen and acetylene (or other fuel gas) shall not be taken into confined spaces.

20.D.07 Cylinder valves and valve caps.

a. Cylinder valves shall be closed when cylinders are in storage, in transit, not in use, or empty.

b. Cylinder valve caps shall be in place when cylinders are in storage, in transit, or whenever the regulator is not in place.

20.D.08 All compressed gas cylinders in service shall be secured in substantial fixed or portable racks or hand trucks.

20.D.09 Compressed gas cylinders transported by crane, hoist, or derrick shall be securely transported in cradles, nets, or skip pans, and never directly by slings, chains, or magnets, unless the cylinder manufacturer’s handling instructions specifically allows for handling cylinders otherwise.

20.D.10 Compressed gas cylinders shall be secured in an upright position at all times, except when being hoisted (except acetylene cylinders, which shall never be laid horizontally). Horizontal storage configurations approved for transportation are permitted for cylinders other than acetylene.

20.D.11 Valve wrench or wheel shall be in operating position when cylinder is in use.

a. Valves shall be opened slowly.

b. Quick closing valves on fuel gas cylinders shall not be opened more than 1 1/2 turns.

20.D.12 Cylinders shall be used only for their designed purpose of containing a specific compressed gas.

20.D.13 Cylinders shall be refilled only by qualified persons.

20.D.14 Cylinders shall be handled in a manner that will not weaken or damage the cylinder or valve.

20.D.15 If the movement can be accomplished safely, leaking cylinders shall be moved to an isolated location out of doors, the valve shall be cracked and the gas shall be allowed to escape slowly.

a. Personnel and all sources of ignition shall be kept at least 100 ft (30 m) away.

b. Instrumentation should be used to assure protection of personnel from health and flammability hazards.

c. The cylinder shall be tagged “DEFECTIVE”, after the gas has escaped.

20.D.16 Cylinders containing different gases shall not be bled simultaneously in close proximity of each other.

20.D.17 Bleeding of cylinders containing toxic gases shall be accomplished in accordance with environmental regulations, and in accordance with a government accepted APP and AHA specifically addressing the bleeding of compressed gas cylinders, and only under the direct supervision of qualified personnel.

20.D.18 Oxygen cylinders and fittings shall be kept away from oil or grease.

a. Cylinders, cylinder valves, couplings, regulators, hose, and apparatus shall be kept free from oil or greasy substance and shall not be handled with oily hands or gloves.

b. Oxygen shall not be directed at oily surfaces, greasy cloths, or within a fuel oil or other storage tank or vessel.

20.D.19 Oxygen and fuel gas pressure regulators, including their related gauges, shall be in proper working order while in use.

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SECTION 21

Fall Protection

21.A General. The requirements of this Section are applicable to all Government and Contractor work forces when their employees are working at heights, exposed to fall hazards and/or using fall protection equipment. Every Contractor and USACE-owned/operated permanent facility is responsible for establishing, implementing and managing a fall protection program.

21.A.01 Fall Protection Threshold.

a. The fall protection threshold height requirement is 6 ft (1.8 m) for ALL work covered by this manual, unless specified differently below, whether performed by Government or Contractor work forces, to include steel erection activities, systems-engineered activities (prefabricated) metal buildings, residential (wood) construction and scaffolding work.

b. For all USACE-owned/operated permanent facilities with open-sided floors, platforms or unprotected edges 4 ft (1.2 m) or more above adjacent floor or ground level, see Section 24.A.01.d.

➢ Note 1: Floating Plant and Vessels are excluded from these requirements except where specifically cited in Sections 19.D and 19.E.

➢ Note 2: For fall protection requirements in excavations, see Section 25.A.02.

➢ Note 3: The Terms “CP” And “QP” in this section refer to Competent Person for fall protection and Qualified Person for Fall Protection respectively. > See Sections 21.B.02, 21.B.03 and Appendix Q.

21.A.02 Workers exposed to fall hazards shall be protected from falling to a lower level by the use of standard guardrails (see Section 21.F.01.b), work platforms, temporary floors, safety nets, engineered fall protection systems, personal fall arrest systems, or the equivalent, in the following situations:

a. Whenever workers are exposed to falls from unprotected sides or edges, access ways, fixed ladders over 20 ft (6 m) in height, unprotected roof edge or floor openings, holes and skylights, unstable surfaces, leading edge work, scaffolds, formwork, work platforms, re-bar assembly, steel erection and engineered metal buildings;

b. For access ways or work platforms over water, machinery, or dangerous operations;

c. When installing or removing sheet piles, h-piles, cofferdams, or other interlocking materials from which workers may fall 6 ft (1.8 m) or more;

➢ Note: The use of sheet pile stirrups as a fall protection method is prohibited.

d. Where there is a possibility of a fall from any height onto dangerous equipment, into a hazardous environment, or onto an impalement hazard;

e. For steel erection activities, when connectors are working at the same connecting point, they shall connect one end of the structural member before going out to connect the other end. The connectors shall always be 100% tied off.

21.A.03 The order of control measures (the hierarchy of controls) to abate fall hazards or to select and use a fall protection method to protect workers performing work at heights shall be:

a. Elimination: Remove the hazard from work areas or change task, process, controls or other means to eliminate the need to work at heights with its subsequent exposure to fall hazards (i.e., build roof trusses on ground level and then lift into place or design change by lowering a meter or valve at high locations to a worker's level). This control measure is the most effective;

b. Prevention (passive or same-level barrier): isolate and separate fall hazards from work areas by erecting same level barriers such as guardrails, walls, covers or parapets;

c. Work platforms (movable or stationary): use scaffolds, scissor lifts, work stands or aerial lift equipment to facilitate access to work location and to protect workers from falling when performing work at high locations. > See Section 22.S;

d. Personal Protective Systems and Equipment: Use of fall protection systems, including (in order of preference): restraint, positioning, or personal fall arrest. All systems require the use of full body harness, connecting means and safe anchorage system.

e. Administrative Controls: Introduce new work practices that reduce the risk of falling from heights, or to warn a person to avoid approaching a fall hazard (i.e., warning systems, warning lines, audible alarms, signs or training of workers to recognize specific fall hazards).

21.A.04 When using stilts, working from raised platforms, or floors above a walking/working surface that exposes workers to a fall of 6 ft (1.8 m) or more in areas protected by guardrails, the height of the guardrail must be raised accordingly to maintain a protective height of 42 in (107 cm) above the stilt, raised platform, floors, or work stands.

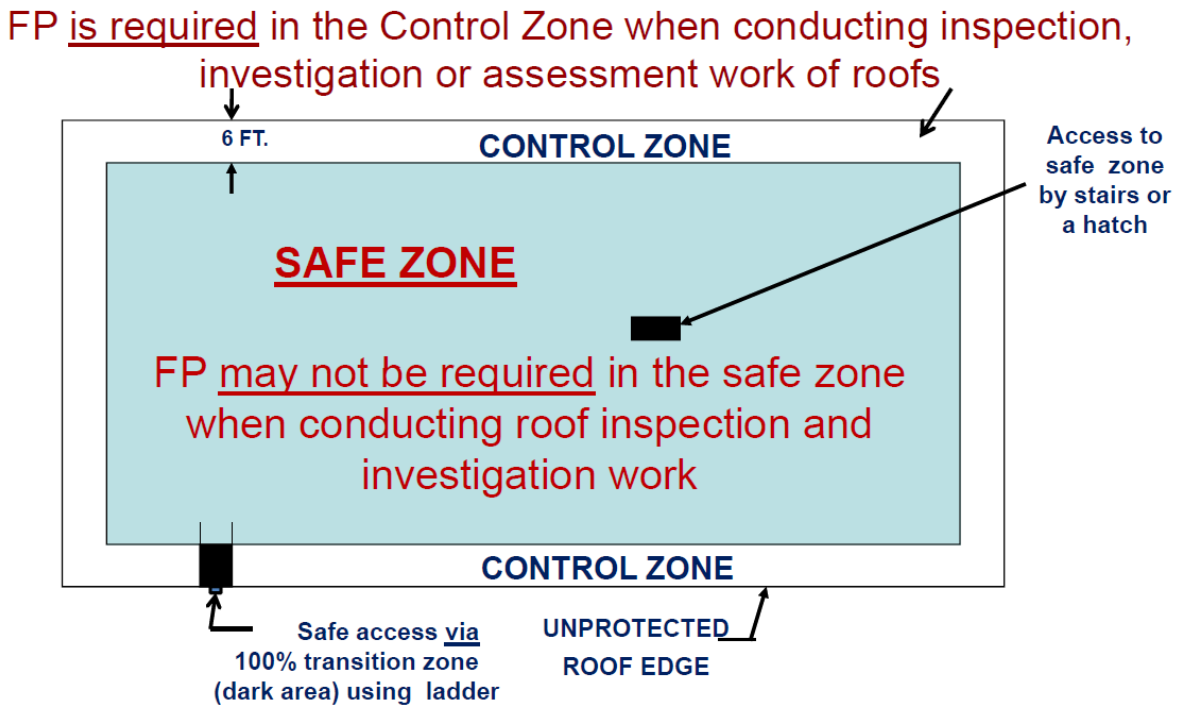
21.A.05 During construction activities, fall protection is required for employees exposed to fall hazards while conducting inspection, investigation or assessment work.

21.A.06 Prior to start of construction or after construction work is complete, fall protection is required when conducting inspection, investigation or assessment work WITHIN 6 ft (1.8 m) from an unprotected edge of a roof. An AHA shall be developed and reviewed by a CP for this activity and submitted for GDA review and acceptance. > See Figure 21-1.

21.A.07 Prior to start of construction or after construction work is complete, fall protection may not be required when conducting inspection, investigation or assessment work MORE THAN 6 ft (1.8 m) away from an unprotected edge of a roof. An AHA shall be developed and reviewed by a CP for this activity and submitted for GDA review and acceptance. > See Figure 21-1.

21.A.08 During maintenance evolutions (i.e., inspecting or maintaining HVAC or other equipment on roofs), fall protection is required when conducting inspection and investigation work.

Figure 21-1
Control Zone/Safe Zone Fall Protection



21.B Roles and Responsibilities.

21.B.01 Fall Protection Program Manager (Program Administrator per ANSI Z359.2). The Program Manager is responsible for the overall development, implementation, monitoring and evaluation of the Fall Protection Program. This person can also function as a QP, CP, CP trainer, QP trainer and/or competent rescue trainer if so trained. The Program Manager shall:

a. Be trained appropriately, as described in Section 21.C;

b. Advise and provide guidance for managers, employees and others on all matters pertaining to their Fall Protection Program;

c. Establish all duties and responsibilities required by the Fall Protection Program and assign them to individuals who are trained and qualified to perform them;

d. Verify personnel are provided with resources to accomplish their responsibilities;

e. Establish and implement a procedure to identify and eliminate or control new and existing fall hazards;

f. Ensure the proper development and implementation of the fall protection and prevention plan (written Fall Protection Procedures, per ANSI Z359.2) and rescue plan (written Rescue Procedures, per ANSI Z359.2).

g. Provide/ensure appropriate level of training is received by End Users (Authorized Persons per ANSI Z359.2), CP, QP, and others as required;

h. Participate in investigation of all mishaps (near misses, incidents or accidents) related to falls from heights (personally or by designation of persons qualified to perform the investigation);

i. Measure and evaluate the effectiveness of the Fall Protection Program by conducting periodic program evaluations and making improvements as necessary.

21.B.02 Qualified Person for Fall Protection. The QP is responsible for technical support of the Fall Protection Program. The QP shall:

a. Have advanced understanding and knowledge of the requirements, equipment and systems, physical sciences, and engineering principles that affect equipment and systems for fall protection and rescue;

b. Be qualified to select proper fall protection and rescue equipment;

c. Supervise the design, selection, installation and inspection of certified anchorages and horizontal lifelines;

d. Be trained to the applicable level, as described in Section 21.C.

21.B.03 Competent Person for Fall protection. The CP is responsible for the immediate supervision, implementation and monitoring of the Fall Protection Program. The CP shall:

a. Be trained to the applicable level, as described in Section 21.C;

b. Conduct a fall hazard survey to identify all fall hazards before End Users are exposed to those hazards;

c. Identify, evaluate and impose limits on the workplace activities to control fall hazard exposures and swing falls and communicate all limitations to all employees authorized to utilize the fall protection system;

d. Have the authority to stop the work immediately if it is determined to be unsafe and take prompt corrective measures to mitigate fall hazards;

e. Prepare, update, review and approve fall protection and prevention plans as directed by the Program Manager.

f. Review procedures as workplace activities change to determine if additional practices, procedures or training need to be implemented;

g. Ensure a rescue plan has been developed for all activities;

h. Specify in the fall protection and prevention plan, the fall protection systems, anchorage locations, connecting means, body supports and other equipment that End Users are required to use when exposed to a fall hazard;

i. Supervise the selection, installation, use and inspection of non-certified anchorages;

j. Verify End Users who work at heights are trained and authorized to do so;

k. Review, periodically and as needed, fall protection and prevention plan/rescue plan and procedures, to insure the End User is adequately informed about the fall protection and prevention plan/rescue plan and procedures for workplace activities;

l. Ensure prompt rescue of End Users can be accomplished via the rescue plan and procedures to be used;

m. Participate in investigation of all mishaps related to falls from heights;

n. Ensure all damaged or deployed fall protection equipment, is removed from service immediately;

o. Inspect all fall protection equipment at the frequency required by the manufacturer.

21.B.04 End User. The End User shall have understanding of workplace activities and follow the policy and procedures and the instructions of the CP regarding the use of fall protection and rescue systems and equipment. >See Section 21.C for training requirements. The End User shall:

a. Bring all unsafe or hazardous conditions or actions that may cause injury to them or others, to the attention of the CP;

b. Properly use, inspect, maintain, store and care for their fall protection equipment and systems;

c. Inspect all fall protection equipment or damage or defects, prior to each use. End User shall notify the CP of those problems and shall not use that equipment.

21.B.05 Competent Rescuer. The Competent Rescuer is responsible for anticipating the potential for planned rescue and ensuring effective rescue plan/procedures and methods are in place before End Users starts any work at heights. This function may be performed by local emergency services, in-house professionals, competent or qualified persons or contractor services. In addition, they shall:

a. Be trained appropriately so they have a working knowledge through experience and training of current fall protection and planned rescue regulations, standards, equipment and systems. > See Section 21.C for all training requirements;

b. Prepare, update, review and approve the rescue plan and procedures before End Users start work at heights;

c. Verify all Authorized Rescuers have been adequately trained and are proficient at performing rescue;

d. Identify resources necessary to conduct safe, effective rescue from heights and verify those resources are available for a prompt rescue;

e. Know the hazards associated with rescue from heights and how to mitigate these hazards within the area of rescue;

f. Verify the rescue equipment is protected against damage;

g. Verify rescue plans, procedures, and performances are, at a minimum, evaluated annually and any deficiencies have been corrected.

21.B.06 Authorized Rescuer. The Authorized Rescuers is responsible for performing and/or assisting in workplace rescues for personnel suspended in, or attached to fall protection systems. They shall:

a. Through experience and training, have a working knowledge of and experience in the selection, use, storage and care of all equipment necessary to perform a rescue;

b. Inspect the rescue equipment according to procedures developed by the Competent Rescuer and ensure it is protected, in proper working condition, and safe for rescue use;

c. Trained to the appropriate level and shall be aware of the hazards that may endanger the rescuer during rescue operations. >See Section 21.C for Authorized Rescuer training requirements.

21.C Training.

21.C.01 Training of all personnel involved in the Fall Protection Program – The Program Manager, QPs, CPs, End Users, Authorized and Competent Rescuers, as well as any associated fall protection trainers – shall be as described in ANSI/ASSE Z359.2, Minimum Requirements for a Comprehensive Managed Fall Protection Program, and shall conform to ANSI/ASSE Z490.1, Criteria for Accepted Practices in Safety, Health and Environmental Training. The refresher for all personnel involved in the fall protection program shall also be in accordance with requirements prescribed in ANSI/ASSE Z359.2 standard.

21.C.02 Fall Protection Program Manager Training. Training for Program Managers shall be conducted by a CP Trainer or QP Trainer.

a. Program Managers shall have a working knowledge of current fall protection regulations, requirements, standards, equipment and systems. Training shall cover the items prescribed in ANSI/ASSE Z359.2 standard.

b. For USACE-owned and/operated permanent facilities, Program Managers shall complete refresher training annually, by participating in at least one (1) hour of fall protection and rescue-related informational meetings and/or training**.**

21.C.03 Qualified Person for Fall Protection. A QP shall be trained by a QP Trainer in proper inspection, assembly and use of all fall protection equipment and systems that they encounter in their work as a QP. The frequency and duration of training that a QP requires to remain proficient in that role varies with the amount and types of fall protection work for which that person is responsible.

a. QPs are responsible for performing various duties that may be critical to the life and health of other workers. Training shall include those items in ANSI /ASSE Z359.2 standard, and shall include hands-on use of all types of equipment and systems used in locations where End Users work, to include: inspecting the systems prior to use; installing systems; analyzing structures and verifying that fall protection systems are properly installed; determining component compatibility; estimating free fall distances; determining total required clearance; dismantling systems storing equipment and common hazards associated with each system component.

b. For USACE-owned/operated permanent facilities, the refresher training requirement for the QPs is to stay current with fall protection and rescue knowledge by participating in at least one (1) hour annually of fall protection and rescue-related training and/or informational meetings.

21.C.04 Competent Person for Fall protection. CP shall be trained by a Competent Person trainer or a Qualified Person Trainer (see ANSI/ASSE Z359.2).

a. Currently, CPs shall have been trained to the level necessary to safely perform their duties.

➢ Note: Eighteen (18) months from the effective date of this manual, acceptable Competent Person for Fall Protection training shall be a MINIMUM of 24 hours, with a combination of formal classroom training and practical applications. All training shall be documented.

b. For USACE-owned/operated permanent facilities, the refresher training requirement for the CPs is to stay current in fall protection and rescue knowledge by participating in at least two (2) hours annually of fall protection and rescue-related training and/or informational meetings.

21.C.05 End User. Each worker who might be exposed to fall hazards from heights, shall be trained before using fall protection equipment by a CP, who is qualified in delivering fall protection training to the workers in the safe use of fall protection systems/equipment and the recognition of fall hazards related to their use, including:

a. The nature of fall hazards in the work area;

b. The correct procedures for erecting, using, dismantling, inspecting, maintaining, and storing fall protection equipment;

c. The application limits, free fall distance, total fall distance and clearance requirements of fall protection systems and equipment;

d. Rescue equipment and procedures;

e. Hands-on training and practical demonstrations;

f. Proper anchoring and tie off techniques;

g. All applicable requirements from this Section.

h. Refresher training shall be provided as necessary for the end users in the following situations:

(1) Changes in the fall protection program render previous training obsolete;

(2) Changes in fall protection or rescue equipment render previous training obsolete;

(3) Inadequacies in an employee's performance indicate a lack of knowledge or skill;

(4) A condition in the workplace changes in a manner that could affect the safe use of the fall protection equipment.

i. For USACE-owned/operated permanent facilities, the refresher training for end users shall be provided a minimum of one (1) hour annually to stay current with fall protection and rescue requirements.

21.C.06 Competent Rescuer. The Competent Rescuer shall be trained by a Competent Rescue Trainer (see ANSI/ASSE Z359.2). The training shall include:

a. Safe use of all types of equipment and systems used for rescue including inspection of the systems prior to use, installation, component compatibility, descent control, back-up systems, dismantling, storage and the common hazards associated with each system;

b. Practical demonstrations on how to properly select, inspect, anchor, assemble and use the fall protection and rescue equipment used;

c. For USACE-owned/operated permanent facilities, the refresher training for Competent Rescuers shall be provided a minimum of one (1) hour annually to stay current with fall protection and rescue requirements.

21.C.07 Authorized Rescuer. The Authorized Rescuer shall be trained by a Competent Rescuer (see ANSI/ASSE Z359.2). The training shall:

a. Be received before exposure to a fall hazard or a potential rescue event;

b. Include practical demonstrations on how to properly select, inspect, anchor, assemble, disassemble, store and use the fall protection and rescue equipment used.

c. Include and demonstrate before-use inspection of rescue equipment and systems.

d. For USACE-owned/operated permanent facilities, the refresher training for authorized rescuers shall be provided a minimum of one (1) hour annually to stay current with fall protection and rescue requirements.

21.C.08 Documentation. Training and evaluations for fall protection and rescue training shall be documented and retained for the current and previous training program and shall include: trainer/evaluator's name, student's name, training or evaluation organization's name (if external), dates/times of training and evaluations, course objectives, content of training program, performance of student based on observation of physical demonstrations of skill or on exercises.

21.D Fall Protection Program.

21.D.01 If a Contractor will have personnel working at heights and/or exposed to fall hazards, a Fall Protection and Prevention Plan shall be developed and submitted to the GDA for review and acceptance as part of their Accident Prevention Plan (APP). This plan may be developed by either the CP or QP. If the plan includes fall protection components or systems requiring direction, supervision, design calculations or drawings by a QP, the name, qualifications and responsibilities of the QP shall be addressed. It shall describe, in detail, the specific practices, equipment and control methods used to protect workers from falling to lower levels. This plan shall be updated as conditions change, at least every six months and shall include:

a. Duties and responsibilities. Identify CPs and QPs and their responsibilities and qualifications;

b. Description of the project or task performed;

c. Training requirements to include safe use of fall protection equipment;

d. Anticipated hazards and fall hazard prevention and control;

e. Rescue plan and procedures;

f. Design of anchorages/fall arrest and horizontal lifeline systems:

(1) It is realized that the provision of fall protection for the first person up for establishing anchorages ONLY would be difficult. In this situation, fall protection may not be required. After anchorages are installed, fall protection is required.

(2) The contractor shall identify all locations where anchorages need to be established, and detail in the Fall Protection and Prevention Plan and AHA how work will be performed safely.

g. Inspection, maintenance and storage of fall protection equipment;

h. Incident investigation procedures;

i. Evaluation of program effectiveness, and

j. Inspection and oversight methods employed.

21.D.02 Each Government-owned facility shall develop a written Fall Protection Program if they have personnel working at heights. The facility shall also develop a Site Specific Fall Protection and Prevention Plan and conduct a fall hazard survey, prepare survey report at existing buildings or structures, and comply with the program elements and requirements as identified in this section.

21.E Controlled Access Zones. The use of Controlled Access Zone as a fall protection method is prohibited.

21.F Fall Protection Systems.

21.F.01 Standard Guardrail Systems.

a. For marine and floating plant guardrail systems, see Sections 19.C, D and E.

b. A standard guardrail shall consist of:

(1) Toprails, midrails, and posts, and shall have a vertical height of 42 +/- 3 in (106.6 cm +/- 7.6 cm) from the upper surface of the toprail to the floor, platform, runway, or ramp level;

(2) Midrails shall be erected halfway between the toprails and the floor, platform, runway, or ramp;

(3) The ends of the toprails and midrails shall not overhang the terminal posts except where such overhang does not create a projection hazard;

(4) Toe-boards shall be provided on all open sides/ends at locations where persons are required or permitted to pass or work under the elevated platform or where needed to prevent persons and material from falling from the elevated platform.

c. Strength requirements: toprails and midrails shall be designed to meet the following requirements:

(1) Toprail shall be capable of withstanding, without failure, a force of at least 200 lb (0.9 kN) applied within 2 in (5 cm) of the top edge, in any outward or downward direction, at any point along the top edge;

(2) When the force described in (1), above, is applied in a downward direction, the top edge of the top rail shall not deflect more than 3 in (7.6 cm) nor to a height less than 39 in (99 cm) above the walking/working level;

(3) Midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members shall be capable of withstanding, without failure, a force of at least 150 lb (666 N) applied in any downward or outward direction at any point along the midrail or other member;

(4) Guardrail systems shall be so surfaced as to prevent injury to a worker from punctures or lacerations and to prevent snagging of clothing.

d. Minimum construction materials for standard guardrail components. The following are minimum requirements used for constructing guardrail systems. The employer is responsible for designing a complete system and assembling these components in accordance with this Section.

➢ Note 1: Synthetic or natural fiber ropes shall not be used as toprails or midrails.

➢ Note 2: Wood railing components shall be minimum 1,500 lb-ft/in^2 fiber (stress grade) construction grade lumber.

(1) Wood railings:

(a) Toprails: Constructed of at least 2-in x 4-in (5-cm x 10-cm) lumber;

(b) Midrails: Constructed of at least 1-in x 6-in (2.5-cm x 15.2-cm) lumber; and,

(c) Posts: Constructed of at least 2-in x 4-in (5-cm x 10-cm) lumber spaced not to exceed 8 ft (2.4 m) on centers.

(2) Pipe railings:

(a) Toprails and midrails: At least 1 ½ in (3.8 cm) nominal diameter (schedule 40 steel pipe); and

(b) Posts: At least 1½ in (3.8 cm) nominal diameter (schedule 40 steel pipe) spaced not more than 8 ft (2.4 m) on centers.

(3) Structural steel railings:

(a) Toprails and midrails: At least 2-in x 2-in x 3/8 in (5 cm x 5 cm x .9 cm) angles, and,

(b) Posts: At least 2-in x 2-in x 3/8-in (5 cm x 5 cm x .9 cm) angles spaced not more than 8 ft (2.4 m) on centers.

(4) Steel Cable (Wire Rope) railings:

(a) Toprail and midrail: ¼ in (6.25 mm) steel cable, flagged every 6 ft (1.8 m) with high visibility material, may be used if tension is maintained to provide not more than 3 in (7.5 cm) deflection, in any direction from the center line, under a 200 lb (0.89 kN) load;

(b) Support posts shall be located to ensure proper tension is maintained;

(c) Perimeter safety cables shall meet the criteria and requirements for guardrail systems. If the perimeter safety cables are used by the workers as a method of attaching a lanyard to the cables they shall meet the requirements of Horizontal Lifeline System (see Section 21.I.08.d.(2).

e. Commercial, off-the-shelf (COTS), engineered guardrail systems may be used instead of constructing a system with the materials above. If so, the portable guardrail system (webbing, straps, etc) must be designed and engineered to meet the same requirements in this section. The employer is still responsible for insuring the system used is approved, completed, installed and used as designed.

f. Toe-boards.

(1) Toe-boards shall be 3½ in (8.75 cm) in vertical height and shall be constructed from 1-in x 4-in (2.5-cm x 10.1-cm) lumber or the equivalent.

(2) Toe-boards shall be securely fastened in place and have not more than ¼ in (0.6 cm) clearance above floor level.

(3) Toe-boards shall be made of any substantial material, either solid or with openings between adjacent pieces not greater than 1 in (2.5 cm).

(4) Where material is piled to such a height that a standard toe-board does not provide protection, paneling or screening from floor to toprail or midrail shall be provided.

(5) Toe-boards shall be able to withstand, without failure, a force of 50 lbs (0.22 kN) applied in any outward or downward direction at any point along the toe-board.

21.F.02 Guardrails receiving heavy stresses from workers trucking or handling materials shall be provided additional strength by using heavier stock, closer spacing of posts, bracing, or by other means.

21.F.03 When guardrails are used at hoisting areas, a minimum 6 ft (18. m) of guardrail shall be erected on each side of the access point through which materials are hoisted.

21.F.04 A gate or removable guardrail section may be used as long as it meets the standard guardrail height 42 +/- 3 in (106.6 +/- 7.6 cm) and is secured across the opening between the guardrail sections when hoisting operations are not taking place.

21.F.05 Existing parapet walls. In order for parapet walls to be considered adequate fall protection systems, they shall have a height of 42 in +/- 3 in (1 m +/- 7.6 cm) unless it is an EXISTING parapet walls with a height of less than 42 in (1 m). If so, the EXISTING parapet wall may be used as a compliant fall protection system if the vertical height is a minimum of 30 in (76 cm) or more plus width that equals to 48 in (1.2 m). > See Figure 21-2.

21.G Covers.

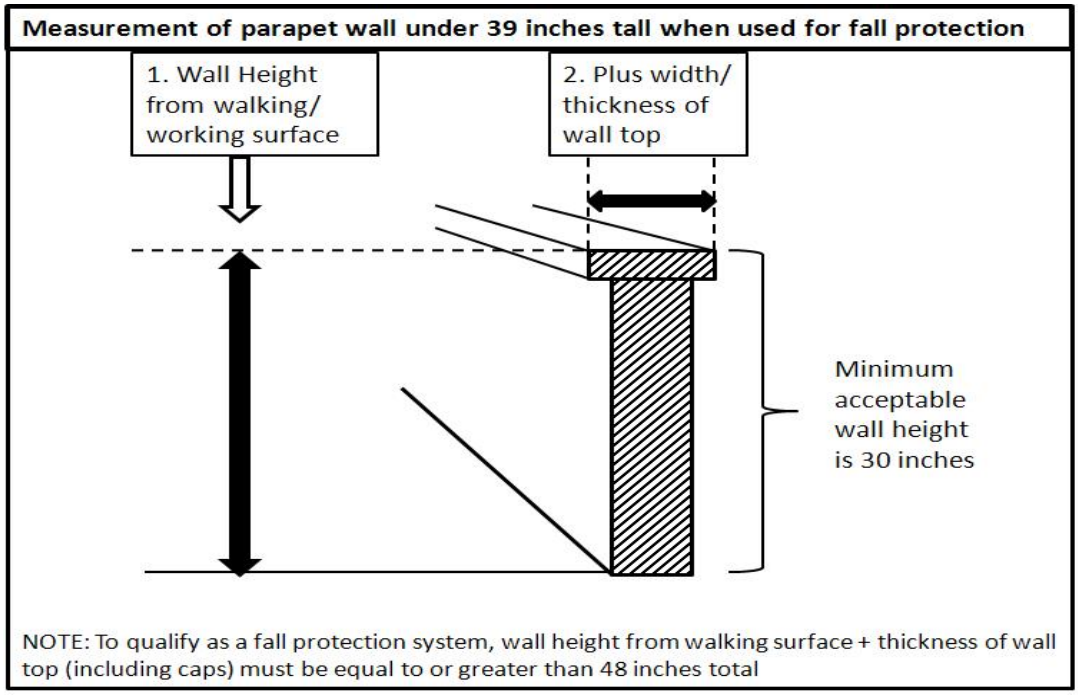
21.G.01 Install covers on any hole 2 in (5.1 cm) or more in its least dimension on walking/working surfaces such as floors, roofs or other openings.

21.G.02 Covers shall be capable of supporting, without failure, at least twice the weight of the worker, equipment and material combined.

21.G.03 Covers shall be secured when installed, clearly marked with the word “HOLE”, “COVER” or “Danger, Roof Opening-Do Not Remove” or color-coded or equivalent methods (e.g., red or orange “X”). Workers must be made aware of the meaning for color coding and equivalent methods.

FIGURE 21-2

Existing Parapet Wall Used as a Fall Protection System



Any combination of 30 in (76 cm) or more in height plus width that equals 48 in (1.2 m) or more is acceptable.

21.H Safety Net Systems for Fall Protection.

- Debris nets are addressed in Section 14.E Housekeeping.

21.H.01 Safety nets shall be installed as close under the work surfaces as practical but in no case more than 30 ft (9.1 m) below such work surface. Nets shall be hung with sufficient clearance to prevent contact with the surfaces or structures below. Such clearance shall be determined by impact load testing. When nets are used on bridges, multi-story buildings or structures, the potential fall area from the walking/working surface to the net shall be unobstructed.

a. The maximum size of the mesh openings shall not exceed 36 in^2 (230 cm^2), nor be longer than 6 in (15 cm) on any side.

b. The border rope or webbing shall have a minimum breaking strength of 5,000 lb (22.2 kN).

21.H.02 Nets shall extend outward from the outermost projection of the work surface as shown in Table 21-1.

21.H.03 Operations requiring safety net protection shall not be undertaken until the net(s) is in place and has either been tested without failure per a. and b. below, or complies with c. below.

a. Safety nets and safety net installations shall be tested in the suspended position immediately after installation under the supervision of QP and in the presence of the GDA and before being used as a fall protection system; whenever relocated, after major repair; and when left at one location, at not more than 6 month intervals.

b. The test shall consist of dropping into the net a 400 lb (180 kg) bag of sand, not more than 30 in+/- 2 in (76.2 cm +/- 5 cm) in diameter, at least 42 in (106.6 cm) above the highest working/walking surface at which workers are exposed to fall hazards. Means must be taken to ensure the weight can be safely retrieved after the test is conducted.

c. If a QP can demonstrate in writing that it is unreasonable to perform the drop-test, the QP shall certify in writing that the net and installation (to include anchorages) is in compliance with all requirements for acceptance by the GDA. The certification must include an identification of the net and net installation, the date that it was determined, and the signature of the QP making the determination and certification. The certification shall remain at the job-site.

TABLE 21-1

Safety Net Distances

Vertical Distance from Working Level to Horizontal Plane of Net	Minimum Required Horizontal Distance of Outer Edge of Net from Edge of Working Surface
Up to 5 ft (up to 1.5 m)	8 ft (2.5 m)
5 ft up to 10 ft (1.5 m up to 3.1 m)	10 ft (3.1 m)
more than 10 ft (more than 3.1 m)	13 ft (4 m)

21.H.04 Shackles and hooks used in safety net installations shall be made of forged steel.

21.H.05 When used with safety nets, debris nets shall be secured on top of the safety net but shall not compromise the design, construction, or performance of the safety nets.

21.H.06 Materials, scrap pieces, equipment, and tools that have fallen into the safety net shall be removed as soon as possible and at least before the next work shift. Safety nets shall be protected from sparks and hot slag resulting from welding and cutting operations.

21.H.07 Inspection of safety nets.

a. Safety nets shall be inspected by a CP in accordance with the manufacturer's instructions and recommendations.

b. Inspections shall be conducted immediately after installation, at least weekly thereafter, and following any alteration, repair, or any occurrence that could affect the integrity of the net system. Inspections shall be documented.

c. If any welding or cutting operations occur above the net(s), noncombustible barriers shall be provided. The frequency of inspections shall be increased in proportion to the potential for damage to the nets.

d. Defective nets shall not be used. Defective components shall be removed from service and replaced.

21.I Personal Fall Protection Systems.

21.I.01 Personal fall protection equipment and systems (to include fall arrest, positioning and restraint) shall be used when a person is working at heights and exposed to a fall hazard.

21.I.02 Inspection of personal fall protection equipment. Personal fall protection equipment shall be inspected by the End User prior to each use to determine that it is in a safe working condition. A CP shall inspect the equipment at least once semi-annually and whenever equipment is subjected to a fall or impacted. Inspection by the CP shall be documented. Defective or damaged equipment shall be immediately removed from service and replaced. Inspection criteria shall include:

a. Harnesses, lanyards, straps and ropes: Check all components for cuts, wear, tears, damaged threads, broken or torn stitching, discoloration, abrasions, burn or chemical damage, ultraviolet deterioration and missing markings and/or labels.

b. Hardware: Check all components for signs of wear, cracks, corrosion and deformation.

21.I.03 Personal fall protection equipment shall be used, inspected, maintained and stored in a safe place in accordance with manufacturer’s instructions and recommendations or as prescribed by the CP.

21.I.04 Selection of personal fall protection equipment shall be based on the type of work being performed; the work environment; the weight, size, and shape of the worker; the type and position/location of anchorage; and the required length of the lanyard.

21.I.05 Personal Fall Arrest System (PFAS) consists of full body harness, connecting means, and an anchorage system.

➢ Note: All PFAS shall meet the requirements contained in ANSI Z359, Fall Protection Code, to include fall restraint and positioning systems.

a. PFAS are generally certified for users within the capacity range of 130 to 310 lbs (59 to 140.6 kg) including the weight of the worker, equipment and tools.

(1) Workers shall not be permitted to exceed the 310 lbs (140.6 kg) limit unless permitted in writing by the manufacturer.

(2) For workers with body weight less than 130 lbs (59 kg), a specially designed harness and also a specially designed energy absorbing lanyard shall be utilized which will properly deploy if this person was to fall.

b. When stopping a fall, PFAS shall:

(1) Limit maximum arresting force on the body of the employee to 1,800 lbs (8.0 kN) when used with a full body harness;

(2) Be rigged such that a worker can neither free fall more than 6 ft (1.8 m) nor contact any lower level or other physical hazard in the path of the fall. The free fall distance of 6 ft (1.8 m) can be exceeded if the proper energy absorbing lanyard is used.

c. When designing new PFAS, the QP shall attempt to minimize fall distances including free fall distances and arrest forces. > See Figure 21-3. If it is necessary to increase free fall distances and arrest forces in order to accommodate existing and new structures or provide mobility to end users:

(1) Only the QP shall make this determination; and

(2) The maximum arrest force shall be kept below 1,800 lbs (8.0 kN).

21.I.06 PFAS – Body Support.

a. Full Body Harness. PFAS require the use of a full-body harness. The use of body belts is prohibited.

(1) Only full body harnesses meeting the requirements of ANSI Z359 are acceptable. Full body harnesses labeled to meet the requirements of the ANSI A10.14 shall not be used.

(2) The fall arrest attachment point on the full body harness shall be integrally attached and located at the wearer's upper back between the shoulder blades (dorsal D-ring).

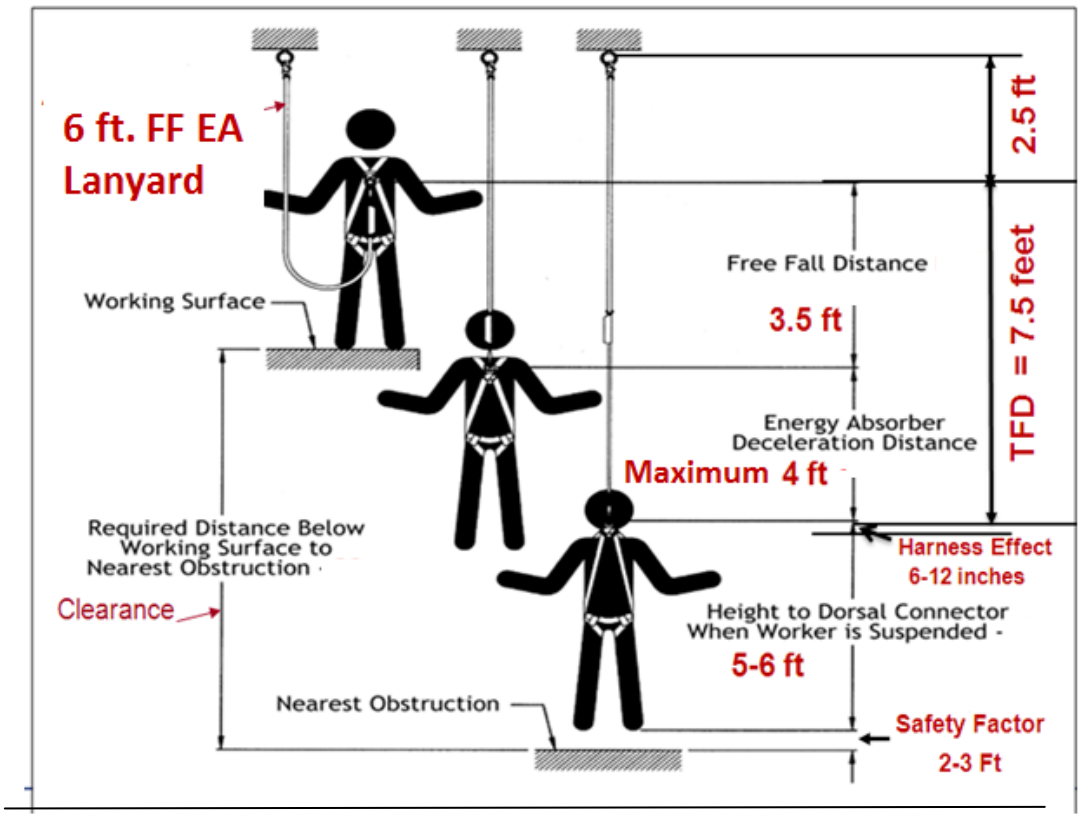
➢ Note: A frontal D-ring attachment point integrally attached to wearer's full body harness and located at the sternum, can be used for fall arrest (i.e., used with a ladder climbing device), provided the free fall distance does not exceed 2 ft (0.6 m) and the maximum arresting force does not exceed 900 lbs (4 kN).

(3) All full body harnesses shall be equipped with Suspension Trauma Preventers such as stirrups, relief steps, or similar in order to provide short-term relief from the effects of orthostatic intolerance.

b. Lineman's equipment (electrically rated harnesses). The full body harness used around high voltage equipment or structures shall be an industry designed "linemen's fall protection harness" that will resist arc flash and shall meet ASTM F887 and ANSI Z359 and the equipment must bear a label or similar stating such.

FIGURE 21-3

Calculating Fall Distance



21.I.07 PFAS – Connecting Means. Connecting subsystems may include energy absorbing lanyards (shock absorbing lanyards) with snap hooks or carabiners at each end, self-retracting devices (SRDs), and/or fall arrestors (rope grabs).

a. Lanyards - General. Lanyards shall be made of ropes, straps or webbing made from synthetic materials. Energy absorbing lanyards, (including rip stitch/tearing and deforming lanyards) shall be capable o sustaining a minimum tensile load of 5,000 lbs (22.2 kN). The maximum length of single or "Y" lanyards used in fall arrest shall not exceed 6 ft (1.8 m).

(1) The 6 ft (1.8 m) Free Fall (FF) energy absorbing lanyard shall only be used when the tie-off point is above the dorsal D-ring creating a FF distance of less than 6 ft. The energy absorber shall have an average arrest force of 900 lbs (4 kN) and a maximum deployment distance of 4 ft (1.2 m). > See ANSI Z359.13, Par 3.1.8.1.

(2) When an anchor point is below the dorsal D-ring, a FF distance greater than 6 ft (1.8 m) is created. For these situations, a 12 ft (3.6 m) FF energy absorbing lanyard shall be used in accordance with manufacturer's instructions and recommendations. The energy absorber shall have an average arrest force of 1,350 lbs (6 kN) and the maximum deployment distance of 5 ft (1.5 m). > See ANSI Z359.13, Par 3.1.8.2.

➢ Note: A 12 ft (3.6 m) FF energy absorbing lanyard does not refer to the lanyard length. Instead it refers to a FF that is greater than 6 ft (1.8 m) up to 12 ft which is created by the anchor point being located below the dorsal D-ring. The maximum length of the lanyard used shall not exceed 6 ft. > See Figure 21-4.

(3) The 6 ft (1.8 m) and 12 ft (3.6 m) FF energy absorbing lanyards shall meet the requirements of ANSI Z359.13 Standard.

➢ Note: Lanyards shall not be looped back over or through an object and then attached back to themselves unless permitted by the manufacturer.

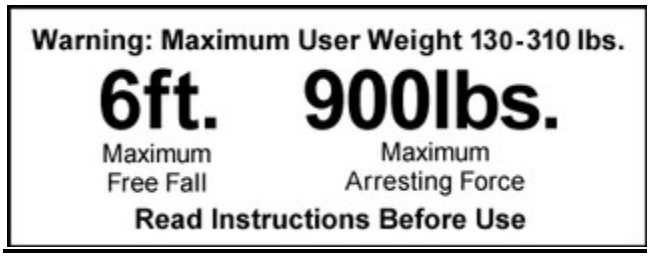
b. "Y" Lanyards. When using lanyard with two integrally connected legs for 100% tie-off, attach only the snap hook at the center of the lanyard shall be attached to the fall arrest attachment element of the harness (D-ring).

(1) The two legs of the lanyard and the joint between the legs shall withstand a force of 5,000 lbs (22.2 kN).

(2) When one leg of the lanyard is attached to the anchorage, the unused leg of the lanyard shall not be attached to any part of the harness except to attachment points specifically designated by the manufacturer for this purpose.

FIGURE 21-4

6 ft Free Fall and 12 ft Free Fall Energy Absorbing Lanyard Labels



(3) The 6 ft (1.8 M) FF "Y" lanyard shall only be used when the tie-off point is above the dorsal D-ring height and when the FF distance is less than 6 ft.

(4) When the tie-off point is located below the dorsal D-ring, the FF distance is greater than 6 ft (1.8 m) so a 12 ft (3.6 m) FF "Y" lanyard may be used.

➢ Note: A 12 ft (3.6 m) FF energy absorbing "Y" lanyard does not refer to the lanyard length. Instead it refers to a FF that is greater than 6 ft (1.8 m) up to 12 ft which is created by the anchor point being located below the dorsal D-ring. The maximum length used shall not exceed 6 ft.

(5) The maximum arrest force on the body shall not exceed 1800 lbs (8 kN).

(6) The 6 ft (1.8 m) and 12 ft (3.6 m) FF energy absorbing "Y" lanyards shall meet ANSI/ASSE Z359.13 standard.

➢ Note: Effective 2 years from date of publication, all energy absorbers used shall be equipped with a deployment indicator.

c. Hardware (connecting components).

(1) Snap hooks and carabiners shall be self-closing and self-locking, capable of being opened only by at least two consecutive deliberate actions. Snap hooks and carabiners having minimum gate strength of 3,600 lbs (16 kN) in all directions, per ANSI Z359.12 shall be used.

(2) Snap hooks and carabiners shall have a minimum tensile strength of 5,000 lbs (22.2 kN); D-rings, O-rings, snap hooks and carabiners shall be capable of withstanding a tensile load of 5,000 lbs.

(3) Connectors, adjusters, and any buckles used as adjusters shall be capable of withstanding a minimum tensile load of 3,372 lbs (15 kN) and shall be made of drop forged, pressed or formed steel, or made of equivalent materials; shall have corrosion resistant finish; and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.

(4) All connecting components used in PFAS shall be compatible and shall be used properly.

d. Self Retracting Devices (SRDs). The SRDs shall meet the requirements of the ANSI/ASSE Z359.14 standard.

(1) A Self-retracting lanyard (SRL) is a device mounted or anchored such that the arrest distance shall not exceed 2 ft (60 cm), and the average arrest force shall not exceed 1,350 lbs (6 kN) or a maximum peak force of 1,800 lbs (8 kN). The SRL is only used for vertical applications.

(2) An SRL with leading edge capability (SRL-LE) is designed for applications where during use, the device is not necessarily mounted or anchored overhead and may be at foot level and where the possible free fall distance from the edge is up to 5 ft (1.5 m) and the average arrest distance shall not exceed 4.5 ft (1.37 m). The device is equipped with an energy absorber to withstand impact loading of the line with a sharp or abrasive edge during fall arrest and for controlling fall arrest forces on the worker.

➢ Note: Effective 2 years from date of publication, all SRDs used shall be equipped with visual indicator.

e. Fall arrestors (rope grabs) designed to be used with a vertical lifeline and ladder climbing devices (rope, cable or rail) shall be approved by the manufacturer for such use. Fall arresters shall have a minimum ultimate strength of 3,600 lbs (16 kN).

➢ Note: For vertical lifelines or ladder climbing devices, use the automatic fall arrestors that move in one direction only.

21.I.08 PFAS - Anchorage System. The anchorage system consists of the anchorage (the rigid part of the building, facility, structure or equipment) and the anchorage connector.

a. Anchorages used for attaching the PFAS shall be independent of any anchorage used to support or suspend platforms. They shall be capable of supporting at least 5,000 lbs (22.2 kN) per worker attached or designed by a QP for twice the maximum arrest force on the body.

b. Anchorage connectors are used to tie the PFAS to the anchorage and shall be capable of withstanding without breaking 5,000 lbs (22.2 kN) load per worker attached.

c. Steel cable/wire rope guardrails may not be used as a Horizontal Life Line (HLL) unless designed and approved by a QP.

➢ Note: Do not use electric conduits, utility pipes, ductwork or unstable points as anchorages for PFAS.

d. Lifelines.

(1) Vertical lifeline (VLL). A VLL shall have a minimum tensile strength of 5,000 lbs (22.2 kN) attached to a single overhead anchorage. Each worker shall be attached to a separate lifeline system.

(2) Horizontal lifeline (HLL).

(a) Locally manufactured HLLs are not acceptable unless they are custom designed for limited or site specific applications by a Registered Professional Engineer (RPE) who is also qualified in designing HLL systems.

(b) Commercially manufactured HLLs shall be designed, installed, certified and used under the supervision of QP only, as part of a complete fall arrest system. The CP may (if deemed appropriate by QP), supervise the assembly, disassembly, use and inspection of the HLL systems, under the direction of the QP.

(c) The design shall include drawings, required clearance, instructions on proper installation, and use procedures, proof testing reports and inspection requirements.

(d) All HLL anchorages shall be designed by a RPE who is also qualified in designing HLL systems. > See ANSI/ASSE Z359.6.

(e) The design of all HLLs shall be reviewed and accepted by the GDA as part of the Fall Protection and Prevention Plan.

21.I.09 Positioning System. A positioning system uses some of the same equipment as a fall protection system (i.e., a harness, etc.), however, a positioning system used alone does not constitute fall protection.

a. A positioning system shall not be used as a primary fall arrest system. While positioning (working with both hands free), a person shall use a separate system that provides back-up protection from a fall.

b. System requirements. Positioning System shall:

(1) Be rigged such that a worker cannot free fall more than 2 ft (0.6 m);

(2) Be secured to an anchorage capable of supporting at least twice the potential impact load of a worker's fall or 3,000 lbs (13.3 kN), whichever is greater;

(3) Ensure workers achieve 100% tie-off during use;

(4) The attachment points on the full body harness used in the positioning system shall be located on the sides or on the front of the harness.

21.I.10 Restraint Systems.

a. Consideration shall be made for use of fall restraint over fall arrest. Fall restraint systems prevent the user from reaching an area where a free fall could occur by restricting the length of the lanyard or by other means.

b. The anchorage strength requirement for restraint systems shall be 3,000 lbs (13.3 kN) or designed by a QP for two times the foreseeable force.

c. Restraint systems can be used only on flat or low-sloped surfaces (</= 18.4^{o} or 4:12 slope).

21.J Ladder-Climbing Devices (LCDs). A LCD is a sleeve or cable/rope attached to a fixed ladder over 20 ft (6 m) in length.

21.J.01 Anchorage strength for LCDs shall be a minimum of 3,000 lbs (13.3 kN).

21.J.02 The connector between the front D-ring of the harness and the ladder cable, rope or sleeve shall be 9 in (20 cm) long.

21.J.03 The free fall distance when using a LCD shall not exceed 2 ft (0.6 m).

21.J.04 There shall be 100% transition at the top of the LCD for safe access to above work surface or roof.

➢ Note: Do not install LCDs on ladders that have ¾ in (1.9 cm) rungs (off- the-shelf-ladders) unless the ladders are designed to withstand the fall forces.

21.K Scaffolds, Work Platforms and Elevating/Aerial Devices.

21.K.01 Scaffolds shall be equipped with a standard guardrail per 21.F.01 or other fall protection systems.

21.K.02 For workers erecting and dismantling scaffolds, an evaluation shall be conducted by a CP to determine the feasibility and safety of providing fall protection if fall protection is not feasible. An AHA detailing rationale for infeasibility of use of fall protection shall be submitted and accepted by the GDA.

21.K.03 Suspended scaffolds.

a. Single point or two point suspended scaffold: In addition to railings, workers shall also be tied off to an independent vertical lifeline using a full body harness.

b. Other suspended scaffolds (e.g. catenary, float, needle-beam, Boatswain chairs): PFAS is required and workers shall be tied off to an independent vertical lifeline using a full body harness.

c. A risk assessment shall be performed when persons are supported on a multi-point adjustable suspended scaffold to evaluate the effectiveness and feasibility of the use of PFAS. Results shall be documented in the AHA for the activity being performed. > See 21.I.05.

21.K.04 Self-Propelled Elevating Work Platforms (Scissor Lifts), per ANSI A92.6.

a. Scissor lifts shall be equipped with standard guardrails.

b. In addition to the guardrail provided, the scissor lift shall be equipped with anchorages meeting the ANSI Z359 Fall Protection Code.

➢ Note: Scissor lifts not equipped with anchorages are prohibited.

c. A restraint system shall be used in addition to guardrails. The lanyards, to include lanyards with built-in shock absorbers, used with the restraint system shall be sufficiently short to prohibit workers from climbing out of, or being ejected from the platform.

d. The use of a self-retracting device (SRD) is prohibited unless permitted by the SRD manufacturer and used in accordance with manufacturer's instructions.

e. Workers are prohibited from climbing on or over the guardrails.

21.K.05 Aerial Work Platforms: Boom Supported Platforms (per ANSI A92.5) and Vehicle Mounted Rotating and Elevating Aerial Devices (per ANSI A92.2).

a. Workers shall be anchored to the basket or bucket in accordance with manufacturer's specifications and instructions (anchoring to the boom may only be used when allowed by the manufacturer and permitted by the CP).

b. Lanyards used shall be sufficiently short to prohibit worker from climbing out of basket.

c. Lanyards with built-in shock absorbers are acceptable.

d. Self-retracting devices are not acceptable.

e. Tying off to an adjacent pole or structure is not permitted unless a safe device for 100% tie-off is used for the transfer.

21.K.06 Manually Propelled Elevating Work Platforms (per ANSI/SIA A92.3). > See Section 22.C.06 for Mobile Scaffolds.

a. The platform shall be equipped with standard guardrails.

b. If the platform is equipped with anchorages meeting the ANSI Z359, a restraint system shall be used in addition to the guardrails.

c. Lanyards used with the restraint system shall be sufficiently short to prohibit workers from climbing out of, or being ejected from the platform.

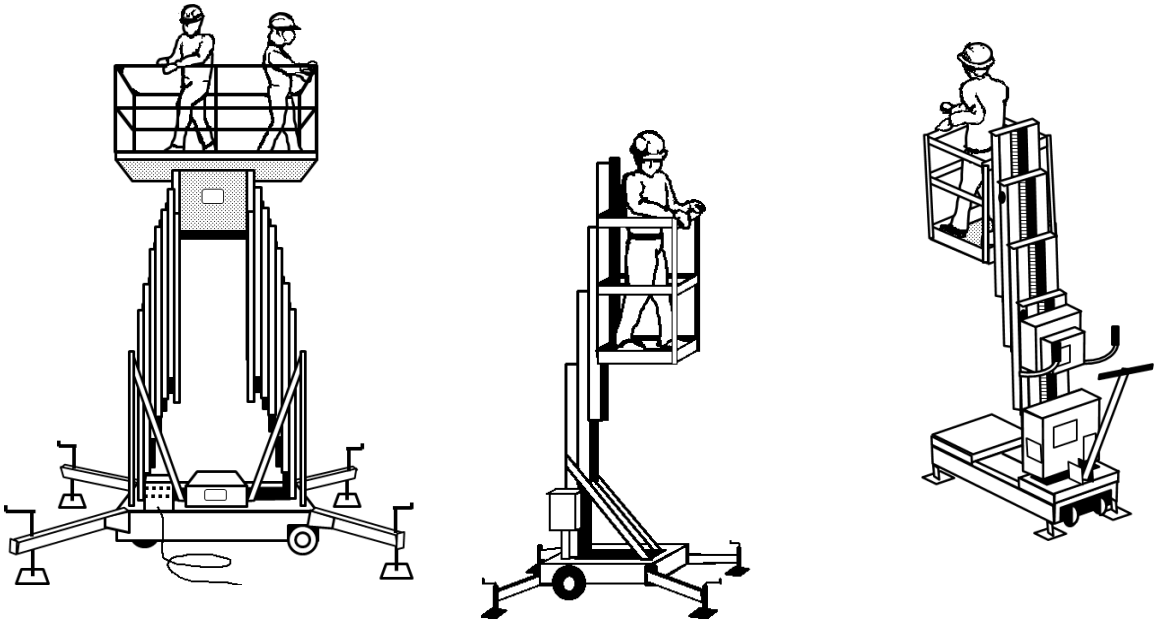
d. Lanyards with built-in shock absorbers are acceptable.

e. Self retracting devices are not acceptable.

f. The platform shall not be occupied when moved and at no time will workers be allowed to climb on or over the guardrails. > See Figure 21-5.

FIGURE 21-5

Typical Examples of Manually Propelled Elevating Aerial Platforms



Example #1 Example #2 Example #3

21.L Warning Line System (WLS).

21.L.01 A WLS may ONLY be used on floors, or flat or low-sloped roofs (between 0-18.4^{o} or less than 4:12 slope) during construction work and shall be erected around all sides of the work area.

21.L.02 A WLS shall consist of wires, rope or chains 34-39 in (0.9-1.0 m) high with supporting stanchions. WLS shall be flagged at not more than 6 ft (1.8 m) intervals with a high visibility material.

21.L.03 The wire, rope or chains shall have a minimum tensile strength of 500 lbs (2.2 kN) and after being attached to the stanchions shall be capable of supporting without braking, the loads applied to the stanchions.

21.L.04 Stanchions shall be capable of resisting without tipping a force of 16 lbs (71 N) applied horizontally against the stanchions 30 in (76.2 cm) above the walking/working surface, perpendicular to the warning line and in the direction of the roof floor or platform edge. The line consisting of wire rope or chains shall be attached at each stanchion in such a way that the pulling on one section of the line will not result in a slack being taken up in adjacent sections before the stanchion tips over.

21.L.05 Working within the WLS does not require fall protection. No worker shall be allowed in the area between the roof or floor edge and the WLS without fall protection. Fall protection is required when working outside the WLS.

21.L.06 Roofing Work.

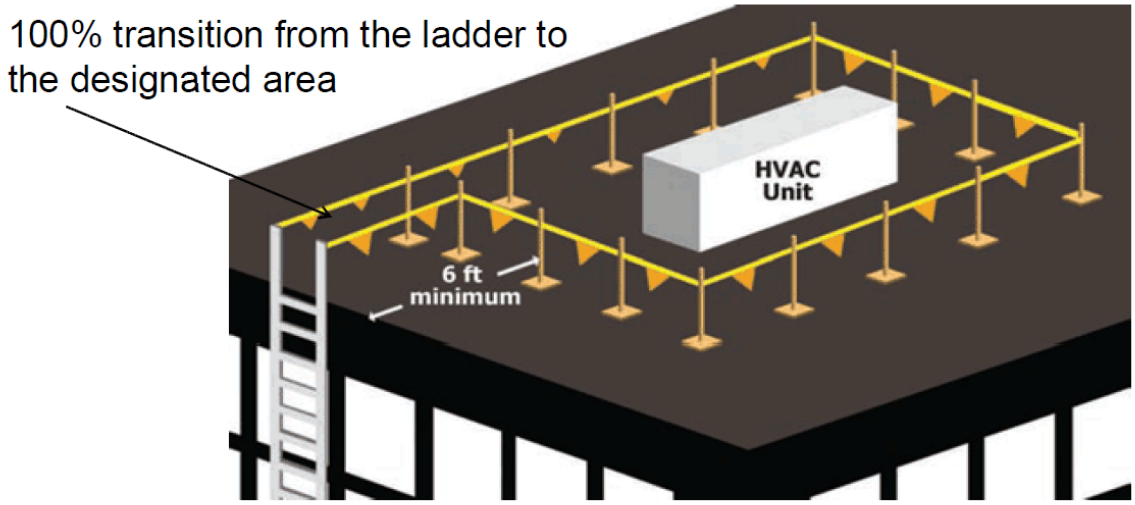
a. For roofing work on flat roofs, the WLS shall be erected not less than 6 ft (1.8 m) from the edge.

b. When roofing work is conducted on low sloped roofs (less than 4:12), or when using mechanical equipment or when work is performed by other trades (i.e., mechanical contractor performing work on equipment located on roofs, etc), the WLS shall be erected not less than 15 ft (4.5 m) from the unprotected side or edge.

21.L.07 A Designated Area is used as a fall protection method during maintenance work (i.e., inspecting or maintaining HVAC equipment) on roofs. The requirement for the Designated Area is identical to WLS. In addition, a 100% transition is required from the access point on the roof to the Designated Area. > See Figure 21-6.

21.M Safety Monitoring System (SMS). The use of a SMS as a fall protection method is prohibited.

Figure 21-6
Designated Area



- Used on roofs during maintenance work – i.e., inspecting or maintaining HVAC equipment - (NOT roofing work)
- Similar to warning line system for construction (21.L)

21.N Rescue Plan and Procedures. The employer is required to provide prompt rescue to all fallen workers.

21.N.01 A rescue plan shall be prepared and maintained when workers are using fall protection equipment. > See ANSI Z359.2, Written Rescue Procedures.

21.N.02 The plan shall contain provisions for self-rescue and assisted rescue of any worker who falls including rescue equipment. If other methods of rescue are planned (i.e. a jurisdictional public or Government emergency rescue agencies), it shall be indicated in the rescue plan including how to contact and summon the agency to the mishap site.

21.N.03 Personnel conducting rescue shall be trained accordingly.

21.N.04 If required, anchorages for self-rescue and assisted–rescue shall be identified, selected, and documented in Site-Specific Fall protection and Prevention Plan. Anchorages selected for rescue shall be capable of withstanding static loads of 3,000 lbs (13.3 kN) or five times the applied loads as designed by a QP.

21.N.05 Workers using fall protection equipment shall have an assigned safety person (spotter) also known as the "buddy system", who will be within visual/verbal range to initiate rescue of the fallen worker if required.

21.N.06 Rescue equipment used for self-rescue or assisted-rescue (i.e. SRL with rescue capability) shall meet ANSI Z359.4 and Z359.14.

21.O Working Over or Near Water (piers, wharves, quay walls, barges, aerial lifts, crane-supported work platforms, etc)**.** PFDs are required for all work over or near water unless detailed below. > See Figure 21-7.

- Note 1: All USACE and contractor workers, to include divers, shall comply with the requirements below.

- Note 2: If utilizing PFDs with full body harness, the full body harness shall be worn under the PFD. The type of PFD used shall not interfere with proper use of a full body harness and lanyard.

21.O.01 When continuous fall protection is used, without exception, to prevent workers from falling into the water, the employer has effectively removed the drowning hazard and PFDs are not required.

- Note: When using safety nets as fall protection, USCG-approved PFDs are usually required, unless rationale is provided in AHA.

21.O.02 When working over or near water and the distance from walking/working surface to the water's surface is 25 ft (7.6 m) or more, workers shall be protected from falling by the use of a fall protection system and PFDs are not required.

21.O.03 When working over or near water where the distance from the walking/working surface to the water's surface is less than 25 ft (7.6 m) AND the water depth is less than 10 ft (3.05 m), fall protection shall be required and PFDs are not required.

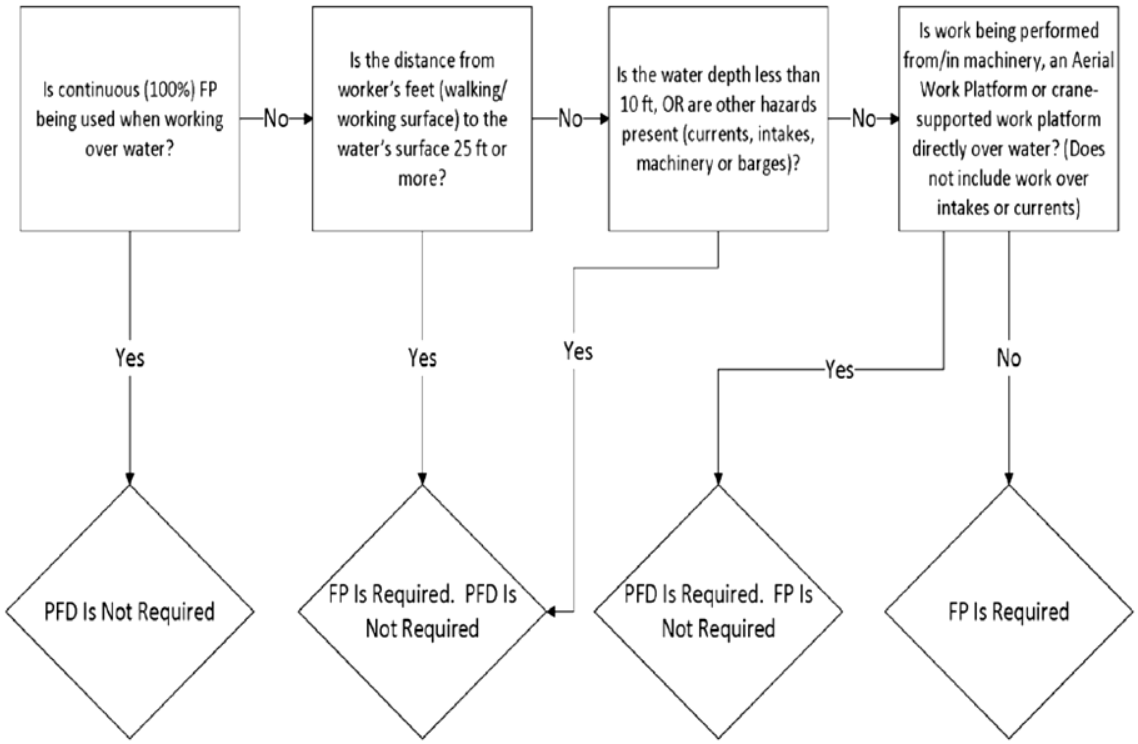
21.O.04 When working over water, PFD, lifesaving equipment and safety skiffs meeting the requirements of this EM shall be used as required.

21.O.05 When working from/in machinery (mechanically operated equipment), aerial lift equipment or other movable work platforms/cranes directly over water AND the depth of the water is at least 10 ft (3 m) deep, fall protection is not required however, PFDs are required.

21.O.06 When there are hazards from currents, intakes, dangerous machinery or equipment, or barges, etc., fall protection shall be required regardless of the fall distance and PFDs are not required.

FIGURE 21-7

Fall Protection (FP) vs. Personal Flotation Device (PFD) Use When Working Over or Near Water



21.P Other Engineered Fall Protection Systems.

21.P.01 Commercially available engineered/integrated systems are recognized as effective fall protection and may be used. These are systems that are not addressed in Paragraph 21.F.

21.P.02 Commercially available engineered/integrated systems shall be designed, installed, certified and used only under the supervision of QP and used per manufacturer instructions and recommendations. The CP may (if deemed appropriate by a QP), supervise the assembly, disassembly, use and inspection of the engineered system, under the direction of the QP.

21.P.03 The design shall include drawings, required clearance, instructions on proper installation, use and inspection requirements. These systems shall be reviewed and accepted by the GDA as part of the Fall Protection and Prevention Plan.

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SECTION 22

Work Platforms and Scaffolding

22.A General. This Section establishes safety requirements for the construction, operation, maintenance and use of work platforms and scaffolding used in construction alteration, demolition, operations and maintenance of buildings and other structures. It does not apply to permanently installed scaffolds or platforms.

22.A.01 Scaffolding and work platforms shall be erected, used, inspected, tested, maintained, and repaired in accordance with:

a. For non-mechanized equipment - ANSI A10.8, Scaffolding Safety Requirements, or the Scaffolding, Shoring, and Forming Institute's Code of Safe Practices, and the manufacturer's operating manual.

b. For mechanized equipment - the manufacturer's operating manual, a copy of the manual shall be available at the work site.

22.A.02 Work platforms and scaffolding shall comply with fall protection (FP) and appropriate access requirements of Sections 21 and 24.

a. All requirements of this Section shall be applied to work platforms and means of access.

b. Standard railings and handrails for stairs shall be in compliance with the requirements of Sections 24.C and 24.E.

c. Standard guardrails shall be in compliance with Section 21.F.01.

(1) Cross bracing is acceptable in place of a midrail when the crossing point of two braces is between 20 in (0.5 m) and 30 in (0.8 m) above the work platform.

(2) Cross bracing is acceptable as a toprail when the crossing point of two braces is between 38 in (0.97 m) and 48 in (1.3 m) above the work platform.

(3) The end points at each upright shall be no more than 48 in (1.3 m) apart.

(4) Cross bracing shall not be used for both a midrail and top rail.

d. Personal FP devices shall be in compliance with Section 21.I;

e. Safety (FP) nets shall be in compliance with the requirements of Section 21.H.

f. Ladders used to access scaffolds and work platforms shall be in compliance with the requirements of this Section and Section 24.B.

22.A.03 Prior to commencing any activity that requires work in elevated areas, all provisions for access and fall protection shall be delineated in the Site-Specific Fall Protection and Prevention Plan and Activity Hazard Analysis (AHA), per Section 21.D, and accepted by the GDA for the activity. For specific guidance related to erecting and disassembling scaffolds, see Section 21.K.

22.A.04 The following hierarchy and prohibitions shall be followed in selecting appropriate work platforms.

a. Scaffolds, platforms, or temporary floors shall be provided for all work except that which can be performed safely from the ground or similar footing.

b. Ladders may be used as work platforms only when allowed by Section 24.B.

c. Ladder jacks, lean-to, and prop-scaffolds are prohibited.

d. Emergency descent devices shall not be used as working platforms.

22.A.05 Work platforms and scaffolds shall not be erected or used in the immediate vicinity of power lines or electrical conductors until such are insulated, de-energized, or otherwise rendered safe against accidental contact. >See Section 11.F.

22.B Scaffolds (excludes Elevating Aerial Work Platforms). >See Section 22.L.

22.B.01 An AHA shall be prepared by the contractor performing the work and submitted to the GDA prior to erection. The AHA will address all of the following elements, if applicable. If not applicable, reasoning shall be provided.

a. Site conditions (ground conditions, overhead utilities, etc.);

b. Identity of specific type of scaffolding to be used;

c. Scaffold dimensions to include height, width, depth and length;

d. Load calculation for the anticipated work load and wind loading;

e. The name of the Competent Person (CP) for Scaffolding, and

f. The method of marking or barricading to be used per 22.B.21.

22.B.02 Erection, moving, dismantling, or altering of scaffolding shall be under the supervision of a CP for Scaffolding.

a. A CP for scaffolding must have a documented, minimum of 8-hours of scaffold training to include training on the specific type of scaffold being used (e.g. Mast-Climbing, Adjustable, Tubular Frame, etc.).

b. The training must include:

(1) Assessment of the base material the scaffold will be erected upon;

(2) Load calculations for materials and personnel;

(3) Erection and dismantling; or,

(4) Training must meet the training requirements in the applicable ANSI standard. >See Section 21.B.04.

22.B.03 When scaffolding is in use, they will be inspected daily by the CP, prior to each shift. The inspection will be recorded on the daily safety inspection required by Section 01.A.13 and on the scaffold tag.

22.B.04 Scaffolding that has been hoisted after configuration or assembly shall be re-inspected by a CP before initial use and again after each hoisting. This inspection will be documented on the scaffold inspection tag.

22.B.05 A scaffold tagging system shall be used. All scaffolds are tagged by the CP. Tags shall:

a. Include name and signature of the CP;

b. Include dates of initial and all daily inspections;

c. Be readily visible, legible, and made from materials that will withstand the elements;

d. Include wording that states one of the following:

(1) Scaffold is complete and safe to use;

(2) Scaffold is incomplete, not ready for use and reasoning, or

(3) Scaffold is incomplete and unsafe to use.

22.B.06 Anyone involved in erecting, disassembling, moving, operating, using, repairing, maintaining or inspecting a scaffold shall be trained by a CP to recognize any hazards associated with the work in question. Proof of training shall be maintained on site and made available to the GDA upon request.

22.B.07 Where persons are required to work or pass under a scaffold, a screen (consisting of No. 18 gauge US Standard wire ½ in (1.2 cm) mesh or the equivalent) shall be provided between the toeboard and the guardrail and extending over the entire opening; or access to the potential impact area below shall be restricted.

22.B.08 Capacities.

a. Scaffolds and their components shall meet the requirements contained in ANSI A10.8 or other applicable ANSI standard and be capable of supporting without failure at least 4 times the maximum anticipated load.

b. Direct connections to roofs and floors, and counterweights used to balance adjustable suspension scaffolds, shall be capable of resisting at least 4 times the tipping moment imposed by the scaffold operating at the rated load of the hoist, or 1.5 times (minimum) the tipping moment imposed by the scaffold operating at the stall load of the hoist, whichever is greater.

22.B.09 Design.

a. The dimensions of the members and materials used in the construction of various working platforms or scaffolds shall conform to the sizes shown in the ANSI A10.8 tables.

b. Factory-fabricated scaffolds and components shall be designed and fabricated in accordance with the applicable ANSI standard. When there is a conflict between the ANSI standard and this manual concerning the design or fabrication of factory-fabricated scaffolds, the ANSI standard shall prevail.

c. Load-carrying timber members shall be a minimum of 1,500 lb-f/in^2 (10,342kPa) (stress grade) construction grade lumber.

(1) All dimensions are nominal sizes (except where rough sizes are noted) as provided by Voluntary Product Standard DOC PS20, published by NIST of the US Department of Commerce.

(2) Where rough sizes are noted, only rough or undressed lumber of the size specified will satisfy minimum requirements.

(3) Lumber shall be reasonably straight-grained and free of shakes, checks, splits, cross grains, unsound knots or knots in groups, decay and growth characteristics, or any other condition that will decrease the strength of the material. > For planking, see Section 22.B.15.

d. When scaffolds are wrapped with tarps, poly enclosures, or similar materials; wind calculations will be calculated by a Qualified Person (QP) to determine the strength and placement of the ties.

22.B.10 Supporting members and foundations shall be of sufficient size and strength to safely distribute loading.

a. Supporting members shall be placed on a firm, smooth foundation that will prevent lateral displacement.

b. Unstable objects such as barrels, boxes, loose bricks, or concrete blocks shall not be used as supports.

c. Vertical members (i.e., poles, legs, or uprights) shall be plumb and securely braced to prevent swaying or displacement.

22.B.11 The design and construction or selection of solid wood planking and platform for means of access shall be based upon either the number of persons for which they are rated or the uniform load distribution to which they will be subjected, whichever is the more restrictive.

22.B.12 Scaffolds shall be plumb and level unless engineered and designed to contour as the structure does.

22. B.13 Scaffolds (other than suspended scaffolds) shall bear on base plates upon mudsills or other adequate firm foundation.

22.B.14 Working levels of work platforms shall be fully planked or decked.

22.B.15 Planking.

a. All wood planking shall be selected for scaffold plank use as recognized by grading rules established by a recognized independent inspection agency for the species of wood used.

b. The maximum permissible spans for 2-in x 10-in (5-cm x 25.4-cm) (nominal), shall be 8 ft (2.4 m) or 2-in x 9-in (5-cm x 22.8-cm) (rough) solid sawn wood planks shall be 10 ft (3 m).

c. Fabricated planks and platforms may be used in lieu of solid sawn wood planks. Maximum spans for such units shall be as recommended by the manufacturer.

d. Planking shall be secured to prevent loosening, tipping, or displacement and supported or braced to prevent excessive spring or deflection. Intermediate beams shall be provided to prevent dislodgement of planks due to deflection. > See Section 24.A.04.

e. Each platform on all working levels of scaffolds shall be fully planked or decked between the front uprights and the guardrail supports as follows:

(1) Each platform unit (e.g. scaffold plank, fabricated plank, fabricated deck, or fabricated platform) shall be installed so that the space between adjacent units and the space between the platform and the uprights is no more than 1 in (2.5 cm) wide, except where the employer can demonstrate that a wider space is necessary (e.g., to fit around uprights when side brackets are used to extend the width of the platform).

(2) Where the employer makes the demonstration as described in 22.B.15.e.(1), the platform shall be planked or decked as fully as possible and the remaining open space between the platform and the uprights shall not exceed 9 ½ in (24.1 cm).

f. When planking is lapped in a long run, each plank shall lap its supports at least 12 in (30.4 cm). Scaffold planks shall extend over their end supports not less than 6 in (15.2 cm) (unless the planking is manufactured with restraining hooks or equivalent means of preventing movement) or more than 12 in (30.4 cm). Work surfaces shall be properly lapped or securely fastened to the scaffold.

g. Where the ends of planks abut each other to form a flush floor, the butt joint shall be at the centerline of a pole and abutted ends shall rest on separate bearers.

h. The front edge of all platforms shall not be more than 14 in (36 cm) from the face of the work, unless guardrail systems are erected along the front edge and/or personal fall arrest systems are used; the maximum distance from the face for plastering and lathing operations is 18 in (46 cm).

i. Planking shall be supported or braced to prevent excessive spring or deflection and secured and supported to prevent loosening, tipping, or displacement.

j. When a scaffold materially changes its direction, the platform planks shall be laid to prevent tipping.

(1) The planks that meet the corner bearer at an angle shall be laid first (unless hook-on fabricated planks are used), and extend over the diagonally placed bearer far enough to have a good safe bearing, but not far enough to involve any danger from tipping, and;

(2) The planking running in the opposite direction at an angle shall be laid so as to extend over and rest on the first layer of planking.

k. Planks shall be maintained in good condition. When cracks exceed 1.5 times the width of the board, the plank will not be used. Planks with notches deeper than 1/3 the width of the plank will not be used. Planks with saw kerfs shall not be used.

22.B.16 When moving platforms to the next level, the existing platform shall be left undisturbed until the new bearers have been set to receive the platform planks.

22.B.17 Materials shall not be stored on scaffolds or runways in excess of supplies needed for that shift.

22.B.18 Access.

a. An access ladder or equivalent safe access shall be provided.

b. Where a built-in ladder is part of a scaffold system, it shall conform to the requirements for ladders. > See Section 24.B.

c. Climbing of braces is prohibited.

d. When hook-on or attachable ladders are used on a supported scaffold more than 20 ft (6 m) in height, they shall have rest platforms every 20 ft or fall protection will be used. If scaffold platforms are used as rest platforms they will be arranged so the climber must exit to a platform before climbing the next section of ladder. When end frames are used for access they will conform to the ladder standard and not exceed 20 ft without FP.

e. Hook-on or attachable ladders shall be specifically designed for use with the type of scaffold and they shall be positioned so as not to tip the scaffold.

f. When erecting or dismantling welded frame scaffolds, the end frames may be used as access provided the horizontal members are not more than 22 in (55.9 cm) apart.

g. The minimum clear length of the rungs shall be 16 in (40.7 cm).

h. The distance from the supporting surface to the first step of a ladder, stair, or frame designed to be climbed shall not exceed 2 ft (61 cm).

i. Ladder access points shall be protected by an inward swinging gate or chain guard.

22 B.19 Where the scaffold height exceeds four times the minimum scaffold base dimension (and including the width added by outriggers, if used), the scaffold shall be secured to the wall or structure.

a. The first vertical and horizontal tie shall be placed at this point.

b. Vertical ties shall be repeated at intervals not greater than 26 ft (7.9 m) with the top tie placed no lower than four times the base dimension from the top of the scaffold.

c. Horizontal ties shall be placed at each end and at intervals not greater than 30 ft (9.1 m).

d. When more stringent means of securing the scaffold are recommended by the manufacturer or an RPE, the more stringent requirements shall be followed.

22.B.20 When scaffolds are to be partially or fully enclosed, a QP shall verify the adequacy of the number, placement, and strength of ties attaching the scaffold to the structure, taking into consideration wind loads and weather.

22.B.21 When vehicles or mobile equipment are used or allowed adjacent to scaffolding, substantial stop logs or barricades shall be installed.

a. The use of a ground guide is recommended for this equipment, however, if it is demonstrated that barricades are not feasible or are not required based on distance, a ground guide shall be used.

b. Ground guides shall not be exposed to potential falling objects from the scaffold or the equipment.

c. Hanging scaffolds are exempt unless the CP determines that vehicles or mobile equipment could pose a hazard to safe operation.

22.B.22 The use of brackets on scaffolds shall be prohibited unless the tipping effect is controlled.

22.B.23 Use of the following types of scaffolding is permitted if they are designed and constructed in accordance with ANSI A10.8:

a. Outrigger scaffolds;

b. Needle beam scaffolds;

c. Interior hung scaffolds;

d. Bricklayer’s square scaffolds;

e. Float/ship scaffolds;

f. Boatswain's scaffolds;

g. Window jack scaffolds;

h. Carpenter's bracket scaffolds, and

i. Form scaffolds.

22.B.24 Other types of scaffolding not included in ANSI A10.8 may be approved by the GDA provided the design is approved by a Registered Professional Engineer (RPE) or it meets a nationally recognized design standard.

22.C Metal Scaffolds and Towers.

22.C.01 Scaffold components made of dissimilar metals shall not be used together unless a CP has determined that galvanic action will not reduce the strength of any component to a level below that required by Section 22.B.09.

22.C.02 The sections of metal scaffolds shall be securely connected and all braces shall be securely fastened.

22.C.03 A ladder or stairway shall be provided for access and shall be affixed or built into all metal scaffolds and so located that, when in use, it will not have a tendency to tip the scaffold.

22.C.04 Tube and coupler scaffolds.

a. Tube and coupler scaffolds shall have posts, runners, and bracing of nominal 2 in (5-cm) (outside diameter) steel tubing or pipe: other structural metals, when used, must be designed to carry an equivalent load. The size of bearers (outside diameter) and the spacing of posts shall meet the requirements contained in ANSI A10.8.

b. Tube and coupler scaffolds shall be limited in heights and working levels to those permitted in ANSI A10.8. Drawings and specifications for tube and coupler scaffolds that exceed the limitations in ANSI A10.8 shall be designed by a RPE.

c. All tube and coupler scaffolds shall be constructed to support four times the maximum intended loads, as set forth by ANSI A10.8 or as specified by a RPE (with knowledge in structural design).

d. Runners shall be erected along the length of the scaffold and shall be located on both the inside and the outside posts at even heights.

(1) When tube and coupler guardrails and midrails are used on outside posts, they may be used in lieu of outside runners. If guardrail systems are removed to other levels, extra runners shall be installed to compensate.

(2) Runners shall be interlocked to form continuous lengths and coupled to each post.

(3) The bottom runners shall be located as close to the base as possible.

(4) Runners shall be placed not more than 6 ft - 6 in (1.9 m) on center.

e. Bearers.

(1) Bearers shall be installed transversely between posts.

(2) When coupled to the post, the inboard coupler shall bear directly on the runner coupler. When coupled to the runners, the couplers shall be kept as close to the post as possible.

(3) Bearers shall extend beyond the posts and runners and shall provide full contact with the coupler.

f. Bracing across the width of the scaffold shall be installed at the ends of the scaffold at least every fourth level vertically and repeated every third set of posts horizontally.

(1) Such bracing shall extend diagonally from the outer post or runner at this level upward to the inner post or runner at the next level.

(2) Building ties shall be installed adjacent to bracing.

g. Longitudinal diagonal bracing across the inner and outer rows of poles shall be installed at approximately a 45° angle in both directions from the base of the end post upward to the extreme top of the scaffold.

(1) Where the longitudinal length of the scaffold permits, such bracing shall be repeated beginning at every fifth post.

(2) On scaffolds where the length is shorter than the height the longitudinal bracing shall extend diagonally from the base of the end posts upward to the opposite end posts and then in alternating directions until reaching the top of the scaffold.

(3) Where conditions preclude the attachment of bracing to the posts, it may be attached to the runners.

22.C.05 Metal frame scaffolds.

a. Spacing of tubular welded panels or frames shall be consistent with the loads imposed.

b. Scaffolds shall be properly braced by cross, horizontal, or diagonal braces (or combination of these) to secure vertical members together laterally, and the cross braces shall be of such length as will automatically square and align vertical members so that the erected scaffold is always plumb, square, and rigid. All brace connections shall be made secure.

c. Scaffold legs shall be set on adjustable bases or plain bases placed on mudsills or other foundations adequate to support the maximum rated loads.

d. Frames shall be placed one on top the other with coupling or stacking pins to provide vertical alignment of the legs.

e. Where uplift may occur, panels shall be locked together vertically by pins or other equivalent suitable means.

f. Drawings and specifications for all frame scaffolds over 125 ft (38.1 m) in height above the base plates shall be designed by a RPE.

22.C.06 Manually propelled mobile scaffolds, <u>including mobile work stands, such as “baker scaffolds</u>”.

a. All wheels and casters on rolling scaffolds shall have a positive locking device, securely fastened to the scaffold, to prevent accidental movement.

b. All casters or wheels shall be locked when a scaffold is occupied.

c. The force necessary to move the mobile scaffold shall be applied as close to the base as practical and provision shall be made to stabilize the tower during movement from one location to another.

d. Rolling scaffolds shall be used only on firm, level, <u>and</u> clean surfaces.

e. Free-standing mobile scaffold working platform heights shall not exceed three times the smallest base dimension.

f. No person shall be allowed to ride on manually propelled scaffolds unless all of the following conditions exist:

(1) The ground surface is within 3° of level and free from pits, holes, or obstructions;

(2) The minimum dimension of the scaffold base (when ready for rolling) is at least one-half of the height and outriggers, if used, are installed on both sides of staging;

(3) The wheels are equipped with rubber or similar resilient tires; and

(4) All tools and materials are secured or removed from the platform before the scaffold is moved.

22.D Wood Pole Scaffolds. > See 29 CFR 1926.452(a).

22.E Suspended Scaffolds.

22.E.01 Suspended scaffolds are scaffolds that are suspended from anchorage points/hoists that allow the scaffold to move up and down as needed for work to be performed. Suspended scaffolds shall be designed, constructed, operated, inspected, tested, and maintained as specified in the operating manual for the device.

22.E.02 Inspections.

a. Suspended scaffold systems shall be inspected prior to being placed in service to determine that the system conforms to this manual and the manufacturer's specifications.

b. Before the scaffold is used, direct connections shall be evaluated by a CP who shall confirm, based on the evaluation, that the supporting surfaces are capable of supporting the loads imposed.

c. Each hoist shall be inspected by a CP before use, after every installation and re-rigging in accordance with the manufacturer's specifications. A trial operation will be done by the operator alone after every installation.

d. Connection and anchorage systems of suspended scaffold shall be inspected at the beginning of each shift.

e. All wire ropes, fiber and synthetic ropes, slings, hangers, hoists, rigging, fall protection equipment, platforms, anchorage points and their connections, and other supporting parts shall be inspected before every installation, daily thereafter, and periodic while the scaffold is in use.

f. Governors and secondary brakes for powered hoists shall be inspected and tested per the manufacturer's recommendations: at the minimum, inspections shall be made annually.

(1) Inspections and tests shall include a verification that the initiating device for the secondary braking operates as intended.

(2) A copy of the latest inspection and test report shall be maintained on the job site.

g. Records of inspections conducted while the unit is at the work site shall be maintained at the work site.

22.E.03 Only personnel trained in the use of the suspended work platform shall be authorized to operate it. Anyone involved in erecting, disassembling, moving, operating, using, repairing, maintaining or inspecting a suspended scaffold shall be trained by a CP to recognize any hazards associated with the work in question. Proof of training shall be maintained on site and made available to the GDA upon request. Training shall include:

a. Reading and understanding the manufacturer's operating manual and any associated rules and instructions, or training by a QP on the contents on these documents, and

b. Reading and understanding all decals, warnings, and instructions on the device.

22.E.04 All parts of all suspended scaffolds shall have a minimum safety factor of 4. A minimum safety factor of 6 is required for support ropes.

22.E.05 Support ropes.

a. Support ropes shall be attached at the vertical centerline of the outrigger and the attachment shall be directly over the hoist machine.

b. Support ropes shall be vertical for their entire length. The scaffold shall not be swayed nor the support ropes fixed to any intermediate points to change the original path of travel.

c. Support ropes shall have the fixed end equipped with a proper size thimble and secured by eye splicing or equivalent means. Free ends shall be brazed or secured to prevent fraying.

d. The wire rope for traction hoists shall be of such length that the operator may descend to the lowest point of travel without the end of the wire rope entering the hoist. Where the wire rope is inadequate for the lowest descent, provision shall be made to prevent the hoist from running off the wire rope.

e. On winding drum type hoists, running ends of suspension ropes shall be attached by positive means to the hoisting drum and at least four wraps of the rope shall remain on the drum at all times.

f. Support ropes shall be capable of resisting chemicals or conditions to which they are exposed.

g. No welding, burning, riveting, or open flame work shall be performed on any platform suspended by fiber or synthetic rope.

h. Defective or damaged rope shall not be used as lifelines or suspension lines. The repairing of wire rope is prohibited.

22.E.06 All suspension scaffold support devices such as outrigger beams, cornice hooks, parapet clamps, or similar devices shall:

a. Be made of mild steel, wrought iron, or materials of equivalent strength;

b. Be supported by bearing blocks;

c. Rest on surfaces capable of supporting the reaction forces imposed by the scaffold hoist operating at its maximum rated load; and

d. Be secured against movement by tiebacks installed at right angles to the face of the building whenever possible and secured to a structurally sound portion of the building. Tiebacks shall be equivalent in strength to the hoisting rope.

22.E.07 Outrigger beams.

a. Outrigger beams shall be made of structural metal and shall be restrained to prevent movement.

b. The inboard ends of outrigger beams shall be stabilized by bolts or other direct connections to the floor or roof deck, or they shall have their inboard ends stabilized by counterweights, except mason's multiple point adjustable suspension scaffold outrigger beams shall not be stabilized by counterweights.

c. Before use, direct connections shall be evaluated by a CP who shall affirm that the supporting surfaces are capable of supporting the loads to be imposed. Mason's multiple point adjustable suspension scaffold connections shall be designed by a RPE experienced in scaffold design.

d. Counterweights shall be made of non-flowable solid material, shall be secured to the outrigger beams by mechanical means, and shall not be removed until the scaffold is disassembled.

e. Outrigger beams shall be secured by tiebacks equivalent in strength to the suspension ropes. Tiebacks shall be secured to a structurally sound portion of the building or structure and shall be installed parallel to the centerline of the beam.

f. Outrigger beams shall be provided with stop bolts or shackles at both ends.

g. When channel iron beams are used in place of I-beams, the channels shall be securely fastened together with the flanges turned outward.

h. Outrigger beams shall be installed with all bearing supports perpendicular to the beam centerline.

i. Outrigger beams shall be set and maintained with the web in a vertical position.

j. Where a single outrigger beam is used, the steel shackle or clevises with which the wire ropes are attached to the beam shall be placed directly over the hoisting machines.

22.E.08 Hoisting machines

a. Hoisting machines shall be of a type tested and listed by a nationally recognized testing laboratory.

b. Each hoist shall contain a name plate(s) containing:

(1) Manufacturer's name;

(2) Maximum load rating;

(3) Identification number; and

(4) Wire rope specifications.

c. Powered hoists shall be electric-, air-, hydraulic-, or propane-powered. Gasoline-powered hoists are prohibited.

d. All powered hoists shall be equipped with speed reducers and shall be provided with a primary brake and a secondary brake.

(1) The primary brake shall automatically engage whenever power is interrupted or whenever the operator ceases to apply effort;

(2) The secondary brake shall stop and hold the hoist under over speed or abnormal conditions. All secondary brakes shall be periodically tested under simulated conditions in accordance with the manufacturer's recommendations.

e. Each powered hoist shall have its own separate control.

(1) If the control is of the push-button type, it shall be constant pressure;

(2) If the control is of the fixed-position type, it shall have provision for automatic locking when in the off position, or shall be guarded against accidental actuation; and

(3) If the control is of the lever type, it may be of the constant pressure type or of the fixed-position type.

f. Manual operation of powered hoists may be provided if the hoist is designed so that not more than one person per hoist is required to perform this operation.

(1) During manual operation, a means shall be provided to make the prime mover inoperative.

(2) Instruction shall be provided advising personnel to disconnect the power source before using a manual crank.

g. Manually-operated hoists.

(1) Manual operation shall provide a means to prevent rapid handle movement or fast un-spooling. Mechanisms used to allow fast un-spooling during the erection process shall not be in place on the scaffold.

(2) In the event a controlled descent device is used, it shall not bypass the secondary brake.

(3) All winding drum hoists shall be provided with a driving pawl and a locking pawl that automatically engages when the driving pawl is released.

(4) Gripping-type hoists shall be designed so that the hoist is engaged on the suspension rope at all times, including all travel actuations of the operating lever.

(5) Each winding drum hoist shall be provided with a positive means of attachment of the suspension hoist. The drum attachment shall develop a minimum of four times the rated capacity of the hoist.

(6) Each hoist shall require a positive crank force to descend.

22.E.09 Working surfaces.

a. Light metal platforms, when used, shall be of a type tested and listed by a nationally recognized testing laboratory.

b. Ladder-type platforms are prohibited.

c. Planking.

(1) Planking shall be composed of not less than nominal 2-in x 10-in (5-cm x 25.4-cm) unspliced planks, cleated together on the underside, starting 6 in (15.2 cm) from each end at intervals not to exceed 4 ft (1.2 m).

(2) The planking shall not extend beyond the hangers more than 12 in (30.4 cm). A bar or other effective means shall be securely fastened to the platform at each end to prevent its slipping off the hanger.

(3) The span between hangers for planked platforms shall not exceed 8 ft (2.4 m).

d. Beam platforms are prohibited.

22.E.10 Suspended scaffolds shall be guyed, braced, guided, or equipped with tag line to prevent swaying.

22.E.11 Two-point suspension scaffolds.

a. Two-point suspension scaffold platforms shall not be less than 20 in (50.8 cm) or more than 36 in (91.4 cm) wide. The platform shall be securely fastened to the hangers by U-bolts or by other equivalent means.

b. The hangers of two-point suspension scaffolds shall be made of mild steel, or equivalent materials, having a cross sectional area capable of sustaining four times the maximum rated load and shall be designed with a support for a standard railing.

c. Two-point suspension scaffolds shall be securely lashed to the structure. Window cleaner's anchors shall not be used.

d. The platform on every two-point suspension scaffolds shall be of the light metal or planking.

e. Two-point suspension scaffolds shall not be joined by bridging.

f. Two-point suspension scaffold platforms, when in use, shall be level within 1 in (2.5 cm) for every 1 ft (0.3 m) of platform length.

22.E.12 Mason's multiple-point adjustable suspension scaffolds.

a. When employees on the scaffold are exposed to overhead hazards, overhead protection equivalent in strength to 2 in (5-cm) planking shall be provided on the scaffold not more than 9 ft (2.7 m) above the platform, laid tight and extending the entire width of the scaffold.

b. The scaffold shall be capable of sustaining a load of 50 psf (2,394 Pa) and shall not be overloaded.

c. The platform shall be suspended by wire ropes from overhead outrigger beams.

22.E.13 Stonesetters' multiple-point adjustable suspension scaffolds shall be designed and used in accordance with ANSI A10.8.

22.E.14 Working capacities.

a. On suspension scaffolds designed for a working load of 500 lb (226.8 kg), no more than two employees shall be permitted to work at one time.

b. On suspension scaffolds with a working load of 750 lb (340.2 kg), no more than three people shall be permitted to work at one time.

22.F Hanging Scaffolds.

22.F.01 A hanging scaffold is a scaffold/work platform that is hung from a location (such as a lock gate) for work to be performed and that remains stationary until it is then repositioned with a crane/hoisting device. Hanging scaffolds shall be designed by a RPE competent in structural design. Scaffold performance and components shall meet or exceed those for general scaffolds and platforms found in ANSI A10.8-2001. > See Figure 22-1.

22.F.02 Hanging scaffolds shall meet the following requirements:

a. The scaffold shall be securely fastened to a vertical structure (i.e. wall, lock gate, etc.) by hooks over a secured structural supporting member, bolt-on brackets, or other secure attachment. The maximum span between secure attachments is 8 ft (2.4 m). Fasteners shall be of adequate size to achieve design strength of scaffold.

b. The scaffold must be secured against an uplift force equal to two times the weight of the scaffold and its rated load by means of hooks, brackets, or other secure attachments designed and placed to counteract uplift.

c. The scaffold shall have a secondary attachment method to secure it against falling if the primary attachment fails. This should be a flexible attachment, such as wire rope or chain, designed to withstand a minimum of five (5) times the weight of the scaffold and its rated load. The secondary attachment shall be connected to an anchor point of the same load rating or greater.

d. The scaffold shall have only one working level. Working platform decks shall be slip resistant and securely attached to the scaffold frame. The maximum width, front to back, of decks is 42 in (106.6 cm). Grating used for deck surfaces shall have a maximum width opening between bars small enough to prevent the rigging components used (slings, chains) from entering.

e. <u>Standard guardrails systems meeting the requirements of Section 21.F.01 shall be installed on all open sides and ends of the platform.</u>

f. The scaffold shall be conspicuously posted with a plate or other permanent marking that indicates:

(1) Weight of the scaffold;

(2) Number of personnel it was designed for;

(3) Rated weight capacity;

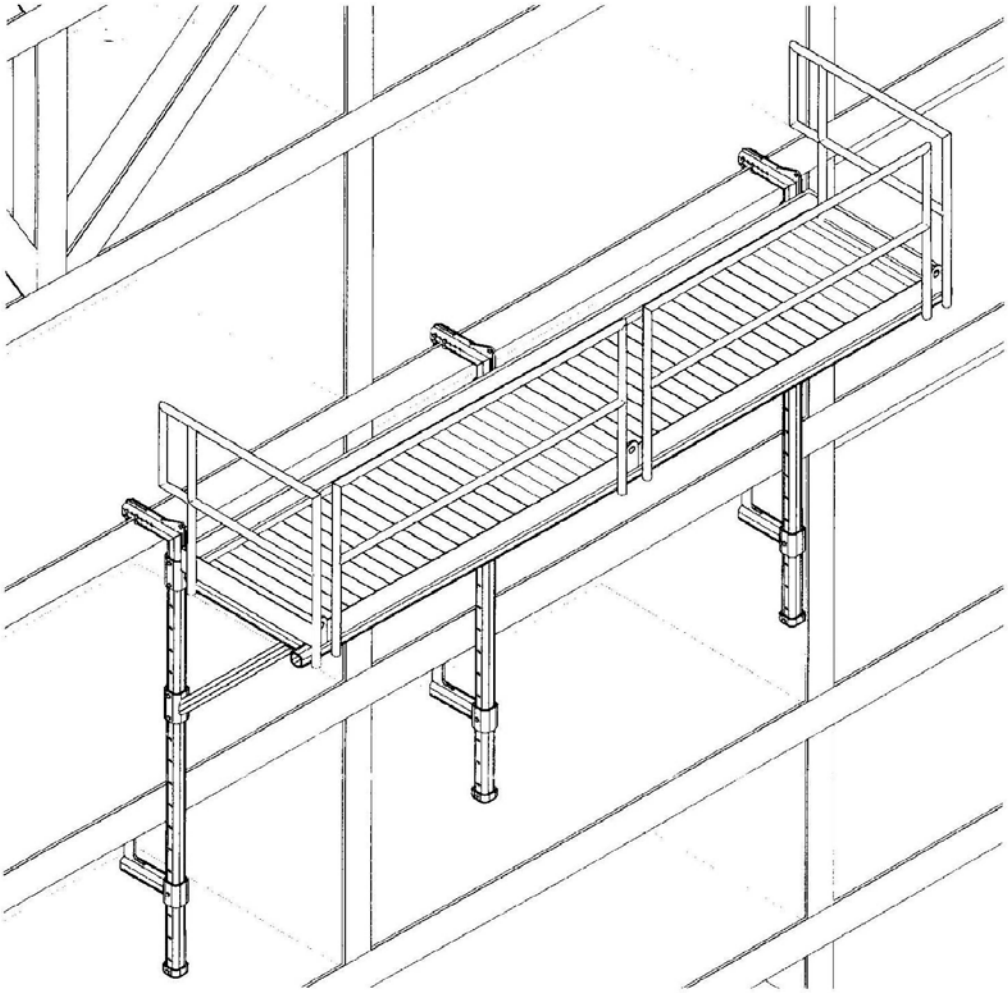
(4) Specific structure(s) it was designed to be attached to – this may be a code or other form of identification when designed for a number of different structures with similar structural attachment points;

(5) Name of the RPE who designed the scaffold; and

(6) Date of manufacture.

FIGURE 22-1

Hanging Scaffold



g. Hanging scaffolds designed to also function as crane- or other load handling equipment- (LHE-) supported personnel work platforms shall meet the requirements of Section 16.T. This includes scaffolds that require a person to stand/ride on the platform while the initial attachment to the structure is made.

h. The space between the platform deck edge and the face of the vertical structure shall not be more than 14 in (35.6 cm). Prior to use on each jobsite application, the CP shall determine if this space constitutes a hazard by being large enough to allow tools or objects to fall on workers below or, if LHE rigging may enter and entangle in the space. In these situations, the space shall be closed or blocked to remove the hazard.

22.F.03 Testing

a. Prior to initial use and after any modification of the structural members or secure attachment points, the platform shall be proof tested to 125% of its rated capacity. The test shall take place on a structure the scaffold was designed for or a test structure with similar support member characteristics.

b. Prior to use on each jobsite or placement location, hanging scaffolds shall be performance tested to 100% of the maximum intended load for the expected work. This test shall be performed with the scaffold attached to the structure in the work location.

22.F.04 Operations

a. Scaffolds and their attachments shall be inspected by a CP prior to initial use on a worksite, before use on each work shift, and regularly during use until they are removed.

b. Workers shall use properly selected and anchored personal fall protection when accessing and working on hanging scaffolds. Personal FP system components shall meet the requirements of Section 21.I.05. No part of a hanging scaffold shall be used as an anchor point for personal FP.

c. The number of workers on the platform shall not exceed the number listed on the scaffold.

d. Ladders may not be used on hanging scaffolds, except as a means of access from above the deck. Ladders used for access must meet the requirements of Section 24.B.

e. Hanging scaffolds shall be coated or painted to minimize corrosion of the components. Storage between uses shall be designed to minimize damage to the scaffold.

22.G Form and Carpenter's Bracket Scaffolding.

22.G.01 Scaffolds shall be constructed of wood, steel, or aluminum members with known strength characteristics and be designed to support a minimum load of 25 lbs/ft^2 (1.054 kg/m^2).

22.G.02 No more than two persons shall occupy any given 8 ft (2.4 m) span of a bracket scaffold at any one time. Tools and materials shall not exceed 75 lbs (34 kg) in addition to person(s) occupying the area.

22.G.03 A guardrail or other form of fall protection is required for all open edges when a fall of 6 ft or greater exists (1.8 m) or, when other hazards exist below the platform.

22.G.04 Figure-four scaffolds shall be constructed as follows:

a. Spacing shall be not more than 8 ft (2.4 m) on centers and scaffold shall be constructed from sound lumber.

b. The bracket ledger shall consist of two pieces of 1-in x 6-in (2.5-cm x 15.2-cm) or heavier material nailed on opposite sides of the vertical form support. Ledgers shall project not more than 3 ½ ft (1 m) from the outside of the form support and shall be braced and secured to prevent tipping or turning.

c. The knee or angle brace shall intersect the ledger at least 3 ft (.9 m) from the form at an angle of approximately 45 degrees, and the lower end shall be nailed to a vertical support.

d. The platform shall consist of two or more scaffold planks that extend at least 6 in (15.2 cm) beyond the ledgers at each end unless secured to the ledgers. When planks are secured to the ledgers (nailed or bolted) a wood filler strip shall be used between the ledgers. Unsupported projecting ends of planks shall be limited to an overhang of 12 in (30 cm).

e. The maximum permissible spans for planking shall be in conformance with ANSI A10.8 and be consistent with allowable bearer loads.

22.G.05 Metal brackets or scaffold jacks that are an integral part of the form shall be securely bolted or welded to the form. Folding-type brackets shall be either bolted or secured with a locking-type pin when extended for use.

22.G.06 Clip-on or hook-over brackets may be used on form work provided the form walers are bolted to the form or secured by snap ties or tie-bolts extending through the form and securely anchored. In addition, carpenter bracket scaffolds may be attached by:

a. A bolt extending through to the opposite side of the structural wall;

b. A metal stud attachment device;

c. Welding; or

d. Hooking over a secured structural supporting member.

22.G.07 Metal brackets shall be spaced not more than 8 ft (2.4 m) on centers.

22.G.08 Scaffold planks shall be either bolted to the metal brackets or be of such length that they overlap the brackets at each end by at least 6 in (15.2 cm). Unsupported projecting ends of scaffold planks shall be limited to a maximum overhang of 12 in (30.4 cm).

22.G.09 The maximum permissible spans for planking shall be consistent with allowable bearer loads.

22.G.10 Folding-type metal brackets, when extended for use, shall be either bolted or secured with a locking-type pin.

22.G.11 Wooden bracket form scaffolds shall be designed in accordance with Table 22-1 and shall be an integral part of the form panel.

22.G.12 Brackets shall consist of a triangular shaped frame made of wood with a cross-section not less than 2-in x 3-in (5-cm x 7.6-cm) or of 1-1/4-in x 1-1/4-in x 1/8-in (3.1-cm x 3.1-cm x 0.3-cm) structural angle iron.

22.G.13 The minimum design for wooden scaffolds criteria shall be in accordance with Table 22-1.

22.G.14 Scaffold planks shall be either nailed or bolted to the runners or be of such length that they overlap the ledgers at each end by at least 6 in (15.2 cm). Unsupported projecting ends of scaffold planks shall be limited to a maximum overhang of 12 in (30.4 cm).

22.G.15 The maximum permissible spans for planking shall be consistent with allowable bearer loads.

TABLE 22-1

Form Scaffolds
(Minimum Design Criteria for Wooden Bracket Form Scaffolds)

Members	Dimensions
Bracket uprights	2 x 4 in or 2 x 6 in (5 x 10.1 cm or 5 x 15.2 cm)
Bracket support ledgers	2 x 6 in (5 x 15.2 cm)
Maximum bracket width	3 ft 6 in (1 m)
Bracket braces	1 x 6 in (2.5 x 15.2 cm)
Guardrail post	2 x 4 in (5 x 10.1 cm)
Guardrail height	36 to 45 in (91.4 to 114.3 cm)
Midrail	1 x 6 in (2.5 x 15.2 cm)
Toeboards	1 x 6 in (2.5 x 15.2 cm)
Bracket upright spacing	8 ft (2.4 m) (on centers)

Form Scaffolds
(Minimum Design Criteria for Light-Duty Figure-Four Form Scaffolds)

Members	Dimensions
Bracket uprights	2 x 4 in or 2 x 6 in (5 x 10.1cm or 5 x 15.2cm)
Bracket outrigger ledgers	(2) 1 x 6 in (2.5 x 15.2 cm)
Bracket braces	(2) 1 x 6 in (2.5 x 15.2 cm)
Maximum length of ledgers	3 ft 6 in (1 m) (unsupported)
Bracket upright spacing	8 ft (2.4 m) (on centers)

22.H Horse Scaffolds.

22.H.01 Horses shall not be constructed or arranged more than two tiers or 10 ft (3 m) in height: scaffolds shall be 5 ft (1.5 m) or less in height and 5 ft (1.5 m) or more in width. When tiered heights exceed 6 ft (1.8 m), FP shall be used.

22.H.02 The members of horse scaffolds shall not be less than those specified in Table 22-2.

22.H.03 Horse scaffolds shall be spaced not more than 5 ft (1.5 m) for medium duty and not more than 8 ft (2.4 m) for light duty.

22.H.04 When arranged in tiers, each horse scaffold shall be placed directly over the horse scaffold in the tier below. The legs shall be nailed or otherwise secured to the planks to prevent displacement or thrust and each tier shall be cross braced.

22.H.05 Weakened or defective components shall not be used.

TABLE 22-2

Minimum Dimensions for Horse Scaffold Members

Members	Dimensions
Horizontal members of bearers	3 x 3.9 in (7.6 x 10 cm)
Legs	2 x 3.9 in (5 x 10 cm)
Longitudinal brace between legs	1 x 5.9 in (2.5 x 15 cm)
Gusset brace at top of legs	1 x 7.9 in (2.5 x 20 cm)
Half diagonal braces	2 x 3.9 in (5 x 10 cm)

22.I Pump Jack Scaffolds.

22.I.01 Pump jack scaffolds shall be designed for a minimum working load of 500 lbs (226.8 kg) and not more than two (2) workers shall be allowed on the scaffold at one time.

22.I.02 Pump jack brackets, braces, and accessories shall be fabricated from metal plates and angles and installed in accordance with the manufacturer's recommendations. Installation and operational manuals shall be maintained onsite and made available upon request of the GDA.

22.I.03 The standing platform shall be fully decked and the planking secured. Platforms thicker than 2 in (5.08 cm) shall not be overlapped.

22.I.04 The minimum width of a standing platform shall be 18 in (45.7 cm) and the work bench shall be 12 in (30.4 cm).

22.I.05 All materials on the work bench shall be secured from falling.

22.I.06 Pump jack scaffolds shall be provided with a guardrail system as specified by the manufacturer. Personal fall arrest systems may be used in lieu of guardrails.

22.I.07 When a workbench is used at an approximate height of 42 in (1.06 m), the top rail may be eliminated if the workbench is fully decked, if the workbench is secured, and if it is capable of withstanding 200 lbs (90.7 kg) force in any direction.

22.I.08 Workbenches shall not be used as a standing platform.

22.I.09 A ladder shall be provided for access to the platform.

22.I.10 All poles shall be supported by sills or other foundations adequate to support the load.

22.I.11 Poles.

a. Pole lumber shall be 2-in x 4-in (5-cm x 10.1-cm) stock, of Douglas fir, or equivalent, straight-grained, clear, free of cross-grain, shakes, large loose or dead knots, and other defects that might impair strength.

b. Wood poles shall not exceed 30 ft (9.1 m) in height; and spacing cannot exceed 7 ft (2.1 m).

c. Metal poles shall not exceed 50 ft (15.2 m) in height unless the design is approved by an RPE. The spacing of metal poles in excess of 7 ft (2.1 m) must also be determined by an RPE.

d. When poles are constructed of two continuous lengths they shall be of 2-in x 4-in (5-cm x 10.1-cm) (kiln dried straight grain fir) or equivalent, spiked together with the seam parallel to the pump jack, and with 10d common nails, 12 in (30.4 cm) center-to-center, staggered uniformly from opposite outside edges.

e. 4-in by 4-in (10.1 cm by 10.1 cm) wood poles may not be spliced to increase the length of any individual member.

f. Poles shall be secured to the wall by triangular bracing, or equivalent, at the bottom, top, and other points to provide a maximum vertical spacing of not more than 10 ft (3 m) between braces. Each brace shall be capable of supporting a minimum of 225 lbs (102 kg) tension or compression.

g. When wood scaffold planks are used as platforms, poles used for pump jacks shall not be spaced more than 10 ft (3 m) on center. When fabricated platforms are used that comply with all other provisions of this Section, pole spacing may exceed 10 ft on center if permitted by the manufacturer.

h. Poles shall not be placed closer than 10 ft (3.04 m) of power lines or electrical conductors until such are insulated, de-energized, or otherwise rendered safe against contact. > See Table 11-1.

22.I.12 Brackets.

a. Each pump jack bracket shall have two positive gripping mechanisms to prevent any failure or slippage.

b. For the pump jack bracket to pass bracing already installed, an extra brace shall be used approximately 4 ft (1.2 m) above the one to be passed until the original brace is reinstalled.

22.J Adjustable Scaffolds.

22.J.01 Adjustable scaffolds shall be designed and constructed in accordance with ANSI/SIA A10.8.

22.J.02 A copy of the user's manual shall be kept on site at all times.

22.J.03 Adjustable scaffolds will be secured to the structure in accordance with the manufacturer's user manual.

22.J.04 Safe access.

a. If portable ladders are used they will be removed every time the platform is raised or lowered, repositioned to ensure that the 4:1 ratio is maintained, and secured to prevent movement.

b. When stair towers are used for access to adjustable scaffolds the difference between the two elevations will be 2 ft (.6 m) or less.

c. Self-retracting lanyard, if allowed by the manufacturer, can be used to provide FP when climbing the tower. > See also Section 21.

d. On towers over 20 ft (10.7 m), rest platforms will be provided at not more than 20 ft intervals.

22.J.05 The leveling of adjustable scaffold will be accomplished by using leveling jacks.

22.J.06 When bridges are used on a single tower it will be done in strict compliance with the manufacturer’s recommendations.

22.J.07 Ratchet driven winding drum hoist shall be equipped with a driving pawl and a locking pawl. The locking pawl must automatically engage when the driving pawl is released.

22.J.08 All crank-driven winding drum hoists shall employ a positively actuated locking pawl that engages the drive train of the hoist and is actuated by reverse descending movement of the crank handle. This mechanism shall not be rendered inoperative by outside contamination.

22.J.09 Every winding drum shall contain not less than three wraps of the suspension wire rope at the lowest point of hoist travel.

22.J.10 Each hoist shall be provided with positive wire rope attachments. Wire rope attachments shall develop a minimum of 80% of the wire rope breaking strength. Wire rope termination methods shall be according to the manufacturer’s recommendation. U-type wire rope clips shall not be used as a wire rope termination method.

22.J.11 The wire rope shall be capable of supportable at least six (6) times the scaffold's design load.

22.J.12 Employers shall instruct and supervise their employees in the safe use of the adjustable scaffolding provided and shall supply them with all of the manufacture's instructional material.

22.J.13 Personnel shall not work on scaffolds during storms, high winds or other adverse weather conditions.

22.K Load Handling Equipment (LHE) – Supported Personnel Work Platforms.
> See Section 16.T.

22.L Elevating Aerial Work Platforms (AWPs).

22.L.01 All elevating aerial work platforms (AWPs) shall be designed and constructed in accordance with ANSI/SIA A92.3, ANSI/SIA A92.5, and ANSI/SIA A92.6, as appropriate.

22.L.02 AWPs shall be operated, inspected, and maintained as specified in the operating manual for the equipment.

a. AWPs shall comply with requirements of this Section and Section 18.G.

b. Records of inspections conducted while the unit is at the work site shall be maintained at the work site.

c. Height-to-base width ratio of the scaffold during movement is 2:1 or less, or per manufacturer's instructions.

d. All elevating AWPs shall have the manufacturer's operating manual readily available on the equipment.

e. AWPs will not be operated unless the access door or chains are in the closed position.

f. Fall protection shall be used in accordance with Section 21.K of this manual.

g. Climbing of the rails is prohibited.

22.L.03 All boom-supported AWPs shall be equipped with an alarm, or other suitable warning device, at the platform. The alarm shall be in operable condition and shall automatically activate when the machine base is more than 5° out of level in any direction.

22.L.04 All AWP operators shall have training that includes both general as well as equipment specific familiarization before being allowed to operate this equipment. Training shall be documented.

22.L.05 Before operating the AWP the operator shall:

a. Survey the work area for loose or soft ground, ditches, drop-offs or holes, bumps and floor obstructions, debris, overhead obstructions, ground and elevated energy sources, and other possible hazards;

b. Ensure the AWP is on a firm, level surface;

c. Ensure the AWP is loaded in accordance with the manufacturer's specifications;

d. Ensure that outriggers and/or stabilizers are used if required by the manufacturer;

e. Ensure that, if the vehicle is on wheels, the wheels are locked or chocked; and

f. Ensure that the fall restraint system is connected.

22.L.06 These AWPs shall not be used by persons working on energized electrical wiring and/or equipment.

22.L.07 AWPs shall only be operated from the ground position in an emergency (rescue), for maintenance, or when unoccupied.

22.L.08 Lift controls will be located below the guardrail height. When lift controls are not located below the guardrail height an aftermarket guard will be installed.

22.M Vehicle-Mounted Elevating and Rotating Work Platforms (Aerial Devices/Lifts).

22.M.01 Vehicle-mounted elevating and rotating work platforms (aerial lifts, to include articulating boom platforms/lifts (knuckle boom lifts), trailer-mounted boom lifts) shall be designed and constructed per ANSI/SIA A92.2.

22.M.02 Vehicle-mounted elevating and rotating work platforms shall be operated, inspected, tested, and maintained as specified in the operating manual for that piece of equipment.

a. Vehicle-mounted elevating and rotating work platforms shall also comply with requirements in Sections 18.G and 21.

b. Records of inspections conducted while the unit is at the work site shall be maintained at the work site.

c. All aerial devices shall have manufacturer’s operating manual readily available in or on the vehicle.

d. If the unit is considered rated, and used as an insulating device, copies of the electrical insulating components and system tests conducted while the unit is at the work site shall be maintained at the work site.

e. All required safety decals, labels and signs shall be in place and readable.

22.M.03 Only personnel trained in the use of the vehicle-mounted elevating and rotating work platform shall be authorized to operate it. Training shall consist of:

a. Reading and understanding the manufacturer's operating manual and any associated rules and instructions, or training by a QP on the contents on these documents; and

b. Reading and understanding all decals, warnings, and instructions on the vehicle-mounted elevating and rotating work platform.

22.M.04 Transporting.

a. Aerial lift trucks, to include cherry pickers, shall not be moved when the boom is elevated in a working position with personnel in the basket except for equipment that is specifically designed for this type of operation. When manufacturers allow mobile operation, the worksite shall be inspected for:

(1) Untamped earth fills (soft ground);

(2) Ditches;

(3) Drop-offs and floor obstructions;

(4) Debris;

(5) Overhead obstructions and electrical conductors;

(6) Weather conditions, and

(7) The presence of unauthorized persons.

b. Before moving an aerial lift, the boom(s) shall be inspected to see that it is properly cradled and outriggers are in stowed positions, except as provided in a, above.

c. Aerial ladders shall be secured in the lower traveling position by the locking device on top of the truck cab and the manually operated device at the base of the ladder before the truck is moved for highway travel.

22.M.05 Operating practices. The manufacturer’s instruction for control station operation must be followed (e.g. primary versus secondary; upper versus lower).

a. Brakes shall be set and outriggers, when used, shall be positioned on pads or a solid surface.

b. Wheel chocks shall be installed before using an aerial lift on an incline.

c. Lift controls shall be tested each day prior to use to ensure safe working condition.

d. Lift controls will be located below the guardrail height. When lift controls are not located below the guardrail height, an after-market guard will be installed.

e. Boom and basket load limits specified by manufacturer shall not be exceeded.

f. Articulating boom and extensible boom platforms, primarily designed as personnel carriers, shall have both platform (upper) and lower controls.

(1) Upper controls shall be in or beside the platform within easy reach of the operator.

(2) Lower controls shall provide for overriding the upper controls.

(3) Controls shall be plainly marked as to their function.

(4) Lower level controls shall not be operated unless permission has been obtained from the employee in the lift except in case of emergency. This practice shall be documented in the applicable AHA.

g. Climbers (spikes) shall not be worn while performing work from an aerial lift.

h. The insulated portion of an aerial lift shall not be altered in any manner that might reduce its insulating value.

i. Occupants shall always stand firmly on the floor of the basket and shall not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position.

22.N Mast Climbing Work Platforms.

22.N.01 Mast Climbing work platforms (MCWPs) shall be erected, used, inspected, tested, maintained, and repaired in accordance with ANSI A92.9, the IPAF/SAIA Safe Use Guidelines for Mast Climbing Work Platforms (henceforth referred to as ‘IPAF/SAIA’) and the manufacturer’s recommendations as outlined in the operating manual, henceforth referred to as ‘manual’.

22.N.02 A pre-use inspection will be performed prior to erecting the work platform, according to requirements set out in IFPA/SAIA and the operator’s manual.

a. An overhead inspection will be done to ensure that the MCWP will not come in contact with any obstructions while moving up or down the mast. Special attention will be given to high voltage conductors. Once the voltage of the line(s) is established, the minimum safe approach distance in Table 11-1 will be used.

b. An inspection of the ground will be done to ensure that there are no obstacles around the MCWP and in the path of travel (if the unit is on a mobile chassis) such as holes, drop-offs, debris, ditches, or soft fill. For static and mobile units, compaction will be sufficient to support the static and live loads for the configuration. The perimeter around the base of the unit, matching the length and width of the platform area above, shall be identified as restricted access by use of danger signs, tape, fences, or other suitable means.

c. Daily maintenance and inspections will be performed and documented by a CP per Section 22.B.03. Copies will be maintained on the job site.

22.N.03 Only designated and trained users shall operate the MCWP. Training records shall be maintained for at least 3 years and maintained on-site. All personnel on the MCWP shall be trained per Section 22.N.14 below.

22.N.04 The MCWP will not be raised on uneven or sloped surfaces unless outriggers are used to level the MCWP and the ground is suitable to support the load.

22.N.05 MCWPs shall be raised only in accordance with manufacturer's recommended free standing height and outrigger requirement, and loading recommendations. All outriggers shall be as per manufacturer's recommendation. The unit shall be level before raising the platform (mast should be plumb and level before vertical movement of platform).

➢ Note: Not all Mast Climbing Work Platforms are designed with freestanding capability. Check the machine and manual to see if the machine being operated has a freestanding height.

22.N.06 If the unit is on a powered chassis, the MCWP must be lowered to its lowest position prior to being moved. Additionally, all material and tools must be removed from the platform, the outriggers must be fully extended and open and the jacks must be raised no more than 1 in (2.5 cm) from the ground. When moved into its new working position, the unit must be set up and leveled again before it is elevated. The work platform shall remain horizontal within 2 degrees during normal movement of the platform.

22.N.07 A MCWP, with platform elevated or personnel on the platform, shall not be driven. The manufacturer's instructions shall be followed when moving a MCWP to determine the safe mast height for ground conditions, ground slope, and overhead obstructions.

22.N.08 MCWPs will be properly tied to the building (or structure) according to manufacturer's guidelines unless it is designed to be freestanding. A QP shall demonstrate the correct anchoring method based on tensile, shear and torsion forces as advised by the manufacturer and with respect to the strength of the structure to be tied to, following all relevant requirements on installation from the anchor manufacturer's data.

22.N.09 No ladders or structures of any kind will be used to increase the size or working height of platform unless specifically designed by the manufacturer for the intended use and all fall hazards have been controlled.

22.N.10 Access.

a. Climbing of braces and guardrails is prohibited. When access ladders, including masts designed as ladders, exceed 20 ft (6 m) in height, positive fall protection shall be used.

b. All access gates shall either close automatically or be electronically interlocked to prevent operation of the MCWP unless they are closed. Chains or ropes shall not be used as access gates.

c. Prior to use at elevations of 20 ft (6 m) or more, an emergency egress plan will be developed to evacuate workers from a MCWP that gets caught in an elevated position 20 ft or more above the ground. If that plan includes descending the mast, all employees working on the MCWP will be provided fall arrest equipment and will be trained in its use.

22.N.11 The MCWP shall not be raised in windy or gusty conditions.

a. The operation manual shall be followed to determine maximum in-service wind speed conditions. A copy of the operator's manual shall be available on the job site.

b. Loads and forces shall be accounted for and followed per manufacturer's instructions.

22.N.12 MCWPs shall not be altered or modified in any way, unless approved by the manufacturer, and performed by a QP.

22.N.13 Only authorized personnel (users and operators) shall use the MCWP.

22.N.14 Training. Personnel will be trained and familiarized by a QP (Qualified by either a manufacturer or an Industry recognized training course) before using and/or operating MCWPs. Anyone involved in erecting, disassembling, moving, operating, using, repairing, maintaining or inspecting a MCWP shall be trained by a QP to recognize any hazards associated with the work in question. Proof of training shall be made readily available on site. Operator training shall meet the following:

a. All training must be per the ANSI 92.9 standard and IPAF/SAIA guidelines.

b. All non-user trained personnel (i.e., building inspectors, consultants, etc.) that may need to be on the MCWPs shall have as a minimum, safety/hazard awareness training, and be escorted by a trained user while on the scaffold.

22.N.15 A damaged or malfunctioning machine shall not be used. Operation of damaged equipment shall be discontinued until the unit is repaired.

22.N.16 MCWPs shall be equipped with a permanently installed device on the work platform to switch off the work platform and secure it from unauthorized use.

22.N.17 Planking and decking shall follow the guidelines set forth in Section 22.B.15 and 29 CFR 1926.451.

22.N.18 Guarding.

a. All open sides of the platform shall be equipped with a guardrail which can be securely fastened in place. Guardrails shall be secured per the manufacturer's instructions and shall withstand, without failure, a force of 300 lbs, applied in any outward or downward direction.

b. If the MCWP is erected towards a wall and the distance is more than 14 in (0.36 m), a guardrail shall be required. The maximum distance between wall and platform may increase to 18 in (0.46 m) for plastering and lathing operations. When it is possible to have a horizontal distance between the wall and platform of not more than 14 in (.36 m), then a guardrail is not necessary.

c. Any MCWP with a travel speed of more than 15 fpm shall include a mast guard around at least 3 sides of the mast. The guard shall provide protection from not more than 1 in (2.5 cm) above the platform floor to a minimum height of 6 ½ ft (1.98 m) above the platform floor, and shall have no opening larger than 1 in^2 (2.5 cm^2).

22.N.19 Annual inspection. An annual inspection will be performed in accordance with the manufacturer's guidelines but no later than 13 months from the date of the prior inspection. The inspection shall be performed by a QP on the specific make and model of MCWP. A copy of the inspection shall be maintained on site with the owner's manual.

22.O Roofing Brackets.

22.O.01 Roofing brackets shall be secured by nailing in addition to the pointed metal projections. Nails will be driven into a rafter or beam; not just into the decking. Fasteners will be selected in accordance with the manufacturer's recommendations.

22.O.02 When it is impractical to nail brackets, rope supports shall be used. When rope supports are used, they shall consist of first-grade manila rope, ¾ in (1.9 cm) diameter or equivalent.

22.P Stilts.

22.P.01 Stilts shall not be used on scaffolds.

22.P.02 Surfaces on which stilts are used shall be flat and free of pits, holes, obstructions, debris and other tripping or slipping hazards.

22.P.03 Stilts shall be properly maintained. Any alteration of the equipment shall be approved by the manufacturer.

22.P.04 Stilts shall not be used on stairs. When used adjacent to stairs or ramps where a fall to a different level could occur, guardrails (as defined in Section 21.F.01.b) or other fall protection shall be provided (increased in height by an amount equal to the height of the stilts).

22.P.05 Employees shall be trained in the proper use of stilts.

22.P.06 When using stilts exposes workers to a fall of 6 ft (1.8 m) or more in areas protected by guardrails, the height of the guardrails must be raised accordingly to maintain a protective height of 42 in (107cm) above the stilt. > See Section 21.A.04.

22.Q Turbine Maintenance Platforms (TMPs). A TMP is type of scaffold unique to hydropower Operations and Maintenance that incorporates aspects of both suspended scaffolds and hanging scaffolds. These TMPs are assembled in the draft tube below the turbine where they are physically attached to the structure. Some TMPs must be assembled below the turbine at the draft tube door level and raised into position and may also be required to be close to the turbine blades such that the TMP must wrap around the turbine hub. This applies to vertical access turbines where the TMP is assembled under the runner.

➢ Note: This Section does not apply to standard off-the-shelf applications of scaffolds designed and used in accordance with ANSI A.10.

22.Q.01 Design.

a. TMPs shall be designed and/or certified by a RPE. Existing TMPs shall be certified prior to the next use. There is a grace period of 6 months from the effective date of this manual.

b. TMPs shall be designed to support their own weight plus 4 times the maximum intended load.

c. A data plate will be attached or the documentation showing the design will be readily available on-site. The RPE will be listed on the drawings and calculations for the platform and not on the data plate. Data, when used, will include the following:

(1) Descriptive name indicating intended usage;

(2) Assembled weight of TMP;

(3) Total maximum live load, pounds;

(4) Total maximum distributed live load (psf);

(5) Date of fabrication;

(6) Name of fabricator;

(7) Any load restrictions or usage limitations.

d. If wire rope is used to either support the platform after installation or to raise the platform while occupied, the wire rope shall have a safety factor of 6.

e. Deflections in structural members and structural systems under appropriate service load combinations shall not impair the serviceability of the structure.

f. If hooks are used to support the platform in its final position, they will be designed with a positive means of securing them to prevent the hooks from being disengaged.

g. The decking/platform shall be designed so that the space between adjacent obstacles or structures and the space between the platform is no more than 9.5 in (24.1 cm) wide, except where the user can demonstrate that a wider space is necessary. Where gaps exceed 9.5 in, needed FP measures shall be evaluated in accordance with Section 21.

h. The working surfaces shall be slip-resistant.

22.Q.05 Testing. Immediately after fabrication and after any modification of the structural members, the platform shall be proof tested to 100% of its rated capacity. The test may take place in the fabricator's shop or other location provided the supports and connections are also tested to 100%. The full rated load shall be statically applied for a minimum of 15 minutes. Following the load test, the TMP shall be inspected for plastic deformation, fracture, and 100% of welds shall receive Non-Destructive Inspection.

22.Q.06 Assembly/Disassembly.

a. An AHA shall be developed for the process of installing and removing TMPs. Fall protection, working over water, and fire protection will be addressed in the AHA along with any other hazards the workers identify. The AHA will be reviewed immediately prior to the start of work with the entire crew.

b. The TMP will be positively attached prior to use. Platform components shall be supported and secured such that each component is stable in all anticipated load conditions. When attachment points are welded they will be either welded by an AWS certified welder or a pull test will be done in accordance with the RPE specifications.

c. Raising and lowering the platform, when occupied by personnel, will only be done with rated grip hoists or other lifting equipment rated for lifting personnel. Chain falls will not be used to lift personnel unless an independent FP system is used.

22.Q.07 Visual inspections shall be done daily in accordance with Section 22.B.03.

22.Q.08 Training.

a. Employees that install and/or remove TMPs shall be trained on how to properly assemble, install and the removal of the specific type of TMP. > See Section 22.B.06.

b. FP training shall be done IAW Section 21.

22.R Forklift/Powered Industrial Truck (PIT) – Mounted Work Platforms.

22.R.01 Forklifts/PITs will not be used to support work platforms unless there is no other practical method. If a rough terrain (RT) forklift must be used, all the conditions in this Section must be met.

22.R.02 The manufacturer must specifically allow this specific machine to lift personnel. The operator's manual shall be maintained at the work site on the forklift.

22.R.03 The manufacturer's platform specifications shall be maintained on site and those specifications must reference ASME B56-6.

a. A data plate may be used in lieu of the manufacturer's specifications if it references ASME B56.6.

b. If the platform is not manufactured by, or for, the company that manufactures the forklift, a letter must be obtained from the forklift manufacturer that states the machine is compatible with the platform design. This letter must be kept on site and a copy provided to the GDA.

22.R.04 The platform must be securely attached to the lifting carriage and forks.

22.R.05 The lifting carriage and forks must be secured from pivoting forward.

22.R.06 If the truck is equipped with a rotator, the rotator must be deactivated.

22.R.07 Personnel shall be protected from moving parts while in their normal working positions.

22.R.08 Overhead protection shall be provided as necessary for the operating conditions.

22.R.09 The lifting operation shall be done smoothly throughout the entire range of the lift.

22.R.10 All lift limiting devices and latches, if so equipped, shall be functional.

22.R.11 A firm footing will be verified by the operator before lifting personnel.

22.R.12 A fall restraint system shall be used in accordance with Section 21 and personnel will maintain a firm footing on the platform at all times.

22.R.13 The platform shall not be tilted forward or rearward.

22.R.14 The platform shall be lowered to the ground level for personnel to enter and exit.

22.R.15 The operator shall remain at the controls whenever personnel are elevated.

22.R.16 The forklift shall not be moved horizontally while occupied.

22.R.17 Before elevating personnel, forklift travel controls must be in neutral and the parking brake set.

22.R.18 The operator shall verify that the mast or boom travel is vertical and will not operate on a slope unless the RT forklift is level.

22.R.19 The operator shall verify that the path of the platform travel is clear of hazards, such as electrical wires, overhead obstructions, scaffolding, storage racks, and other obstacles.

22.R.20 Before elevating personnel, the work area must be marked to warn of work by elevated personnel.

22.R.21 Driving a forklift equipped with a personnel work platform in a raised position or with personnel on the platform is forbidden.

22.R.22 Before raising or lowering the platform, the operator shall alert the personnel on the platform and then move the platform smoothly and with caution as requested by the occupants.

22.R.23 The combined weight of the platform, load, and personnel shall not exceed one-third of the capacity at the related load center position as indicated on the information plate(s) of the RT forklift truck.

22.S Work Stands (Portable Work Platforms).

22.S.01 Work stands shall be designed in accordance with either ANSI A14.2 (aluminum) or ANSI A14.5 (plastic/fiberglass). > See Figure 22-2.

22.S.02 Work stands shall not have a working height exceeding 4 ft (1.2 m).

22.S.03 The load rating shall be clearly and legibly marked and the work stand shall not be loaded beyond the manufacturer's rated capacity. The maximum intended load includes the worker and all tools and supplies.

22.S.04 When work stands are used adjacent to stairs or ramps where a fall to a different level could occur, guardrails (as defined in 21.F.01.b) or other fall protection shall be provided (increased in height by an amount equal to the height of the work stand. > See Section 21.A.04.

22.S.05 Work stands shall inspected for visible defects on a daily basis and shall be maintained with no structural damage.

22.S.06 Job-built work stands are not allowed. Saw horses shall not be used as work stands.

FIGURE 22-2

Work Stands (Portable Work Platforms), Examples

3 ft Fiberglass Work Stand

2 ft Aluminum Work Stand

3 ft Aluminum Work Stand

4 ft Aluminum Work Stand

22.T Trestle Ladder Scaffolds.

22.T.01 Scaffold platforms must be placed no higher than the second-highest rung or step of the ladder supporting the platform.

22.T.02 All ladders used in step, platform and trestle ladder scaffolds must:

a. Meet or exceed 29 CFR 1926 Subpart X.

➢ NOTE: Job-made ladders are not permitted.

b. Be prevented from slipping by how they are placed, fastened, or equipped.

22.T.03 Scaffolds must not be bridged one to another.

22.T.04 Climbing and Working Locations. The user shall climb or work with the body near the middle of the step or rung. Higher than the step or rung indicated on the label marking the highest standing level of a ladder. The user shall not step or stand on:

a. A ladder top cap or the top step of the step or trestle ladder, or the bucket or pail shelf of a self-supporting ladder.

b. The rear braces of a self-supporting ladder, unless designed and recommended for that purpose by the manufacturer.

c. The top step of the extension section of an extension trestle ladder.

d. The top cap or top step of a combination ladder when it is used as a self-supporting ladder.

FIGURE 22-3

Trestle Ladder Scaffolds, Examples

Example #1

Example #2

Example #3

Example #4

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SECTION 23

Demolition, Renovation and Re-Occupancy

23.A General. The process of demolishing or renovating a structure can be completed in several ways. The terms “renovation”, “structural demolition”, “soft demolition” and “mechanical demolition” should be understood within the context of this section. > See Appendix Q for definitions.

23.A.01 Demolition and renovation activities shall be performed in accordance with ANSI Standard A10.6, Safety Requirements for Demolition.

a. Prior to initiating demolition or renovation activities, the following survey and plan shall be accomplished. > See lead and asbestos requirements in Section 06.C.

(1) Engineering Survey. An engineering survey by a Registered Professional Engineer (RPE) shall be performed of the structure to determine the structure layout, the condition of the framing, floors, walls, the possibility of unplanned collapse of any portion of the structure (any adjacent structure where employees or property may be exposed shall be similarly checked), and the existence of other potential or real demolition hazards.

➢ Note: The engineering survey is not required for soft demolition or renovation activities as long as no load-bearing structure will be removed or demolished.

(2) Demolition/Renovation Plan. A demolition plan developed by a RPE and shall be submitted to the GDA. Plan shall be based on the engineering, lead and asbestos surveys and shall intend for the safe dismantling and removal of all building components and debris. This plan is required for all demolition and renovation activities and shall include, but is not limited to, the following basic elements: schedule; scope of work being accomplished; description of work methods, equipment, job site and key personnel; site preparation; Waste Management Plan to include Asbestos-Containing Materials (ACM)/Other Regulated Material (ORM) Abatement Plan; Site Restoration Plan and other requirements specified in a Statement of Work or as directed by the Contracting Officer (KO).

b. All employees engaged in demolition/renovation activities shall be instructed in the plan so that they may conduct their work activities in a safe manner.

23.A.02 Electric, gas, water, steam, sewer, and other service lines affected as a result of project work shall be shut off, capped, or otherwise controlled inside and outside the building line before demolition is started.

a. In each case, any utility company that is involved shall be notified in advance.

b. The Contractor shall provide the GDA and the Contractor's designated authority with an engineering drawing (e.g., site plans, utility plans) that indicates the location of all service lines and the means for their control.

c. If it is necessary to maintain any power, water, or other utilities during renovation, such lines shall be temporarily relocated and protected.

d. It shall be the responsibility of the facility owner to identify and field verify the point or points for disconnection and de-energizing electrical components and electrical service lines. > See Sections 11 and 12.

(1) The Contractor must confirm that the disconnection or de-energizing has been performed prior to the start of the demolition process.

(2) De-energized electrical service shall be secured via a lock-out method and field verified by the contractor, per Section 12 and their HEC Program.

e. If the project includes the abandonment or demolition of existing gas lines, ensure that the existing lines are accurately located and the procedures and installations for removal or replacement are accomplished in accordance with applicable sections of 29 CFR 1926.850.

f. If the project includes fire suppression systems, the owner shall provide to the GDA confirmation or verification that the Chemical Fire Suppression (CFS) system has been de-activated and that the chemical has been removed from the system prior to the start of the renovation/demolition process. If the CFS system is found to be active after demolition has begun, the contractor shall immediately cease work and notify the GDA. The contractor shall take no action to abate or remove the CFS system or components.

23.A.03 It shall be determined if any hazardous building materials, hazardous chemicals, gases, explosives, flammable materials, or dangerous substances have been used in any building construction, pipes, tanks, or other equipment on the property.

a. When such hazards are identified, testing shall be conducted to determine the type and concentration of the hazardous substance and test results shall be provided to the GDA and the Contractor's designated authority.

b. Such hazards shall be controlled or eliminated before demolition is started.

c. If Hazardous Materials (HAZMAT) are found on the project site or location after demolition has begun, the contractor shall immediately cease work and notify the GDA. The contractor shall take no action to abate or remove the HAZMAT without GDA approval.

23.A.04 All ACM and ORMs shall be removed from structures in accordance with all federal and state laws before renovation/demolition begins.

a. ACM/ORM shall be taken to a controlled landfill or other licensed disposal facility;

b. Construction and Debris (C&D) shall be taken to a general waste landfill; and

c. Recyclable materials shall be taken to a recycle yard or retained by the GOV.

23.A.05 When employees work within a structure to be demolished that has been damaged by fire, flood, explosion, or other cause, the walls or floor shall be shored or braced IAW the Engineering Survey and Plan required by Section 23.A.02.

23.A.06 Work progression.

a. Except for cutting holes in floors for chutes, holes through which to drop materials, preparation of storage space, and similar preparatory work, the demolition of floors and exterior walls shall begin at the top of the structure and proceed downward.

b. Each story of exterior wall and floor construction shall be removed and dropped into the storage space before commencing the removal of exterior walls and floors on the next story below.

23.A.07 Potential hazards due to the fragmentation of glass shall be considered and controlled for all persons inside and outside of the demolition site.

23.A.08 Mechanical equipment shall not be used on floors on working surfaces unless such floors or surfaces are of sufficient strength to support the imposed load.

23.A.09 Employee entrances to multistory structures being demolished shall be protected by sidewalk sheds, canopies, or both.

a. Protection shall be provided from the face of the building for a minimum of 8 ft (2.4 m).

b. All such canopies shall be at least 2 ft (0.6 m) wider than the building entrances or openings (1 ft (0.3 m) wider on each side), and shall be capable of sustaining a load of 150 psi (1,034.2 kPa).

23.A.10 Only those stairways, passageways, and ladders designated as means of access to the structure shall be used.

a. The designated means of access shall be indicated on the demolition plan. Other access ways shall be indicated as not safe for access and closed at all times.

b. The stairwell shall be covered to protect workers from falling debris at a point no less than two floors below the floor on which work is being performed.

c. Access to a floor where work is in progress shall be through a separate lighted, protected passageway.

23.A.11 During demolition, continuing inspections by a Competent Person (CP) shall detect hazards resulting from weakened or deteriorated floors, walls, or loosened material. No employee shall be permitted to work where such hazards exist until they are corrected by shoring, bracing, or other means. The frequency of inspections will be identified in the blasting/renovation plan.

23.A.12 Debris Removal.

a. Walls, or sections of masonry, shall not be permitted to fall upon the floors of the building in such masses as to exceed the safe carrying capacities of the floors.

b. Any chute opening into which debris is dumped shall be protected by a guardrail 42 in (1.1 m) above the floor or other surface on which personnel stand to dump the material. Any space between the chute and the edge of openings in the floors through which it passes shall be covered.

c. When debris is dropped through openings in the floors without chutes, the openings and the area onto which the material is dropped shall be enclosed with barricades not less than 42 in (1.1 m) high and not less than 6 ft (1.8 m) back from the projected edge of the opening above.

(1) Signs warning of the hazard of falling materials shall be posted at each side of the debris opening at each floor.

(2) Debris removal shall not be permitted in lower areas until debris handling ceases on the floors above.

d. All material chutes, or sections thereof, at an angle of more than 45° from the horizontal shall be enclosed, except for openings equipped with closures at or about floor level for the insertion of materials.

(1) The openings shall not exceed 48 in (1.2 m) in height measured along the wall of the chute.

(2) Such openings, when not in use, shall be kept closed at all floors below the top floor.

e. A substantial gate shall be installed in each chute at or near the discharge end. A competent employee shall be assigned to control operation of the gate and the backing and loading of trucks.

f. When operations are not in progress, the area surrounding the discharge end of a chute shall be closed.

g. Where material is dumped from mechanical equipment or wheelbarrows, a toe board or bumper, not less than 4 in (10 cm) thick and 6 in (15 cm) high, shall be attached at each chute opening.

h. Chutes shall be designed and constructed of such strength as to eliminate failure due to impact of materials or debris loaded therein.

i. The storage of waste and debris on any floor shall not exceed the allowable floor loads.

j. In buildings having wood floor construction, the floor joists may be removed from not more than one floor above grade to provide storage space for debris provided falling material is not permitted to endanger the stability of the structure.

(1) When wood floor beams serve to brace interior walls or freestanding exterior walls, such beams shall be left in place until other support can be installed to replace them.

(2) Floor arches, to an elevation of not more than 25 ft (7.6 m) above grade, may be removed to provide storage area for debris provided such removal does not endanger the stability of the structure.

(3) Storage space into which material is dumped shall be blocked off, except for openings for the removal of materials. Such openings shall be kept closed when material is not being removed.

(4) Floor openings shall have curbs or stop-logs to prevent equipment from running over the edge.

(5) Any opening cut in a floor for the disposal of materials shall be not longer in size than 25% of the aggregate of the total floor area, unless the lateral supports of the removed flooring remain in place. Floors weakened or otherwise made unsafe by demolition shall be shored to carry safely the intended imposed load for demolition.

23.A.13 Debris Disposal.

a. Debris generated by demolition or contained within the facility or found within the defined work perimeter of the facility or project shall be removed from the site as waste material, to include ACM and ORM. Debris shall be separated according to type of disposal that is required.

b. The disposal site, whether Government furnished, private, or commercial shall be approved by the GDA prior to Notice to Proceed. Contractor shall provide to the GDA documentation that confirms the disposal location, the type of debris, and quantities of each type.

23.A.14 Wall Removal.

a. Masonry walls, or sections of masonry, shall not be permitted to fall upon the floors of the building in such masses as to exceed the safe carrying capacities of the floors.

b. No wall section that is more than 6 ft (1.8 m) in height shall be permitted to stand without lateral bracing, unless such wall was designed and constructed to stand without such lateral support and is in a condition safe enough to be self-supporting. No wall section shall be left standing without lateral bracing any longer than necessary for removal of adjacent debris interfering with demolition of the wall.

➢ Exception: For wall sections that are designed and constructed to stand without lateral support, an exception may be allowed.

c. Employees shall not be permitted to work on the top of a wall when weather constitutes a hazard.

d. Structural or load-supporting members on any floor shall not be cut or removed until all stories above such a floor have been demolished and removed. This shall not prohibit the cutting of floor beams for the disposal of materials or for the installation of equipment, providing the requirements of in this Section are met.

e. Floor openings within 10 ft (3 m) of any wall being demolished shall be planked solid, except when employees are kept out of the area below.

f. In buildings of skeleton-steel construction, the steel framing may be left in place during the demolition of masonry. Where this is done, all steel beams, girders, and structural supports shall be cleared of all loose material as the masonry demolition progresses downward.

g. Walls that serve as retaining walls to support earth or adjoining structures shall not be demolished until such earth has been braced or adjoining structures have been underpinned. > See Section 23.B.04.

h. Walls shall not be used to retain debris unless capable of safely supporting the imposed load.

23.A.15 Floor Removal.

a. Before demolishing any floor, debris and other material shall be removed from the immediate work location and other adjacent floor areas.

(1) Planks not less than 2-in x 10-in (5-cm x 25.4-cm) in cross section, full sized undressed, shall be provided for and shall be used by employees to stand on while breaking down floor areas between beams/joists.

(2) Such planks shall be so located as to provide a safe support for personnel should the joists between the beams collapse.

(3) Straddle space between planks shall not exceed 16 in (40.6 cm).

b. Safe walkways, not less than 18 in (45.7 cm) wide, formed of wood planks not less than 2 in (5 cm) thick or of equivalent strength, shall be provided and used by personnel when necessary to enable them to reach any point without walking upon exposed beams.

c. Stringers of ample strength shall support the flooring planks. The ends of such stringers shall be supported by floor beams or girders.

d. Planks shall be laid together over solid bearings with the ends overlapping at least 1 ft (0.3 m).

e. When floors are being removed, employees shall not be allowed in the area directly underneath. The area shall be barricaded to prevent access and signed to warn of the hazard.

23.A.16 Steel Removal.

a. When a floor, or any portion of a floor, has been removed, planking shall be provided for the workers razing/dismantling the steel framing.

b. Steel construction shall be dismantled column-by-column and tier-by-tier (columns may be in two-story lengths).

c. Any structural member being dismembered shall not be overstressed.

23.B Structural Demolition.

23.B.01 General. Removal of a facility may include the structure as well as any related appurtenances: fences, parking areas and associated lights, roadways and access from roadways, sidewalks and stairs associated with access, pads, patios, and paved lay-down areas, utilities, underground storage tank (UST)/above ground storage tank (AST), poles, interior and exterior equipment associated with the facility, interior and exterior equipment within the designated perimeter of the facility.

23.B.02 All operations involving the use of load handling equipment (LHE) shall meet Section 16 to include: Certificated of Compliance; documented personnel qualifications (operators, riggers, signal persons, others); LHE inspections, operational and load tests and certifications; and standard lift plan. If the manufacturer of the equipment does not allow the equipment to be utilized as planned, you are prohibited from performing this function.

23.B.03 No personnel shall be working within the structure once the structural demolition process has begun. Before structural demolition can begin, abatement of ACM and other regulated materials shall be done.

23.B.04 Structural demolition may include any or all of these features prior to demolition:

a. Removal of universal waste prior to the start of facility removal;

b. Partial demolition to expose the structure frame;

c. Soft demolition.

23.B.05 Mechanical Demolition.

a. All motorized equipment used on a project shall meet requirements of the EM 385-1-1, as well as applicable OSHA requirements. In addition, see National Demolition Association's Demolition Safety Manual, Chapter 7.0 for further information on equipment safety.

b. No person shall be permitted in any area that can be affected by demolition when mechanical demolition is being performed. Only those persons necessary for the operations shall be permitted in this area at any other time.

c. Dust abatement measures will be used to suppress dust during demolition.

d. Operators are required to wear respirators per Section 05.

e. A demolition ball shall be used ONLY if it has been approved by GDA. If the use of a demolition ball is approved:

(1) The weight of the demolition ball shall not exceed 50% of the crane's rated load, based on the length of the boom and the maximum angle of operation at which the demolition ball will be used, or it shall not exceed 25% of the nominal breaking strength of the line by which it is suspended, whichever is less;

(2) The crane boom and load line shall be as short as possible;

(3) The ball shall be attached to the load line with a swivel-type connection to prevent twisting of the load line and shall be attached by positive means so that the weight cannot be accidentally disconnected.

(4) Continued on-going inspections by the CP shall be made as the demolition work progresses to detect hazards resulting from weakened or deteriorated floors or walls, or loosened material. No employee shall be permitted to work where such hazards exist until they are corrected by shoring, bracing, or other effective means.

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SECTION 24

Safe Access

24.A General.

24.A.01 Safe access shall be provided to work areas and where danger exists of workers falling through floor, roof, or wall openings, or from platforms, runways, ramps, fixed stairs, ladders, or for rope access.

a. A stairway, ladder, ramp, or personnel hoist shall be provided where there is a break of 19 in (48.2 cm) or more in a route of access.

b. Means of access constructed of metal shall not be used for electrical work or where the potential exists to contact electrical conductors.

c. Means of access between levels shall be kept clear to allow free passage of workers. If work is performed in an area that restricts free passage, a second means of access shall be provided.

d. For all government-owned/operated facilities, every open-sided floor or platform 4 ft (1.2 m) or more above adjacent floor or ground level shall be guarded by a guardrail system (or equivalent) along all open sides (except where there is an entrance to a ramp, stairway or fixed ladder). The guardrail system shall be provided with a toeboard when necessary. > See Section 21.F.01.

24.A.02 An AHA, accepted by the GDA for the activity in which means of access are to be used, shall delineate the following:

a. The design, construction, and maintenance of the means of access, and

b. Erection and dismantling procedures of scaffolds, including provisions for providing fall protection (FP) during the erection or dismantling when the erection or dismantling involves work at heights. > See Sections 21.K.02 and 22.A.03.

24.A.03 Job-made means of access shall be designed to support, without failure, at least four times the maximum intended load and shall be constructed according to Section 22 of this manual.

24.A.04 Means of access shall not be loaded beyond the maximum intended load for which it was designed or beyond its manufacturer's rated capacity. When loaded, planking and decking shall not deflect more than 1/60 the span length.

24.A.05 The width of accessways shall be determined by the purpose for which they are built, shall be sufficient to provide safe passage for materials and movement of personnel and (except for ladders) shall not be less than 18 in (45.7 cm).

24.A.06 Accessways shall have overhead protection equal to 2 in (5 cm) solid planking whenever work is performed over them or if personnel are exposed to hazards from falling objects.

24.A.07 Accessways shall be inspected daily.

a. The walkway must be free of tripping hazards, obstructions and cannot impede or restrict the travel of personnel. In addition, accessways shall be kept free of ice, snow, grease and mud or any other environmental hazards.

b. Where accessways are slippery, abrasive material shall be used to assure safe footing.

c. All obstructions or projections into an access way shall be removed or conspicuously marked. Obstructions or projections that are sharp, pointed or that may cause lacerations, contusions, or abrasions shall be covered with protective material.

d. Accessways, including their accessories that become damaged or weakened shall not be used. These defective items shall be repaired or replaced.

24.A.08 When moving platforms to the next level, the old platform shall be left undisturbed until the new bearers have been set to receive the platform planks.

24.A.09 Safe Roof Access.

a. Platforms, level and guarded shall be provided at the landing area on the roof.

b. Crawling boards.

(1) Crawling boards shall be not less than 10 in (25 cm) wide and 1 in (2.5 cm) thick, having cleats 1 in x 1.5 in (2.5 cm x 3.75 cm).

(2) Cleats shall be equal in length to the width of the board and spaced at equal intervals not to exceed 24 in (60 cm).

(3) Nails shall be driven through and clinched on the underside. Screws may be used in lieu of nails.

(4) Crawling boards shall be secured and extend from the ridge pole to the eaves when used with roof construction, repairs, or maintenance.

(5) A firmly fastened lifeline of at least ¾ in (2 cm) diameter rope, or equivalent, shall be strung beside each crawling board for a handhold.

c. Access paths shall be erected as follows:

(1) Points of access, material handling areas and storage areas shall be connected to the work area by a clear access path formed by two warning lines.

(2) When the path to a point of access is not being used, one of the following shall be used:

(a) A rope, wire, or chain, equal in strength and height to the warning line, shall be placed across the path at the point where the path intersects the warning line erected around the work area, or

(b) The path shall be offset such that a person cannot walk directly into the work area.

24.B Ladders. > See also Sections 22.S, Work Stands (Portable Work Platforms) and 22.T, Trestle Ladder Scaffolds.

24.B.01 The construction, installation, and use of ladders shall conform to ANSI/American Ladder Institute (ALI) A14 series standards as applicable. The load rating shall be clearly and legibly marked on all ladders.

24.B.02 Every ladderway, floor opening or platform shall be guarded by a standard railing with standard toe-board (when exposure exists to falling materials), on all exposed sides (except at entrance to opening). The passage through the railing shall be provided with either a guardrail or shall be offset so that a person cannot walk directly into the opening. The guarding shall meet the strength requirements of Section 21.F.01. Swing gates are preferred over chain gates.

24.B.03 Length of ladders.

a. All portable ladders shall be of sufficient length and shall be placed so that workers will not stretch or assume a hazardous position.

b. Portable ladders, used as temporary access, shall extend at least 3 ft (0.9 m) above the upper landing surface.

(1) When a 3 ft (0.9 m) extension is not possible, a grasping device (such as a grab rail) shall be provided to assist workers in mounting and dismounting the ladder.

(2) In no case shall the length of the ladder be such that ladder deflection under a load would, by itself, cause the ladder to slip from its support.

c. The length of stepladders shall not exceed 20 ft (6 m).

d. For portable ladders:

(1) The length of single ladders or individual sections of ladders shall not exceed 30 ft (9 m).

(2) Two-section extension ladders shall not exceed 48 ft (14.6 m).

(3) Multi-section extension ladders (over two-sections) shall not exceed 60 ft (18 m) in length.

e. When splicing of side rails is required to obtain the required length, the resulting side rail must be at least equal in strength to a one-piece side rail made of the same material.

24.B.04 Width of ladders.

a. The minimum clear distance between the sides of individual-rung/step ladders shall be 16 in (40.6 cm).

b. The minimum clear distance between side rails for all portable ladders shall be 12 in (30.4 cm).

24.B.05 Spacing of rungs, cleats, and steps on ladders.

a. On portable ladders, spacing of rungs shall be 12 in (30.4 cm) on center and uniform, except for job-made ladders where the spacing shall be 10 in (25.4 cm) to 14 in (35.5 cm).

b. On step stools, spacing shall be not less than 8 in (20.3 cm) or more than 12 in (30.4 cm) apart, as measured from their centerlines.

24.B.06 Ladders shall be surfaced so as to prevent injury to an worker from punctures or lacerations and to prevent snagging of clothing.

24.B.07 Wooden ladders shall not be coated with any opaque covering, except for identification or warning labels that may be placed on only one face of a side rail.

24.B.08 Portable ladders shall have slip-resistant feet.

24.B.09 The rungs and steps of portable metal ladders shall be corrugated, knurled, dimpled, coated with skid-resistant materials, or otherwise treated to minimize slipping.

24.B.10 A metal spreader bar or locking device shall be provided on each stepladder to hold the front and back sections in an open position.

24.B.11 Set-up of ladders.

a. Ladders shall not be placed in passageways, doorways, drives, or any locations where they may be displaced by any other work unless protected by barricades or guards.

b. Portable ladders shall be used at such a pitch that the horizontal distance from the top support to the foot of the ladder will not be greater than ¼ the vertical distance between these points.

c. Wooden job-made ladders, with spliced rails, shall be used at an angle such that the horizontal distance is 1/8 the length of the ladder.

d. Ladders shall be secured by top, bottom, and intermediate fastenings, as necessary, to hold them rigidly in place and to support the loads that will be imposed upon them.

e. The steps or rungs of all ladders shall be set to provide at least 7 in (17.7 cm) toe space from the inside edge of the rung to the nearest interference.

f. The top of a non-self supporting ladder shall be placed with the two rails supported equally, unless the ladder is equipped with a single support attachment.

g. Step-across distance. The step-across distance from the nearest edge of ladder to the nearest edge of equipment or structure shall be not more than 12 in (30.5 cm) or less than 2-1/2 in (6.4 cm).

24.B.12 Use of ladders.

a. Ladders shall be restricted to their intended use. Three points-of-contact (see Appendix Q) shall be maintained at all times when ascending or descending ladders.

b. Ladders shall be inspected for visible defects on a daily basis and after any occurrence that could affect their safe use. Broken or damaged ladders shall be immediately tagged "DO NOT USE", or with similar wording, and withdrawn from service until restored to a condition meeting their original design.

c. Ladders shall not be moved, shifted, or extended while occupied.

d. Ladders shall not be loaded beyond the maximum intended load for which they were designed and tested, or beyond the manufacturer's rated capacity (includes the worker and all the tools and supplies carried).

e. Ladders shall not be climbed by more than one person at a time between the same set of rails.

f. Portable ladders used as means of access to ascend and descend to a work location do not require fall protection, however only light work for short periods of time shall be performed on portable ladders. No work requiring lifting of heavy materials or substantial exertion shall be done from ladders.

g. When ladders are the only means of access to or from a working area for 25 or more workers, or when a ladder is to serve simultaneous two-way traffic, double-cleated ladders shall be used.

h. The top or top step of a stepladder, shall not be used, as a step unless it has been designed to be so used by the manufacturer (e.g., platform ladders).

i. Ensure latches are in place before climbing an extension ladder.

j. Keep loose tools off the steps and top platform.

k. Modifications to manufactured ladders in order to adapt the ladder to specific or special use shall only be performed using a design approved by a RPE. These ladders shall meet the applicable ANSI A14 series standard.

24.B.13 Job made wooden ladders will be made in accordance with ANSI A14.4.

24.B.14 Single-rail ladders shall not be used. Three-legged ladders may be used for specific tasks, if accepted by the GDA.

24.B.15 The use of ladder climbing devices shall be in accordance with Section 21.J.

24.B.16 Articulated ladders are allowed if they meet ANSI A14.2 standard.

24.B.17 Any ladder accessory, including but not limited to, ladder levelers, ladder stabilizers or stand-off devices, or ladder straps or hooks, that may be installed or used in conjunction with ladders must be installed and used per manufacturer's instructions.

24.C Handrails.

24.C.01 A standard handrail shall be of construction similar to a standard guardrail (see Section 21.E.01) except that it is mounted on a wall or partition and does not include a midair.

24.C.02 Handrails shall have smooth surfaces along the top and both sides.

24.C.03 Handrails shall have an adequate handhold for anyone grasping it to avoid falling.

24.C.04 Ends of handrails shall be turned into the supporting wall or partition or otherwise arranged so as to not constitute a projection hazard.

24.C.05 The height of handrails shall be not more than 38 in (86.3 cm) nor less than 34 in (76.2 cm) from upper surface of handrail to surface of tread, in line with face of riser or to surface of ramp. Existing installations need not be modified if they meet the building code that was in effect at the time the facility was built.

24.C.06 All handrails and railings shall be provided with a clearance of approximately 3 in (7.6 cm) between the handrail or railing and any other object.

24.D Floor, Wall, and/or Roof Holes and Openings.

24.D.01 Floor and roof holes/openings are any that measure over 2 in (51 mm) in any direction of a walking/working surface which persons may trip or fall into or where objects may fall to the level below. > See Section 21.G.

- Note: Skylights located in floors or roofs are considered floor or roof hole/openings.

24.D.02 All floor, roof openings or hole into which a person can accidentally walk or fall through shall be guarded either by a railing system with toeboards along all exposed sides or a load-bearing cover. When the cover is not in place, the opening or hole shall be protected by a removable guardrail system or other fall protection system, or shall be attended when the guarding system has been removed. > See Sections 21.F and 21.G.

24.D.03 All floor and roof holes through which equipment, materials, or debris can fall shall be covered.

24.D.04 Conduits, trenches, and manhole covers and their supports, when exposed to vehicles or equipment, shall be designed to carry a truck rear axle load of 2 times the maximum anticipated load.

24.D.05 Every hatchway and chute floor opening shall be guarded by a hinged floor-opening cover. The opening shall be barricaded with railings so as to leave only one exposed side. The exposed side shall be provided either with a swinging gate or offset so that a person cannot walk into the opening. When operating conditions require the feeding of material into a hatchway or chute opening, protection shall be provided to prevent a person from falling through the opening.

24.D.06 Wall openings 30 in (76 cm) or more in height and 18 in (48 cm) or more in width from which a fall could occur shall be protected with a standard guardrail or equivalent. A toeboard shall be provided where the bottom of the wall opening, regardless of width, is less than 4 in (10.1 cm) above the working surface. > See Section 21.F.01.

24.D.07 An extension platform outside a wall opening onto which materials can be hoisted for handling shall have a standard railing that meets criteria in Section 21.F.01 of this manual. However, one side of an extension platform may have removable railings to facilitate handling materials, if appropriate fall protection is used.

24.D.08 Roof openings and holes shall be provided with covers, guardrail systems or warning lines systems on all exposed sides.

a. Roofing material, such as roofing membrane, insulation or felts, covering or partly covering openings or holes, shall be immediately cut out. No hole or opening shall be left unattended unless covered according to Section 21.G.

b. All covers for openings shall be identified in accordance with Section 21.G.

c. Non-load-bearing skylights shall be guarded by a load-bearing skylight screen, cover, or railing system along all exposed sides.

d. Workers are prohibited from standing/walking on skylights.

24.E Stairways.

24.E.01 On all structures 20 ft (6 m) or more in height, stairways shall be provided during construction.

a. Where permanent stairways are not installed concurrently with the construction of each floor, a temporary stairway shall be provided to the work level.

b. Alternatives to the use of stairways shall be addressed in the AHA and shall be acceptable to the GDA.

24.E.02 Requirements for stairways.

a. Temporary stairways shall have landings not less than 30 in (76.2 cm) in the direction of travel and extend at least 22 in (55.8 cm) in width at every 12 ft (3.6 m) or less of vertical rise.

b. Stairs shall be installed between 30° and 50° from horizontal.

c. Risers shall be of uniform height and treads of uniform width.

24.E.03 Metal pan landings and metal pan treads, when used, shall be secured in place and filled with concrete, wood, or other material at least to the top of each pan.

24.E.04 Wooden treads shall be nailed in place.

24.E.05 Every flight of stairs with four or more risers or rising more than 30 in (76.2 cm) shall have standard stair railings (defined below) or standard handrails, unless omitted by design.

a. On stairways less than 44 in (111.7 cm) wide having both sides enclosed, at least one standard handrail shall be installed, preferably on the right descending side.

b. On stairways less than 44 in (111.7 cm) wide having one side open, at least one standard stair railing shall be installed on the open side.

c. On stairways less than 44 in (111.7 cm) wide having both sides open, one standard stair railing shall be installed on each side.

d. On stairways more than 44 in (111.7 cm) wide, but less than 88 in (223.5 cm) wide, one standard handrail shall be installed on each enclosed side, and one standard stair railing installed on each open side.

e. On stairways more than 88 in (223.5 cm) wide, one standard handrail shall be installed on each enclosed side, one standard stair railing on each exposed side, and a standard handrail in the middle of the stairway.

24.E.06 Standard stair railing shall be installed around all stairwells.

a. The height of stair rails shall be 42+/- 3 in (1 m +/- 8 cm) from the upper surface of the top rail to surface of tread in line with face of riser at forward edge of tread. Existing installations need not be modified. Existing installations need not be modified.

b. Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members shall be provided between the toprail and the stairway steps.

(1) Midrails shall be located at a height midway between the top edge of the stairway system and the stairway steps.

(2) Screens or mesh, when used, shall extend from the toprail to the stairway steps and along the entire opening between rail supports.

(3) Intermediate vertical members, when used, shall be not more than 19 in (48.2 cm) apart.

(4) Other structural members, when used, shall be installed in such a manner that there are no openings in the stair rail system that are more than 19 in (48.2 cm) wide.

24.E.07 Doors or gates opening onto a stairway shall have a platform; and swinging of the door shall not reduce the width of the platform to less than 20 in (50.8 cm).

24.E.08 Spiral stairways shall not be permitted, except for special limited usage and secondary access where it is not practical to provide a conventional stairway.

24.E.09 Three points of contact shall be maintained at all times when ascending or descending spiral stairs, ship stairs, or alternating tread stairs. Three point contact means that either both hands and one foot, or both feet and one hand are in contact with the climbing device at all times.

24.F Ramps, Runways and Trestles.

24.F.01 Ramps, runways, and platforms shall be as flat as conditions will permit. Where the slope exceeds 1 ft:5 ft (0.3 m:1.5 m), traverse cleats shall be applied to the working surface.

24.F.02 Vehicle ramps, trestles, and bridges on which foot traffic is permitted shall be provided with a walkway and guardrail outside the roadway. The roadway structures shall be provided with wheel guards, fender logs, or curbs not less than 8 in (20.3 cm) high placed parallel and secured to the sides of the runway.

24.F.03 All locomotive and gantry crane trestles that extend into or pass over a work area, except where a crane is hoisting between rails, shall be decked solid with not less than 2 in (5 cm) planking, or the equivalent, for the full length of the extension into the working area.

24.F.04 When used in lieu of steps, ramps shall be provided with cleats to ensure safe access.

24.G Personnel Hoists and Elevators.

24.G.01 Design, construction, installation or erection, operation, inspection, testing, and maintenance of personnel hoists and elevators shall be in accordance with the manufacturer's recommendations and the applicable ANSI standard.

a. Track-guided personnel hoist systems and structures that are temporarily installed inside or outside buildings during construction, alteration, or demolition shall be in compliance with ANSI A10.4;

b. Rope-guided personnel hoist systems that are temporarily erected during construction, alteration, or demolition shall be in compliance with ANSI A10.22;

c. Non-guided personnel hoist systems that are temporarily erected during construction, alteration, or demolition shall be in compliance with ANSI A10.8 and ANSI A10.22. (An air-tugger hoist, or the equivalent meeting the criteria in section 4.2 of ANSI A10.22, may by substituted for a base-mounted hoist).

d. Elevators operating in permanent hoistways on the permanent guide rails for handling personnel during construction shall be in compliance with ANSI/ASME A17.1

e. A copy of the manufacturer's manual covering construction, installation or erection, operation, inspection, testing, and maintenance and a copy of the applicable ANSI standard shall be available on site.

f. Personnel hoists and elevators shall comply with applicable requirements from section 16 of this manual.

24.G.02 Personnel hoists used in bridge tower construction shall be approved by a registered engineer and erected under the supervision of a RPE competent in this field.

24.H Safe Practices for Rope Access Work. If rope access work is to be performed, a Rope Access Work Plan and accompanying procedures must be developed and submitted to the GDA for acceptance.

24.H.01 Climbing equipment.

a. Ropes: Used as working line and safety line shall be made of synthetic fiber with a nominal breaking strength of at least 5400 lbs (24 kN) when new. The working lines and safety lines shall be specifically designed and intended for life safety use. Additionally, elasticity (elongation) of both lines shall be limited to 7% with a load of 540 lbs applied.

b. Carabiners and snap hooks: Used for climbing (life support) shall have at least two consecutive, deliberate actions to prepare the gate for opening and shall be rated at 5,000 lbs (22.2kN) and shall meet the ANSI/ASSE Z359 Fall Protection Code. Gates shall be rated at 3600 lbs (16kN). Rope snaps and snap hooks shall be self-closing and self-locking. The use of rope thimbles when attaching rope snaps is recommended to prevent rope fraying.

c. Pulleys/Rope Sleeves: Anti-friction devices are also recommended to prevent rope damage.

d. Rope Blocks/Brakes: Used to make the work safer and requires less hands to control heavy loads. When handling limb removal ropes, ground personnel should not wrap the rope around their hands or waist and keep the rope away from their feet to prevent entanglement.

e. Climbers PPE: Appropriate footwear, long pants, work shirt with a minimum 4 in (10.2 cm) sleeve length, eye protection, face shield, hearing protection during chainsaw usage, hard hat with chin strap or ANSI Z89.1 approved climbers helmet (vented or non-vented), and fingerless gloves such as mechanics gloves. When the air temperature exceeds 85 ^{o}F (29 ^{o}C), climbers should carry a water supply with them.

f. All equipment shall be inspected prior to each use and maintained and used in accordance with manufacturer instructions.

g. Employees shall be properly trained in the use of all equipment.

h. Ropes shall not be used to lower limbs or raise equipment.

i. Sharp tools such as hand saws shall be sheathed when not in use.

j. Tools used for de-barking, cavity work, cabling, bark tracing, shall be carried in a bag or belt designed for such use, and not carried in pockets or placed in boots.

k. Climbers Saddle: Climbers belts/saddles are only meant to be used as a suspension scaffold/equipment. In addition to the saddle a fall arrest system is required. Belts shall be equipped with leg straps or seats to take pressure off of the climbers back.

l. Climbing ropes shall not be spliced to effect repair.

m. Ropes shall be coiled and piled, or shall be suspended, so that air can circulate through the coils to aid in drying.

n. Wet ropes shall not be used for electrical work.

o. Ropes shall be inspected before and after each use.

p. Harnesses and other personal fall protection equipment used in rope access shall meet the ANSI Z359/ASSE Z359, Fall protection Code.

q. If descender devices are used, they shall allow a controlled descent taking into consideration the weight of the worker, the length of the descent, considerations for safety and the need for stopping along the working line for the purpose of hands free work.

24.H.02 General Practices.

a. Safety, Secondary, Belay or Back-up Line(s).

(1) Safety, Secondary, Belay or Back-up line(s) or other appropriate fall arrest devices shall be used in addition to the main line (working line) unless the employer can demonstrate that the second line or other fall arrest devices would create a greater hazard or otherwise would not be feasible. > See paragraph 24.H.02.a(2).

(2) Safety, Secondary, Belay or Back-up line(s) shall not be used alone for tree climbing. The use of a secondary line (safety line) may pose additional risks and increased difficulties. Careful consideration to the impact of secondary line use should be considered before making a decision on use in tree climbing operations.

(3) Where a safety line is used in conjunction with the working line, each line shall have its own separate anchor and shall be separately fixed to the worker's harness. This does not preclude both lines being attached to a single harness attachment point.

(4) The safety line shall be connected to the sternal or dorsal D-ring of the full body harness.

(5) When using safety line, the maximum free fall distance shall not exceed 6 ft (1.8 m) and the maximum arrest force shall not exceed 1,800 lbs (8 kN).

b. Employer shall insure that anchors have been evaluated in order to ensure that overall system safety factors can be met.

c. Before adopting rope access techniques for a particular job, the Competent Person (CP) for Rope Access shall perform risk assessment and develop a written safety analysis report and submit it as part of the Rope Access Work Plan to GDA for acceptance. The safety analysis report shall include consideration of the various rope access alternatives available and their respective access advantages and hazards. In particular, attention shall be given to the following aspects:

(1) Ability of the suspended person to safely use materials, equipment or tools necessary for the work and whether the reaction from any tool may place the person at risk;

(2) Whether the work may loosen material which could become a hazard to the worker or others;

(3) Whether the time required for the work at any one location will be such that there may be unacceptable levels of risk;

(4) Whether it would be possible to quickly rescue workers that are using rope access techniques from any position they could be expected to enter.

d. The contractor shall make provision for prompt rescue or self rescue and for emergency services.

e. The Rope Access Worker shall:

(1) Have a working understanding of the employer's Rope Access Work Plan and all applicable policy and procedures;

(2) Adjust, inspect, maintain, care for, and properly store rope access equipment;

(3) Inspect and verify the integrity of anchor systems and components;

(4) Recognize worksite hazards and notify the Rope Access Supervisor of any such hazard;

(5) Be capable of identifying work zones and job hazard analyses;

(6) Understand and communicate any written or verbal warnings;

(7) Be familiar with rescue procedures and systems used by the employer, and assist in the performance of rescue from rope access systems;

(8) Utilize appropriate personal protective equipment as designated by the Rope Access Supervisor;

(9) Follow the Competent Person (CP) for Rope Access directions or, where appropriate pursuant to the requirements of the Safe Practices Document, the Rope Access Lead Technician's directions regarding the work to be performed;

(10) Notify the CP for Rope Access if assigned.

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Section 25
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SECTION 25

Excavation and Trenching

25.A General. The requirements of this Section are applicable to all Government and contractor work forces when their employees are performing excavation or trenching activities.

25.A.01 Excavation/Trenching Plan. An Excavation/Trenching Plan and/or Activity Hazard Analysis (AHA) will be prepared by the Competent Person (CP) for Excavation or a Registered Professional Engineer (RPE), submitted and accepted by the GDA prior to beginning operations.

a. For excavations or trenches greater than 5 ft (1.5 m) in depth, both an Excavation/Trenching plan and AHA are required;

b. For excavations/trenches less than 5 ft (1.5 m) in depth, or made entirely in stable rock, an AHA is required (See Sections 1 and 25.A.01.a) and the Excavation/Trenching plan is optional;

c. The Excavation/Trenching Plan shall include, at a minimum;

(1) Activity Hazard Analysis (AHA). The AHA shall include required information per Section 1 and in addition:

(a) For all piping activities, include workers' increased exposure during connection activities (i.e. bent over, kneeling);

(b) Methods and locations for egress;

(c) Identification and credentials of the CP for Excavation;

(d) Documentation that examination of the ground by the CP provides no indication of a potential cave-in.

(2) Rescue plan and procedures (See Section 25.B.02). A rescue plan shall be prepared and maintained when workers are working at depths in excess of 5 ft (1.5 m);

(3) Diagram or sketch of the area where the work is to be done, with adjacent and nearby structures shown;

(4) Projected maximum depth of the excavation;

(5) Projected soil type and method of testing to determine soil type;

(6) Planned method of shoring, sloping and/or benching;

(7) Planned method for confined space entry, trench access and egress and atmospheric monitoring processes;

(8) Location of utility shut offs (if required);

(9) Proposed methods for preventing damage to overhead utility lines, trees designated to remain, and other man-made facilities or natural features designated to remain within or adjacent to the construction rights-of-way;

(10) Plan for management of excavated soil/asphalt/concrete;

(11) Plan for traffic control;

(12) Digging permits (Excavation permits). All underground lines/utilities (communication lines, water, fuel, electric lines) shall be located and protected from damage or displacement.

(a) Utility companies and other responsible authorities shall be contacted to locate and mark the locations and, if they so desire, direct or assist with protecting the underground installations.

(b) The Contractor shall obtain a “Digging Permit” (excavation permit) from Base Civil Engineers or other authority having jurisdiction prior the initiation of any excavation work. Requests for the permits will be processed through the GDA.

(13) Certification of UXO clearance. Where excavations are to be performed in areas known or suspected to contain explosives, unexploded munitions, or military ordnance, surface and subsurface clearance by qualified explosive ordnance disposal (EOD) personnel shall be accomplished prior to excavation work;

(14) For Cofferdams: Controlled flooding plan, fall protection, access/egress and evacuation procedures.

25.A.02 Excavation Testing and Documentation. > See Table 25-1.

a. When workers will be in or around an excavation, a CP for Excavation shall inspect the excavation, the adjacent areas, and protective systems daily. Inspections shall also be completed: before each work shift, throughout the work shifts as dictated by the work being done; after every rainstorm; when fissures, tension cracks, sloughing, undercutting, water seepage, bulging at the bottom or similar conditions occur; when there is a change in size, location or placement of the spoil pile; where there is any indication or change in adjacent structures; and after other events that could increase hazards (e.g., snowstorm, windstorm, thaw, earthquake, etc.).

b. The CP shall be able to demonstrate:

(1) Training, experience, and knowledge of soil analysis, use of protective systems, and requirements of this Section and 29 CFR 1926 Subpart P;

(2) Ability to detect conditions that could result in cave-ins, failures in protective systems, hazardous atmospheres, and other hazards including those associated with confined spaces; and

(3) The authority to take prompt corrective measures to eliminate existing and predictable hazards and stop work when required.

c. When persons for the purpose of inspection/testing will be in or around an excavation that is between 6 ft (1.8 m) and 20 ft (6.1 m) deep, that has vertical face leading edge fall exposure (sides have not been laid back), or that contains hazards (e.g., impalement hazards, hazardous substances), they shall be provided with fall protection per Section 21.

➢ Exception: The Designated CP for Excavation may exempt the use of fall protection for inspectors/supervisors provided those individuals are not exposed to hazards within 24 in (0.6 m) of edges, the excavation contains no additional hazards and the individual(s) stay a minimum of 24 in (0.6 m) from the excavation's edge.

d. Testing for soil classification shall be of an approved method: pocket penetrometer, plasticity/ wet thread test or visual test and shall be conducted at a minimum of once prior to the start of each work shift or, if conditions warrant, as described in Section 25.A.02.a.

e. All testing for soil classification shall be determined by the CP, documented , and maintained for the life of the project (i.e., QC daily reports, excavation inspection log, etc.). > See Table 25-1.

f. If evidence of a situation that could result in possible cave-ins, slides, failure of protective systems, hazardous atmospheres, or other hazardous condition is identified, exposed workers shall be removed from the hazard and all work in the excavation stopped until all necessary safety precautions have been implemented.

g. In locations where oxygen deficiency or gaseous conditions are known or suspected, in excavations 4 ft (1.2 m) or greater in depth, air in the excavation shall be tested prior to the start of each shift or more often if directed by the GDA. A log of all test results shall be maintained at the work site. > See Sections 5 and 6.

25.A.03 Protective systems. Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

a. The sides of all excavations in which employees are exposed to danger from moving ground shall be guarded by a support system, sloping or benching of the ground, or other equivalent means.

b. Excavations less than 5 ft (1.5 m) in depth and which a CP examines, determines and documents that there is no potential for cave-in do not require protective systems, however, a fixed means of egress shall be provided.

c. Sloping or benching of the ground shall be in accordance with Section 25.C.

d. Support systems shall be in accordance with Section 25.D.

e. Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied to the system.

f. Shoring shall be used for unstable soil or depths greater than 5 ft (>1.5 m) unless benching, sloping, or other acceptable plan is implemented by the Contractor and accepted by the GDA.

25.A.04 Stability of adjacent structures.

a. Except in stable rock, excavations below the level of the base of footing of any foundation or retaining wall shall not be permitted unless:

(1) A support system, such as underpinning, is provided to ensure the stability of the structure and to protect employees involved in the excavation work or in the vicinity thereof; or

(2) A RPE has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation and that the excavation will not pose a hazard to employees.

b. If the stability of adjoining buildings or walls is endangered by excavations, shoring, bracing, or underpinning designed by a qualified person shall be provided to ensure the stability of the structure and to protect employees.

c. Sidewalks, pavements, and related structures shall not be undermined unless a support system is provided to protect employees and the sidewalk, pavement, or related structure.

25.A.05 Where it is necessary to undercut the side of an excavation, overhanging material shall be safely supported.

25.A.06 Protection from water.

a. Diversion ditches, dikes, or other means shall be used to prevent surface water entering an excavation and to provide good drainage of the area adjacent to the excavation.

b. Employees shall not work in excavations in which there is accumulated water or in which water is accumulating unless the water hazards posed by accumulation is controlled.

(1) Freezing, pumping, drainage, and similar control measures shall be planned and directed by a RPE. Consideration shall be given to the existing moisture balances in surrounding soils and the effects on foundations and structures if it is disturbed.

(2) When continuous operation of ground water control equipment is necessary, an emergency power source shall be provided. Water control equipment and operations shall be monitored by the CP to ensure proper operation.

25.A.07 Protection from falling material.

a. Employees shall be protected (by scaling, ice removal, benching, barricading, rock bolting, wire mesh, or other means) from loose rock or soil that could create a hazard by falling from the excavation wall: special attention shall be given to slopes that may be adversely affected by weather, moisture content, or vibration.

b. Materials, such as boulders or stumps, that may slide or roll into the excavation shall be removed or made safe.

c. Excavated material shall be placed at least 2 ft (0.6 m) from the edge of an excavation or shall be retained by devices that are sufficient to prevent the materials from falling into the excavation. In any case, material shall be placed at a distance to prevent excessive loading on the face of the excavation.

25.A.08 Mobile equipment and motor vehicle precautions.

a. When vehicles or mobile equipment are used or allowed adjacent to an excavation, substantial stop logs or barricades shall be installed. The use of a ground guide is recommended.

b. Workers shall stand away from vehicles being loaded or unloaded to avoid being struck by spillage or falling materials.

c. Excavating or hoisting equipment shall not be allowed to raise, lower, or swing loads over or adjacent to personnel in the excavation without substantial overhead protection. Personnel shall maintain a safe distance from hoisting operation until the load has been placed.

➢ Note: Any equipment used to hoist loads, with the use of rigging attached to the equipment (to include excavators, forklifts, etc.) shall be considered "load handling equipment (LHE) or hoisting equipment" and as such, shall follow the requirements in Section 16.

d. Employees exposed to public vehicular traffic shall be provided with, and shall wear, high visibility apparel as per Section 05.F.

25.A.09 Employees shall not be permitted to work on the faces of sloped or benched excavations at levels above other employees except when employees at lower levels are adequately protected from the hazard of falling material or equipment.

25.A.10 When operations approach the location of underground utilities, excavation shall progress with caution until the exact location of the utility is determined. Workers shall be protected from the utility and the utility shall be protected from damage or displacement.

25.A.11 Employees entering excavations classified as confined spaces, or that otherwise present the potential for emergency rescue (i.e., bell-bottom pier holes or similar), shall wear rescue equipment and maintain communication with the (confined space) attendant. > See Section 34.

25.B Safe Access.

25.B.01 Protection shall be provided to prevent personnel, vehicles, and equipment from falling into excavations. Protection shall be provided according to the following hierarchy. > See Appendix Q for definitions of Perimeter Protection: Class I, Class II, and Class III.

a. If the excavation is exposed to members of the public or vehicles or equipment, then Class I perimeter protection is required.

b. Class II perimeter protection is the minimum protection required if the excavation does not meet the requirements for Class I perimeter protection but is:

(1) Routinely exposed to employees, and

(2) Is deeper than 6 ft (1.8 m) or

(3) Contains hazards (e.g., impalement hazards, hazardous substances).

c. When workers are in the zone between the warning barricades/ flagging and the excavation, they shall be provided with fall protection as specified in Section 21. > See Section 25.A.02.c for exception.

d. If the excavation does not meet the requirements for either Class I or Class II perimeter protection, then Class III perimeter protection is the minimum protection required.

25.B.02 Rescue Plan and Procedures. The employer is required to provide prompt rescue to all buried workers.

a. A written rescue plan shall be prepared by the CP or a RPE, submitted and accepted by the GDA prior to beginning operations and maintained when workers are working at depths of over 5 ft (1.5 m).

b. The plan shall contain provisions for self-rescue and assisted rescue of any worker who is buried during a cave-in including rescue equipment. If other methods of rescue are planned (i.e. by a jurisdictional, public or Government emergency rescue agencies), it shall be indicated in the rescue plan including how to contact and summon the agency to the mishap site.

c. Personnel conducting rescue shall be trained accordingly.

25.B.03 All wells, calyx holes, pits, shafts, etc., shall be barricaded or covered.

25.B.04 Excavations shall be backfilled as soon as possible. Upon completion of exploration and similar operations, test pits, temporary wells, calyx holes, etc., shall be backfilled immediately.

25.B.05 Walkways or bridges shall be provided with standard guardrails (as defined in Section 21.F.01) where people or equipment are required or permitted to cross over excavations.

25.B.06 Where personnel are required to enter excavations/trenches over 4 ft (1.2 m) in depth, sufficient stairs, ramps, or ladders shall be provided to require no more than 25 ft (7.6 m) of lateral travel.

a. At least two means of exit shall be provided for personnel working in excavations. Where the width of the excavation exceeds 100 ft (30.4 m), two or more means of exit shall be provided on each side of the excavation.

b. When access to excavations in excess of 20 ft (6 m) in depth is required, ramps, stairs, or mechanical personnel hoists shall be provided.

25.B.07 Ramps. > See Sections 24.B. and 24.F.

a. Ramps used solely for personnel access shall be a minimum width of 4 ft (1.2 m) and provided with standard guardrails. > See Section 21.F.01.

b. Ramps used for equipment access shall be a minimum width of 12 ft (3.6 m). Curbs not less than 8-in x 8-in (20.3-cm x 20.3-cm) timbers, or equivalent protection, shall be provided. Equipment ramps shall be designed and constructed in accordance with accepted engineering practice.

25.B.08 Ladders used as access ways shall extend from the bottom of the excavation to not less than 3 ft (0.9 m) above the surface.

25.C Sloping and Benching.

25.C.01 Sloping or benching of the ground shall be in accordance with one of the systems outlined below. > See 29 CFR 1926, Subpart P, Appendix B).

a. Allowable configurations and slopes. For excavations less than 20 ft (6 m) in depth, the maximum slope shall be 34° measured from the horizontal (1-1/2 horizontal to 1 vertical). These slopes shall be excavated to form configurations that are in accordance with the slopes shown for Type C soil. > See also Section 25.A.03 and 29 CFR 1926, Subpart P, Appendices A and B and Figure 25-1.

b. Determination of slopes and configurations using classification of soil and rock deposits. > See Section 25.A.03 and 29 CFR 1926, Subpart P, Appendix A. All excavations less than 20 ft (6m) in depth which have vertically lowered portions shall be shielded or supported to a height at least 18 in (.5 m) above the top of the vertical side with a maximum allowable slope of 1-1/2:1. Maximum allowable slopes and allowable configurations for sloping and benching systems, shall be determined in accordance with the conditions and requirements set forth in 29 CFR 1926, Subpart P, Appendices A and B. > See also Figure 25-1.

c. Designs using other tabulated data. The design shall be selected from and be in accordance with written tabulated data, such as charts and tables approved by a RPE. At least one copy of the tabulated data shall be maintained at the job site during excavation. The tabulated data shall include:

(1) Identification of the parameters that affect the selection of a sloping or benching system drawn from the data;

(2) Identification of the limits of use of the data, to include the magnitude and configuration of slopes determined to be safe;

(3) Explanatory information as may be necessary to aid the user in correctly selecting a protective system from the data; and

(4) The identity of the RPE who approved the data.

d. Design by a RPE. The sloping or benching systems was not created using Options a, b or c above but is instead, approved by a RPE. At least one copy of the design shall be maintained at the job site during excavation. Designs shall be in writing and include:

(1) The magnitudes and configurations of the slopes that were determined to be safe for the particular excavation, and

(2) The identity of the RPE who approved the design, including name, address, telephone, fax and email address.

25.D Support Systems.

25.D.01 Support systems (including shield systems and other protective systems) shall be in accordance with one of the following systems:

a. Designs Using Manufacturer's Tabulated Data. Designs drawn from manufacturer's tabulated data shall be in accordance with all specifications, limitations, and recommendations issued or made by the manufacturer.

(1) Deviation from the specifications, recommendations, and limitations are only allowed after the manufacturer issues specific written approval.

(2) A copy of the manufacturer's specifications, recommendations, and limitations (and the manufacturer's approval to deviate from these, if required) shall be in written form and maintained at the job site during excavation.

b. Designs using other tabulated data. Designs shall be selected from and be in accordance with tabulated data (such as tables and charts). At least one copy of the tabulated data shall be maintained at the job site during excavation. The tabulated data shall include:

(1) Identification of the parameters that affect the selection of the protective system drawn from such data,

(2) Identification of the limits of use of the data, and

(3) Explanatory information as may be necessary to aid the user in correctly selecting a protective system from the data, and

(4) The identity of the RPE who approved the data, including name, address, telephone, fax and email address.

c. Designed by a RPE. At least one copy of the design shall be maintained at the job site during excavation. Designs shall be in writing and include:

(1) A plan indicating the sizes, types, and configurations of the materials to be used in the protective system, and

(2) The identity of the RPE who approved the design, including name, address, telephone, fax and email address.

25.D.02 Materials and equipment used for protective systems.

a. Materials and equipment shall be free from damage or defects that might impair their proper function.

b. Manufactured materials and equipment shall be used and maintained in a manner consistent with the recommendations of the manufacturer and in a manner that will prevent employee exposure to hazards.

c. When material or equipment is damaged, a CP shall examine the material or equipment and evaluate its suitability for continued use.

25.D.03 Installation and removal of support systems. > See Figures 25-1 through 25-3.

a. Members of support systems shall be securely connected together to prevent sliding, falling, kickouts, or other predictable failure.

b. Support systems shall be installed and removed in manners that protect employees from cave-ins, structural collapses, or from being struck by members of the support system.

c. Individual members of a support system shall not be subjected to loads exceeding those for which they were designed to withstand.

d. Before temporary removal of individual members, additional precautions shall be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.

e. Removal shall begin at and progress from the bottom of the excavation. Members shall be released slowly as to note any indication of possible failure of the remaining members or possible cave-in of the sides of the excavation.

f. Backfilling shall progress together with the removal of support systems from excavations.

g. For trench excavations: excavation material shall be permitted to a level not greater than 2 ft (.6 m) below the bottom of the members of a support system, only if the system is designed to resist the forces calculated for the full depth of the trench, and there is no indication while the trench is open of a possible loss of soil from behind or below the bottom of the support system.

25.D.04 Shield systems.

a. Shield systems shall not be subjected to loads exceeding those that the system was designed to withstand.

b. Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.

c. Employees shall be protected from the hazard of cave-ins when entering or exiting the area protected by shields.

d. Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.

e. For shield systems used in trench excavations: excavations of earth material to a level not greater than 2 ft (.6 m) below the bottom of the shield shall be permitted, only if the shield is designed to resist the forces calculated for the full depth of the trench, and there is no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.

25.D.05 Additional requirements for trenching.

a. Installation of support systems shall be closely coordinated with excavations of trenches.

b. Bracing or shoring of trenches shall be carried along with the excavation.

c. Backfilling and removal of trench supports should progress together from the bottom of the trench. Jacks or braces shall be released slowly and, in unstable soil, ropes shall be used to pull out the jacks or braces from above after personnel have cleared the trench. > See Figure 25-3.

d. Excavation of material to a level no greater than 2 ft (0.6 m) below the bottom of the members of a trench support system (including a shield) shall be permitted, only if the system is designed to resist the forces calculated for the full depth of the trench and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the support system.

25.E Cofferdams.

25.E.01 If overtopping of the cofferdams by high water is possible, design shall include provisions for controlled flooding of the work area.

25.E.02 If personnel or equipment are required or permitted on cofferdams, standard railings, or equivalent protection, shall be provided.

25.E.03 Walkways, bridges, or ramps with at least two means of rapid exit, with standard guardrails (as defined in Section 21.F.01), shall be provided for personnel and equipment working on cofferdams.

25.E.04 A plan (including warning signals) for evacuation of personnel and equipment in case of emergency and for controlled flooding shall be developed and posted.

25.E.05 Cofferdams located close to navigable shipping channels shall be protected from vessels in transit.

TABLE 25-1

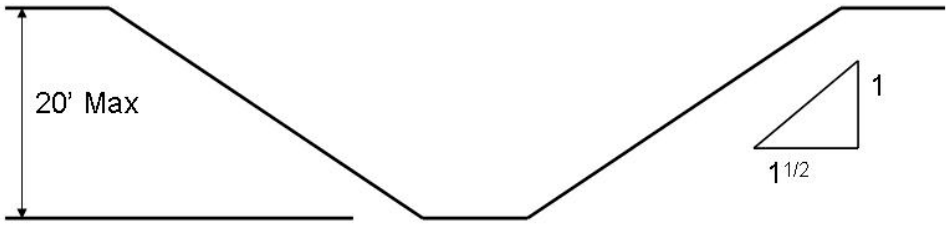
Soil Classification

Soil Type	Criteria	Other Considerations
Stable Rock	Natural solid mineral that can be excavated with vertical sides and remain intact while exposed.	
Type A	Cohesive soil with an unconfined compressive strength of 1.5 tons per square foot (tsf) (144 kPa) or greater.	Can not be Type A if soil is: 1) fissured; 2) subject to vibration from heavy traffic, pile driving, etc.; 3) previously disturbed; 4) part of sloped, layered system where layers dip into excavation on a slope of 4H:1V or greater; or 5) subject to other factors requiring it to be classified as less stable material.
Type B	Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa).	Type B soil can also be: 1) granular cohesionless soils such as angular gravel, silt, silt loam, sandy loam, and in some cases, silty clay loam and sandy clay loam; 2) previously disturbed soils except those which would otherwise be classed as Type C soil; 3) soil that meets the requirements of Type A, but is fissured or subject to vibration; 4) dry rock that is not stable; or 5) part of sloped, layered system where layers dip into excavation on a slope of 4H:1V , but only if the soil would otherwise be classed as Type A.
Type C	Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less.	Type C soil can also be: 1) granular soils including gravel, sand, and loamy sand; 2) submerged soil or soil from which water is freely seeping; 3) submerged rock that is not stable; or 4) part of sloped, layered system where layers dip into excavation on a slope of 4H:1V or steeper. <u>Can NOT be benched!</u>

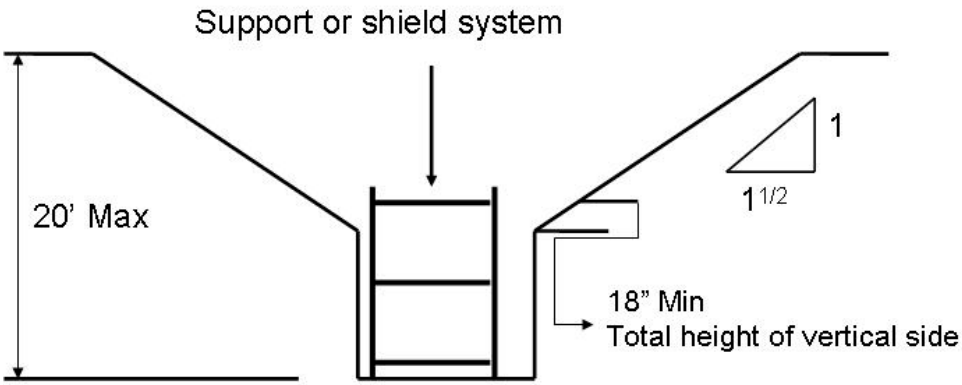
NOTE: Soil classification must be determined by a Competent Person, per Section 25.A.02

FIGURE 25-1

Sloping and Benching



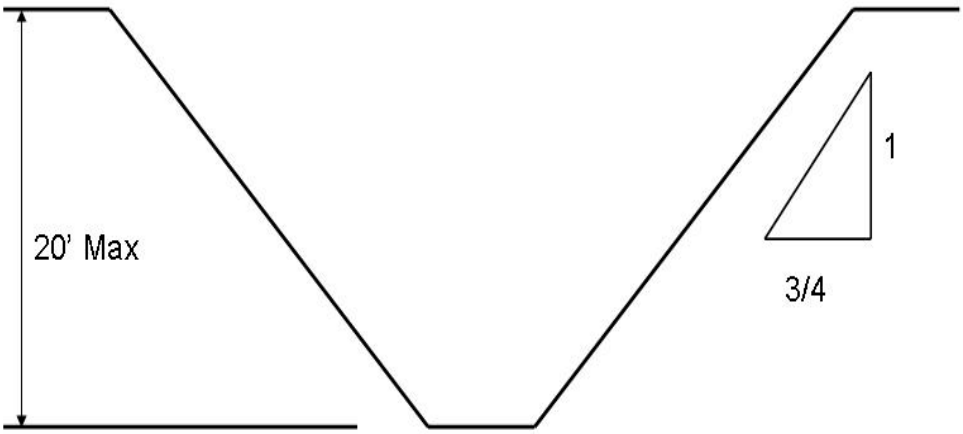
Simple Slope - Type C Soil



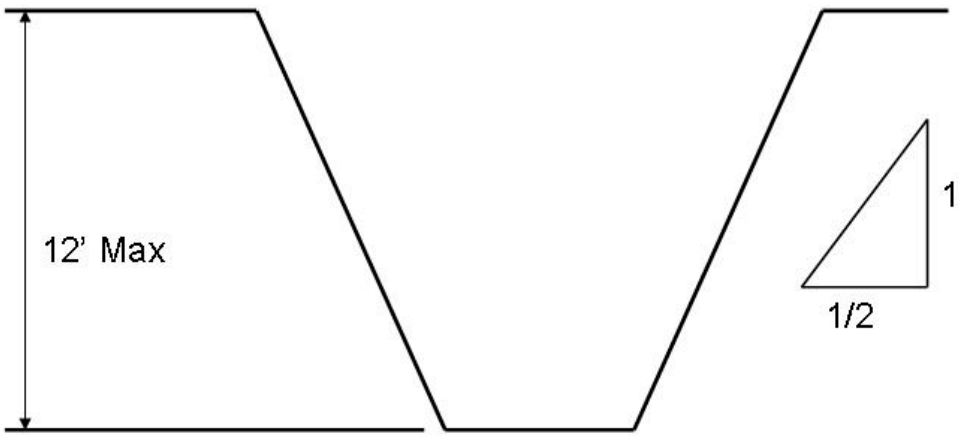
Vertical-Sided
Lower Portion - Type C Soil

FIGURE 25-1 (Continued)

Sloping and Benching



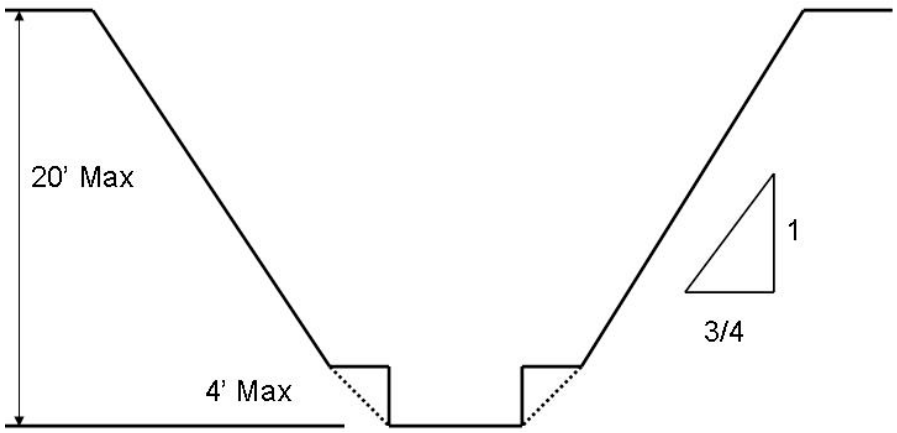
Simple Slope – General - Type A Soil*



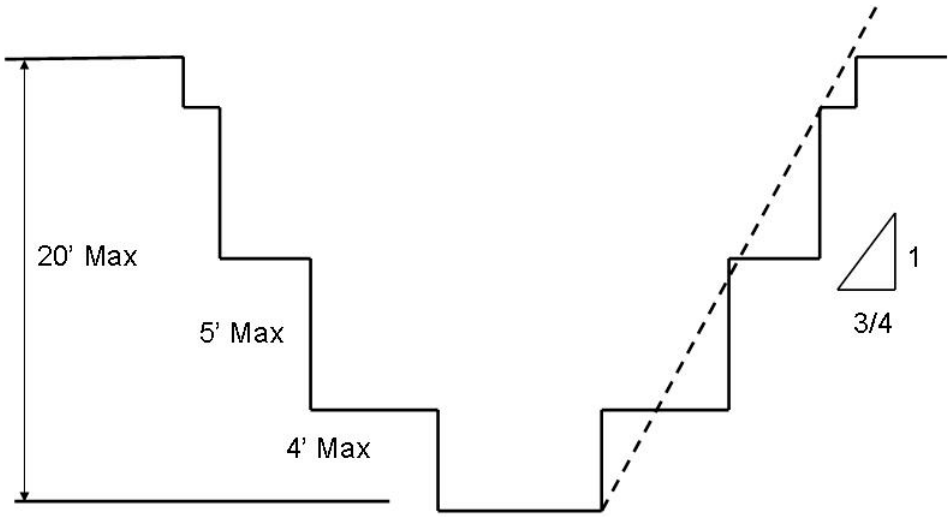
Simple Slope – Short Term - Type A Soil*

FIGURE 25-1 (Continued)

Sloping and Benching



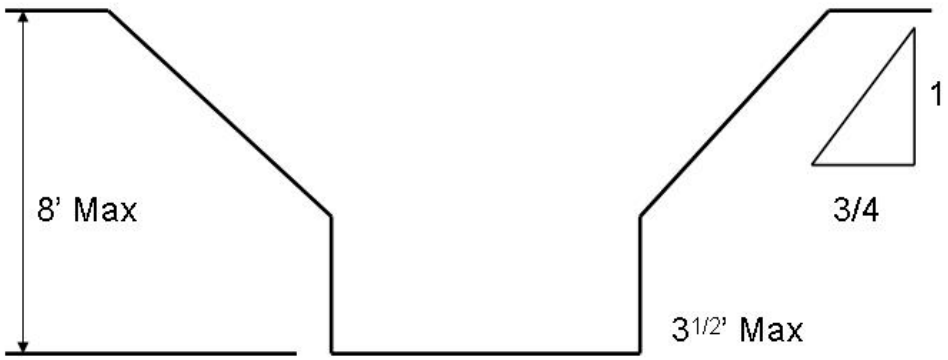
Simple Bench - Type A Soil*



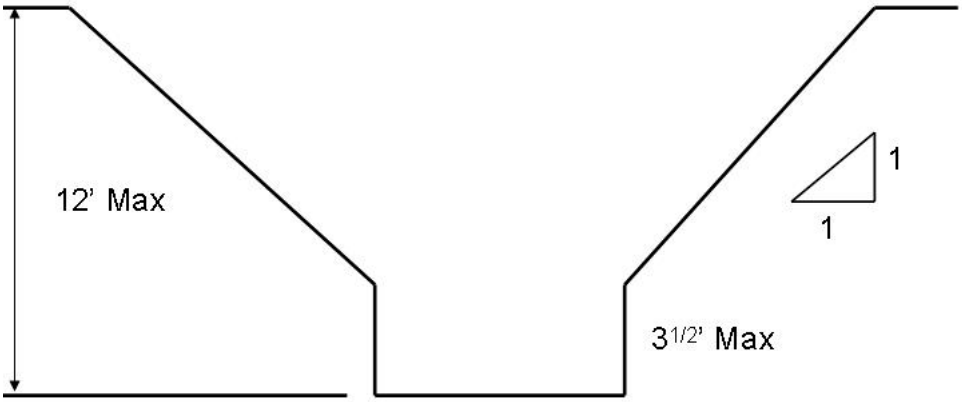
Multiple Bench - Type A Soil*

FIGURE 25-1 (Continued)

Sloping and Benching



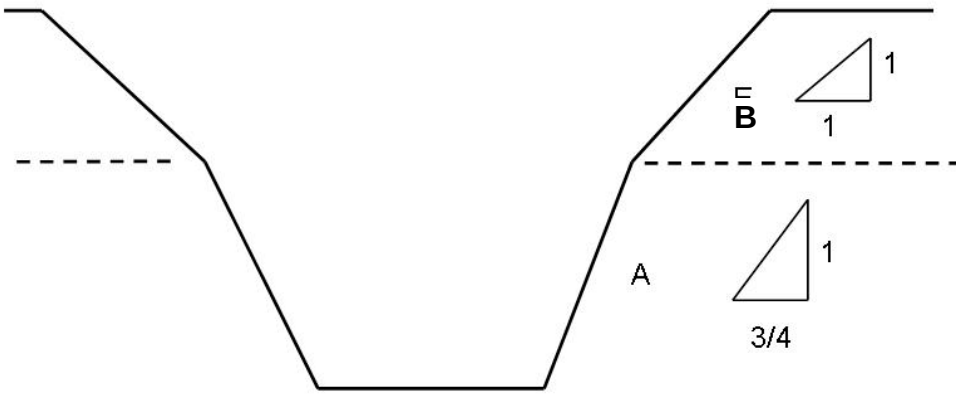
Unsupported Vertically Sided Lower Portion –
Maximum 8 Feet in Depth - Type A Soil*



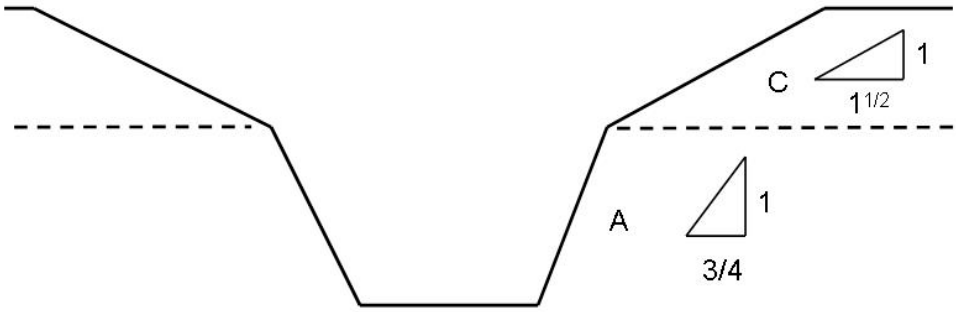
Unsupported Vertically Sided Lower Portion –
Maximum 12 Ft in Depth - Type A Soil*

FIGURE 25-1 (Continued)

Sloping and Benching



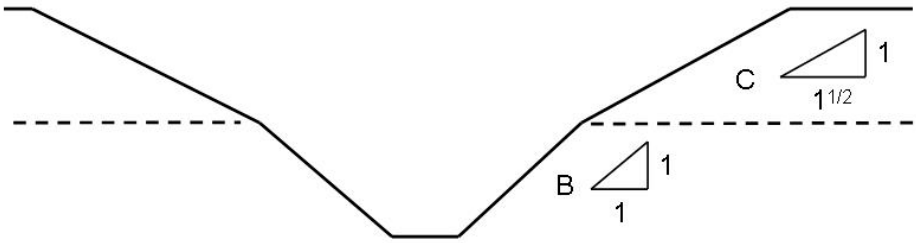
Excavations Made In Layered Soils - B over A*



Excavations Made In Layered Soils - C over A*

FIGURE 25-1 (Continued)

Sloping and Benching

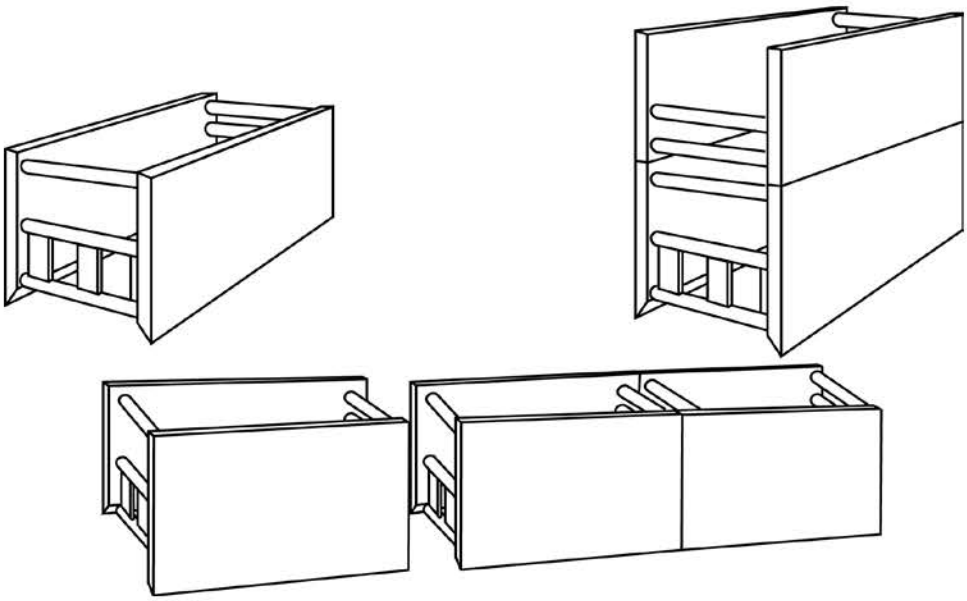


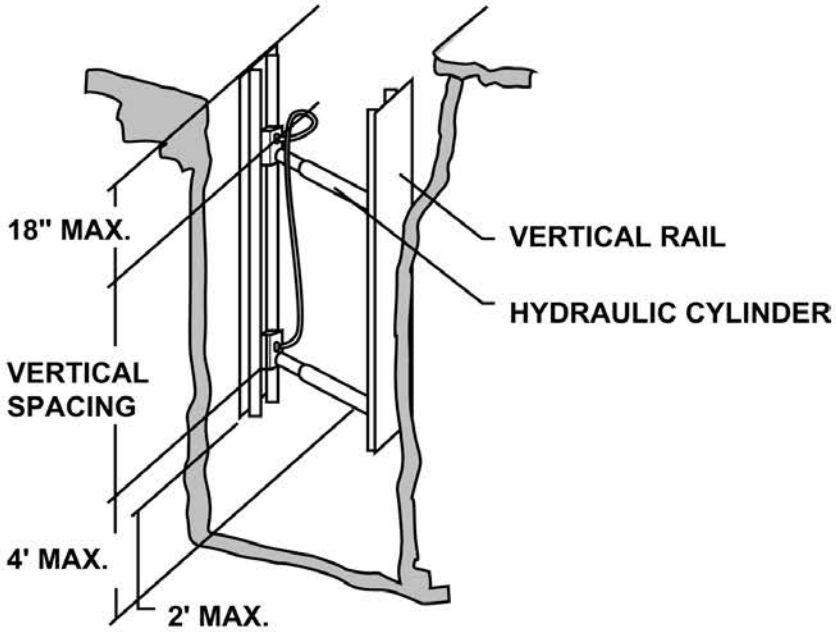
Excavations Made In Layered Soils - C over B*

* Requires the approval and identity of a Registered Professional Engineer <u>if paragraph(s) 25.C.01.c or 25.C.01.d are used to determine design of sloping/benching system(s)</u>.

FIGURE 25-2

Trench Shields

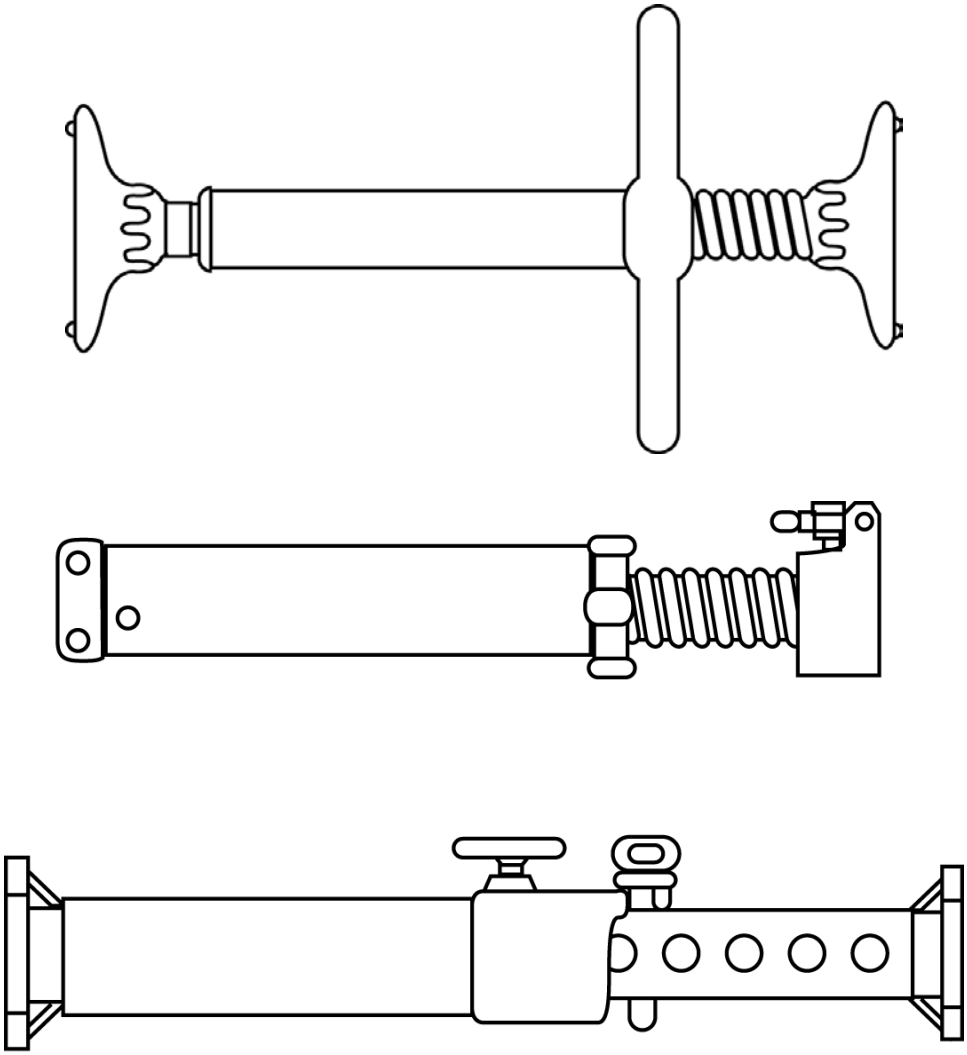




Aluminum Hydraulic Shoring

FIGURE 25-3

Trench Jacks



Pneumatic/hydraulic Shoring

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Section 26
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SECTION 26

Underground Construction (Tunnels), Shafts and Caissons

26. General. This section applies to the construction of underground tunnels, shafts, chambers, and passageways. This section also applies to cut-and-cover excavations which are both physically connected to ongoing underground construction operations within the scope of this section, and covered in such a manner as to create conditions characteristic of underground construction.

26.A.01 Access and Egress.

a. Access to all underground openings shall be controlled to prevent unauthorized entry.

b. Unused access ways or other openings shall be tightly covered or fenced off and shall be posted with warning signs indicating “KEEP OUT” or similar language.

c. Completed or unused sections of underground structures shall be barricaded.

d. See Section 34 of this manual for confined space requirements.

26.A.02 Every location of underground construction shall have a check-in/check-out system that will ensure that above-ground personnel can determine the identification of all underground personnel.

26.A.03 Oncoming shifts shall be informed of any hazardous occurrences or conditions that have affected or might affect employee safety, including liberation of gas, equipment failures, earth or rock slides, cave-ins, flooding, fires, or explosions.

26.A.04 Communications.

a. In situations where unassisted voice communication is inadequate, power-assisted means shall be used to provide communication among workers and support personnel.

b. At least two effective means of communication (at least one of which shall be voice communication) shall be provided in all shafts that are being developed or used either for personnel access or for hoisting.

c. Powered communication systems shall operate on an independent power supply and shall be installed so that the use of or disruption of any one phone or signal location will not disrupt the operation of the system from any other location.

d. Communication systems shall be tested upon initial entry of each shift to the underground and as often as necessary thereafter to ensure proper operation.

e. Any employee working alone underground, who is both out of range of natural unassisted voice communication and not under observation by other persons, shall be provided with effective means to communicate the need for and to obtain emergency assistance. Employees working alone shall be required to check in with their supervisor at least once an hour.

26.A.05 Emergency rescue plans and equipment.

a. Plans for rescuing personnel who might become injured or incapacitated while underground or in a shaft or caisson shall be developed.

(1) Plans shall be incorporated in either the APP or the AHA and posted at the job site.

(2) Plans shall be periodically reviewed with all affected personnel so that they maintain a working knowledge of emergency responsibilities and procedures.

(3) Emergency plans shall be drilled on a periodic basis to ensure their efficacy.

b. Emergency equipment specified in the emergency plan shall be provided within 15 minutes of each portal or shaft entry. Inspections and workability tests of the equipment shall be made and documented monthly.

c. When a shaft is used as a means of egress, arrangements shall be made for power-assisted hoisting capability to be readily available in an emergency, unless the regular hoisting means can continue to function during a power failure.

d. Hoisting devices used for emergencies shall be designed so that the load hoist drum is powered in both directions of rotation and so that the brake is automatically applied upon power release or failure.

e. Self-rescuing/emergency respirators shall be immediately available to all employees at workstations in underground areas where they may be trapped by smoke or gas. > See Section 05.G.

f. At least one designated person shall be on duty above ground whenever personnel are underground.

(1) The designated person shall be responsible for keeping an accurate count of employees' underground and securing immediate aid in case of emergency.

(2) The designated person shall not be given other responsibilities that could affect his emergency response duties.

g. Each worker underground shall have an acceptable portable hand lamp or cap lamp in his work area for emergency use, unless natural light or an emergency lighting system provides adequate illumination for escape.

26.A.06 Rescue teams.

a. On job sites where less than 25 persons are underground at one time, provisions shall be made for at least one five-person rescue team to be either on the job site or within 30-minutes travel time from the underground entry point. This rescue team may be provided by local emergency response services.

b. On job sites where 25 or more persons are underground at one time, provisions shall be made for at least two five-person rescue teams. One rescue team shall be on the job site or be within 30-minutes travel time from the underground entry point, and the other rescue team shall be within 2-hours travel time. These rescue teams may be provided by local emergency response services.

c. Rescue team members shall be qualified in rescue procedures, the use and limitations of breathing apparatus, and the use of firefighting equipment. Qualifications shall be reviewed not less than annually.

d. On job sites where flammable or noxious gases are encountered or anticipated in hazardous quantities, rescue team members shall practice donning and using SCBA monthly.

e. Rescue teams shall be kept informed of conditions at the job site with may impact their response.

26.A.07 In addition to the requirements of Section 5, personnel in wet underground areas shall wear rubber boots (and rain gear, as necessary).

26.A.08 First aid facilities.

a. A fully equipped first aid station and emergency transportation shall be provided at each underground construction project regardless of the number of persons employed.

b. If an underground construction project has multiple portals, a first aid station shall be provided at each portal or entry shaft or shall be so located between them that the distance from the station to each portal/entry shaft is less than 5 mi (8 km) and travel time less than 15 minutes.

26.A.09 Electrical and lighting.

a. All electrical systems used in hazardous locations must be approved for that location. > See Section 11.H.

b. Lighting circuits shall be installed on one side of the tunnel near the spring line and shall be mounted on insulators at each point of suspension.

c. Light fixtures shall be nonmetallic and weatherproof and mounted in a manner that provides safe clearance for personnel and equipment.

d. Only portable lighting equipment that is approved for the hazardous location shall be used within:

(1) Storage areas, or

(2) 50 ft (15.2 m) of any underground heading during explosives handling.

26.A.10 Inspections, testing and documentation.

a. A program for testing all rock bolts for tightness shall be established. The frequency of testing shall be determined by rock conditions and the distance from vibration sources.

b. The employer shall examine and test the roof, face, and walls of the work area at the start of each shift and frequently thereafter.

c. Ground conditions along underground haulways and accessways shall be inspected by a Competent Person (CP) as frequently as necessary to maintain safe passage.

d. All drilling and associated equipment to be used during a shift shall be inspected before each shift by a CP.

e. Drilling areas shall be inspected for hazards before drilling operations are started.

f. A CP shall inspect haulage equipment before each shift.

g. Whenever defects affecting safety or health are identified, the defects shall be corrected before activities are initiated or continued.

26.A.11 Protection from falling material.

a. A CP shall inspect the roof, face and walls of the work area at the start of each shift and as often as necessary to determine the stability of the tunnel. > See 29 CFR 1926.800(o)(3)(i)(A).

b. Portal openings and access areas shall be guarded by shoring, fencing, head walls, shotcreting, or other equivalent means to ensure safe access of employees and equipment. Adjacent areas shall be scaled or otherwise secured to prevent loose soil or rock from endangering the portal and access areas.

c. Ground stability in hazardous subsidence areas shall be ensured by shoring or filling in, or by erecting barricades and posting warning signs to prevent entry.

d. Loose ground in underground areas that might be hazardous to employees shall be taken down, scaled, or supported.

e. Rock masses separated from the main mass by faults, joints, or fractures shall be secured by rock bolting or other suitable means or shall be removed. The means of securing shall be designed by a foundation engineer, an engineering geologist, or other qualified person.

f. Anchored chain-link fabric or other method approved by the GDA shall be provided on rock faces subject to spalling.

g. Where tunnels are excavated through earth or shale, any excavation above or adjacent to portal areas shall be sloped to the angle of repose or held in place by ground supports. When undercutting occurs on these slopes (whether due to erosion or other causes) the overhanging material shall be promptly removed.

h. Where the need is indicated, a protective shelter shall be provided at each underground portal to protect persons and equipment from the hazards of falling rock or other material. The protective shelter shall project at least 15 ft (4.5 m) out from the portal.

i. Ice or snow buildup on rock faces or earth slopes that create a hazard shall be promptly removed.

26.A.12 Tunneling in soil.

a. Where tunnels are excavated by conventional methods, the excavation shall not be extended more than 24 in (60.9 cm) ahead of ground supports; where continuous mining machines are used for tunnel excavation, the excavation shall not be extended more than 48 in (121.8 cm) ahead of ground supports.

b. Under no circumstances shall persons be permitted to work in unsupported sections of the tunnels.

c. All voids in back of ground supports shall be filled, blocked, braced, or treated to prevent further cave-ins.

d. Where liner plate is not used for tunnel support, 2 in (5 cm) wire mesh or chain-link fabric shall be installed over the crown section, extending down to the spring line on each side of the tunnel and secured in place.

26.A.13 Ground support systems.

a. Torque meters and/or torque wrenches shall be used where rock bolts are used for ground support.

b. Frequent tests shall be made to determine if bolts meet the required torque. The test frequency shall be determined by rock conditions and distance from vibration sources.

c. Rock bolt support systems shall be designed by a foundation engineer, geologist, geotechnical engineer, mining engineer or other qualified Registered Professional Engineer (RPE). Suitable protection shall be provided for employees exposed to the hazard of loose ground while installing ground support systems.

d. Support sets shall be installed so that the bottoms have sufficient anchorage to prevent ground pressures from dislodging the support base of the sets. Lateral bracing shall be provided between immediately adjacent sets to provide added stability.

e. Damaged or dislodged ground supports shall be repaired or replaced. Whenever possible, new supports shall be installed before removing the damaged supports.

f. A shield or other type of support shall be used to maintain a safe travel way for personnel working in dead-end areas ahead of any support replacement operation.

26.A.14 Material handling equipment.

a. Powered mobile haulage equipment shall have audible warning devices to inform personnel to stay clear. The operator shall sound the warning device before moving the equipment and whenever necessary during travel.

b. All vehicles and mobile equipment required to move in and out of underground construction areas shall have a revolving, flashing amber light, mounted so as to be visible in all directions. The flashing light shall be on whenever a vehicle or mobile equipment is in operation.

c. Haulage equipment shall be equipped with two headlights at both ends, a back-up light, and an automatic back-up alarm.

d. Conveyors used to transport muck from tunnels shall be installed, guarded, and maintained as required by Section 17. Fire extinguishers or equivalent protection shall be provided at the head and tail pulleys of underground belt conveyors and at 300 ft (91.4 m) intervals along the belt line.

e. No person shall ride haulage equipment unless it is equipped with seating for each passenger and passengers are protected from being struck, crushed, or caught between other equipment or surfaces.

f. When dumping cars by hand, the car dumps shall be provided with tie-down chains or bumper blocks to prevent cars from overturning.

g. Where narrow-gage railroads are used for haulage, the tracks shall be secured to prevent shifting. No "humping" of mine dump cars shall be permitted.

h. Whenever rails serve as a return for a trolley circuit, both rails shall be bonded at every joint and cross-bonded every 200 ft (60.9 m).

i. Mine dump cars shall be equipped with automatic safety couplings, and cradle cars shall be equipped with a positive locking device to prevent accidental dumping.

j. Berms, bumper blocks, safety hooks, or equivalent means shall be provided to prevent over-travel and overturning of haulage equipment at dumping locations.

k. Bumper blocks or equivalent shall be provided at all track dead ends.

26.A.15 Vehicles not directly involved in work shall be kept away from portals and separated from construction activities.

26.A.16 A caution sign reading “BURIED LINE” (or similar wording) shall be posted where air lines <u>or other utility lines</u> are buried or otherwise hidden by water or debris.

26.A.17 Where underground openings are located adjacent to sources of water with potential for causing flooding in the underground work area, measures shall be taken to ensure that the underground area cannot be flooded.

26.B Hazardous Classifications.

26.B.01 Underground construction operations shall be classified in accordance with the following.

a. Underground construction operations shall be classified as potentially gassy operations if either:

(1) Air monitoring discloses 10% or more of the lower explosive limit (LEL) for methane or other flammable gases measured at 12 in +/- 0.25 in (30.4 cm +/- 0.6 cm) from the roof, face, floor, or walls for a period of more than 24 hours; or

(2) The history of the geological area or geological formation indicates that 10% or more of the LEL for methane or other flammable gas is likely to be encountered.

b. Underground operations shall be classified as gassy operations if:

(1) Air monitoring discloses 10% or more of the LEL for methane or other flammable gases measured at 12 in +/- 0.25 in (30.4 cm +/- 0.6 cm) from the roof, face, floor, or walls for three consecutive days; or

(2) There has been an ignition of methane or other flammable gases emanating from the strata that indicates the presence of such gases; or

(3) The underground construction operation is both connected to an underground work area that is currently classified as gassy and is also subject to a continuous course of air containing the flammable gas concentration.

26.B.02 Underground construction gassy operations may be downgraded to potentially gassy operations when air monitoring results remain under 10% of the LEL for methane or other flammable gases for 3 consecutive days.

26.B.03 Requirements for gassy operations.

a. Only equipment approved for the hazardous location and maintained in suitable condition shall be used in gassy operations.

b. Mobile diesel-powered equipment used in gassy operations shall be approved in accordance with the requirements of 30 CFR 36 by MSHA and State regulations and shall be operated in accordance with these requirements and the manufacturer's instructions.

c. Each entrance to a gassy operation shall be prominently posted with signs notifying all entrants of the gassy classification.

d. Smoking shall be prohibited in all gassy operations and the employer shall be responsible for collecting all personal sources of ignition, such as matches and lighters, from all persons entering a gassy operation.

e. A permit is required and a fire watch shall be maintained when hot work is performed. > See Section 9.

f. Once an operation has been classified as gassy, all activities in the affected area (except those in (1) through (3), below) shall be discontinued until the operation either is in compliance with all gassy operation requirements or has been downgraded to potentially gassy:

(1) Activities related to the control of the gas concentration;

(2) Installation of new equipment, or conversion of existing equipment, to comply with subparagraph (1), above; and

(3) Installation of above-ground controls for reversing the air flow.

26.C Air Monitoring, Air Quality Standards, and Ventilation.

26.C.01 Air monitoring requirements.

a. Air monitoring devices shall be inspected, calibrated, maintained, and used in accordance with the manufacturer's instructions. Back-up monitoring devices shall be maintained in calibrated and working condition at the worksite. > See Section 6.

b. When air monitoring is required "as often as necessary", the CP shall determine which substances to monitor and how frequently to monitor. Such determination shall be based on:

(1) The location of the job site and proximity to fuel tanks, sewers, gas lines, old landfills, coal deposits, and swamps;

(2) The geology of the job site, particularly the soil types and their permeability;

(3) Any history of air contaminants in nearby job sites or any changes in air quality monitored during a previous shift; and

(4) Work practices and job site conditions (use of diesel engines, explosives, or fuel gas, ventilation characteristics, visible atmospheric conditions, decompression of the atmosphere, welding, cutting, or hot work, etc.).

c. A record (including location, date, time, substance, monitoring results, and name of person conducting the test) of all air quality tests shall be maintained at the job site.

d. The atmosphere in all underground work areas shall be tested as often as necessary to assure that the atmosphere at normal atmospheric pressure contains at least 19.5% oxygen and no more than 22% oxygen.

e. The atmosphere in all underground work areas shall be tested quantitatively for CO, nitrogen dioxide, hydrogen sulfide, and other toxic gases, dusts, vapors, mists, and fumes as often as necessary to ensure that the PEL are not exceeded.

f. The atmosphere in all underground work areas shall be tested quantitatively for methane and other flammable gases as often as necessary to determine whether action is to be taken under 26.C.02.f-h and to determine whether an operation is to be classified gassy or potentially gassy under 26.B.01.

g. The atmosphere in all underground work areas shall be tested as often as necessary to ensure that the ventilation requirements of Section 26.C.03-05 are met.

h. If diesel-engine or gasoline-engine driven ventilating fans or compressors are used, an initial test shall be made of the inlet air of the fan or compressor, with the engine operating, to ensure that the air supply is not contaminated by engine exhaust.

i. When rapid excavation machines are used, a continuous flammable gas monitor shall be operated at the face with the sensor(s) placed as high and close to the front of the machine's cutter head as possible.

j. Operations that meet the criteria for potentially gassy or gassy operations shall be subjected to the following monitoring:

(1) Tests for oxygen content shall be conducted in all affected work areas and work areas immediately adjacent to such areas at least at the beginning and midpoint of each shift;

(2) When using rapid excavation machines, continuous automatic flammable gas monitoring equipment shall be used to monitor the air at the heading, on the rib, and in the return air duct. The continuous monitor shall signal the heading and shut down electric power in the affected underground work area, except for acceptable pumping and ventilation equipment, when 20% or more of the LEL for methane or other flammable gases is encountered.

(3) A manual flammable gas monitor shall be used as needed, but at least at the beginning and midpoint of each shift, to ensure that the limits prescribed in 26.B 01 and 26.C.01.d and f are not exceeded. In addition, a manual electrical shut down control shall be provided near the heading.

(4) Local gas tests shall be made prior to and continuously during any welding, cutting, or other hot work.

(5) In underground operations driven by drill-and-blast methods, the air in the affected area shall be tested for flammable gas prior to re-entry after blasting and continuously when employees are working underground.

26.C.02 Air quality standards.

a. Whenever air monitoring indicates the presence of 5 ppm or more of hydrogen sulfide, a test shall be conducted in the affected underground work areas, at least at the beginning and midpoint of each shift, until the concentration of hydrogen sulfide has been less than 5 ppm for 3 consecutive days.

b. Whenever hydrogen sulfide is detected in an amount exceeding 10 ppm, a continuous sampling and indicating hydrogen sulfide monitor shall be used to monitor the affected work areas.

c. Employees shall be informed when a concentration of 10 ppm hydrogen sulfide is exceeded.

d. The continuous sampling and indicating hydrogen sulfide monitor shall be designed, installed, and maintained to provide a visual and aural alarm when the hydrogen sulfide concentration reaches 10 ppm to signal that additional measures might be necessary to maintain hydrogen sulfide exposure below the PEL.

e. When the competent person determines, on the basis of air monitoring results or other information, that air contaminants may be present in sufficient quantities to be dangerous to life, the employer shall:

(1) Prominently post a notice at all entrances to the underground area to inform all entrants of the hazardous condition, and

(2) Ensure that the necessary precautions are taken.

f. Whenever 5% or more of the LEL for methane or other flammable gases is detected in any underground work area or in the air return, steps shall be taken to increase ventilation air volume or otherwise control the gas concentration, unless operations are conducted in accordance with the potentially gassy or gassy operation requirements: such additional ventilation controls may be discontinued when gas concentrations are reduced below 5% of the LEL.

g. Whenever 10% or more of the LEL for methane or other flammable gases is detected in the vicinity of welding, cutting, or other hot work, such work shall be suspended until the concentration of such flammable gas is reduced to less than 10% of the LEL.

h. Whenever 20% or more of the LEL for methane or other flammable gases is detected in any underground work area or in the return:

(1) All employees, except those necessary to eliminate the hazard, shall be immediately withdrawn to a safe location above ground; and

(2) Electrical power, except for acceptable pumping and ventilation equipment, shall be cut off to the area endangered by the flammable gas until the concentration of such gas is reduced to less than 20% of the LEL.

i. When ventilation has been reduced to the extent that hazardous levels of methane or other flammable gas may have accumulated, all affected areas shall be tested after ventilation has been restored and before any power, other than for acceptable equipment, is restored or work is resumed and shall determine whether the atmosphere is within flammable limits.

j. Whenever the ventilation system has been shut down with all employees out of the underground area, only competent persons authorized to test for air contaminants shall be allowed underground until the ventilation has been restored and all affected areas have been tested for air contaminants and declared safe.

26.C.03 Ventilation.

a. Fresh air shall be supplied to all underground work areas in sufficient quantities to prevent dangerous accumulation of dusts, fumes, mists, gases, or vapors.

b. Mechanical ventilation shall be provided in all underground work areas except where it is demonstrated that natural ventilation provides the necessary air quality through sufficient air volume and airflow.

(1) Ventilation and exhaust systems for tunnel excavation shall be of sufficient capacity to maintain an adequate supply of uncontaminated air at all points in the tunnel.

(2) The supply of fresh air shall not be less than 200 CFM (94.4 L/s) each employee underground plus that necessary to operate the equipment.

(3) The linear velocity of air flow in all underground work areas shall be at least 30 ft/min (0.15 m/s) where blasting or rock drilling is conducted or where there are other conditions likely to produce dusts, fumes, vapors, or gases in harmful quantities.

(4) The direction of mechanical airflow shall be reversible.

(5) Ventilation doors shall be designed and installed so that they remain closed when in use, regardless of the direction of airflow.

c. Following blasting, ventilation systems shall exhaust smoke and fumes to the outside atmosphere before work is resumed in affected areas.

d. Potentially gassy or gassy operations shall have ventilation systems installed which are constructed of fire-resistant materials and have acceptable electrical systems, including fan motors.

e. Gassy operations shall be conducted with controls for reversing the airflow of ventilation systems located above ground.

f. In potentially gassy or gassy operations, wherever mine-type ventilation systems using an offset main fan installed on the surface are used, they shall be equipped with explosion-doors or a weak-wall having an area at least equivalent to the cross sectional area of the airway.

g. Air that has passed through underground oil or fuel-storage areas shall not be used to ventilate work areas.

26.C.04 When drilling rock or concrete, appropriate dust control measures shall be taken to maintain dust levels within safe limits.

26.C.05 Internal combustion engines, except diesel-powered engines on mobile equipment, are prohibited underground.

26.C.06 Mobile diesel-powered equipment used underground in atmospheres other than gassy operations shall be either approved by MSHA (30 CFR 36), or shall be demonstrated to be fully equivalent to such MSHA-approved equipment, and shall be operated in accordance 30 CFR 36.

26.D Fire Prevention and Protection.

26.D.01 Fire Prevention and Protection Plans.

a. For every underground construction project, a Fire Prevention and Protection Plan shall be developed and implemented. The plan shall detail:

(1) The specific work practices to be implemented for preventing fires;

(2) Response measures to be taken in case of fire to control and extinguish the fire;

(3) Equipment required;

(4) Personnel requirements and responsibilities; and

(5) Requirements for daily and weekly fire prevention and protection inspections.

b. Fire prevention and protection plans shall be incorporated in either the APP or the AHA and posted at the job site.

c. Fire prevention and protection plans shall be reviewed with all affected personnel as often as is necessary for them to maintain a working knowledge of emergency responsibilities and procedures.

d. Plans shall be drilled as often as is necessary to ensure their efficacy.

26.D.02 Fire extinguishers.

a. Fire extinguishers shall be provided and maintained in accordance with the requirements of Section 9.

b. Fire extinguishers (or equivalent protection) shall be provided and maintained at each portal and shaft entry, within 100 ft (30.4 m) of the advancing face of each tunnel, and at locations containing combustible materials.

c. A fire extinguisher of at least 4A:40B:C rating or other equivalent extinguishing means shall be provided at the head pulley and tail pulley of underground belt conveyors.

26.D.03 Open flames/fires and smoking.

a. Open flames and fires are prohibited in all underground construction operations except as permitted for welding, cutting, and other hot work operations.

b. Smoking may be allowed only in areas free of fire and explosion hazards.

c. Readily visible signs prohibiting smoking and open flames shall be posted in areas having fire or explosion hazards.

26.D.04 Heating devices used in tunnels shall be approved for such locations by a nationally-recognized testing laboratory.

26.D.05 Gasoline shall not be taken, stored, or used underground.

26.D.06 Acetylene, LP-Gas, and methyl acetylene propadiene stabilized gas may be used underground only for welding, cutting, and other hot work. No more than the amount necessary for work during the next 24-hour period shall be permitted underground.

26.D.07 Only fire-resistant hydraulic fluids approved by a nationally-recognized authority or agency shall be used in hydraulically actuated underground machinery and equipment unless the machinery or equipment is protected by a fire suppression system or a multi-purpose fire extinguisher rated for sufficient capacity for the type and size of hydraulic equipment involved (but at least 4A:40B:C).

26.D.08 Storage of flammable and combustible materials.

a. Not more than a 1-day supply of diesel fuel may be stored underground.

b. Oil, grease, and diesel fuel stored underground shall be kept in tightly sealed containers in fire-resistant areas at least 300 ft (91.4 m) from underground explosive magazines and at least 100 ft (30.4 m) from shaft stations and steeply inclined passageways.

c. Flammable or combustible materials shall not be stored above ground within 100 ft (30.4 m) of any access opening to any underground operation unless they are located as far as practical from the opening and either a fire-resistant barrier of not less than a 1-hour rating is placed between the stored material and the opening.

d. Electrical installations in underground areas where oil, grease, or diesel fuel are stored shall be used only for lighting fixtures.

e. Lighting fixtures in storage areas or within 25 ft (7.6 m) of underground areas where oil, grease, or diesel fuel are stored shall be approved for Class I, Division 2 locations > See Section 11.H.

26.D.09 The piping of diesel fuel from the surface to an underground location is permitted only if:

a. Diesel fuel is contained at the surface in a tank whose maximum capacity is no more than the amount required to supply the equipment serviced by the underground fueling station for a 24-hour period;

b. The surface tank is connected to the underground fueling station by an acceptable pipe or hose system controlled at the surface by a valve, and at the shaft bottom by a hose nozzle (nozzle shall not be of the latch-open type);

c. The pipe is empty at all times except when transferring diesel fuel from the surface tank to a piece of equipment in use underground; and

d. Hoisting operations in the shaft are suspended during refueling operations if the supply piping in the shaft is not protected from damage.

26.D.10 Any structure located underground or within 100 ft (30.4 m) of an opening to the underground shall be constructed of material having a fire-resistance rating of at least 1 hour.

26.D.11 Oil-filled transformers shall not be used underground unless they are located in a fire-resistant enclosure and surrounded by a dike to contain the contents of the transformers in event of a rupture.

26.D.12 Noncombustible barriers shall be installed below welding or burning operations in or over shaft or raise.

26.E Drilling.

26.E.01 Drilling machines. > See also Section 18.

a. Employees shall not be allowed on a drill mast while the drill bit is in operation or the drill machine is being moved.

b. When drill machines are being moved from one drilling area to another, drill steel, tools, and other equipment shall be secured and the mast placed in a safe position.

c. Drills on columns shall be anchored firmly before drilling is started and shall be retightened frequently.

d. Accessible areas within the swing radius of the rear of the equipment's rotating superstructure, either permanently or temporarily mounted, shall be barricaded to prevent an employee from being struck or crushed by the crane and hoisting equipment.

e. Jumbos.

(1) Safe access shall be provided to all working levels of drill jumbos.

(2) Jumbo decks and stair treads shall be designed to be slip-resistant and secured to prevent accidental displacement.

(3) Only employees assisting the operator shall be allowed to ride on jumbos, unless the jumbo meets the requirements for adequate seating arrangements that protect passengers from being struck, crushed, or caught between equipment or surfaces, and has safe access.

(4) Employees working under jumbo decks shall be warned whenever drilling is about to begin.

(5) On jumbo decks over 10 ft (3 m) in height, guardrails, which are removable, or equal protection shall be provided on all open sides, excluding access openings of platforms, unless an adjacent surface provides equivalent fall protection.

(6) Stair access to jumbo decks wide enough to accommodate two persons if the deck is over 10 ft (3 m) in height.

(7) Receptacles or racks shall be provided for drill steel stored on jumbos.

(8) The employer shall provide mechanical means for lifting drills, roof bolts, mine straps, and other material to the top decks of jumbos over 10 ft (3 m) in height.

26.E.02 Scaling bars shall be available at scaling operations and shall be maintained in good conditions at all times. Blunted or severely worn bars shall not be used.

26.E.03 Blasting holes shall not be drilled through blasted rock (muck) or water.

26.E.04 Before commencing the drill cycle after a blast, the face and any remaining blasting holes shall be examined for misfires that, if found, shall be removed.

26.E.05 Employees in a shaft shall be protected either by location or by suitable barriers if powered mechanical loading equipment is used to remove muck containing unfired explosives.

26.F Shafts.

26.F.01 All wells or shafts over 5 ft (1.5 m) in depth that employees must enter shall be supported by lagging, piling, or casing of sufficient strength to withstand shifting of the surrounding earth.

a. The full depth of the shaft shall be supported by casing or bracing except where the shaft penetrates into solid rock having characteristics that will not change because of exposure <u>as determined by a CP or a Qualified Geotechnical Engineer</u>.

(1) Where the shaft passes through earth into solid rock or through solid rock into earth and where there is potential for shear, the casing or bracing shall extend at least 5 ft (1.5 m) into the solid rock.

(2) When the shaft terminates in solid rock, the casing of bracing shall extend to the end of the shaft or 5 ft (1.5 m) into the solid rock, whichever is less.

b. The casing or bracing shall extend 42 in +/- 3 in (106.6 cm +/- 7.6 cm) above ground level, except that the minimum casing height may be reduced to 12 in (30.4 cm) provided that a standard railing is installed, that the ground adjacent to the top of the shaft is sloping away from the shaft collar to prevent entry of liquids, and that effective barriers are used to prevent mobile equipment operating near the shaft from jumping over the 12 in (30.4 cm) barrier.

26.F.02 After blasting operations in shafts, a competent person shall inspect the walls, ladders, timbers, blocking, and wedges to determine if they have loosened. Where found unsafe, corrections shall be made before shift operations are started.

26.F.03 No employee shall be permitted to enter an unsupported auger-type excavation in unstable material for any purpose. In such cases, necessary clean-out shall be accomplished without entry.

26.F.04 There shall be two safe means of access in shafts at all times: this may include the ladder and hoist.

26.G Hoisting. Hoistways may be used to hoist materials or personnel, but not both simultaneously.

26.G.01 A warning light suitably located to warn employees at the shaft bottom and subsurface shaft entrances shall flash whenever a load is being moved in the shaft, except in fully enclosed hoistways.

26.G.02 Whenever a hoistway is not fully enclosed and employees are at the shaft bottom, conveyances or equipment shall be stopped at least 15 ft (4.5 m) above the bottom of the shaft and held there until the signalman at the bottom of the shaft directs the operator to continue lowering the load; except that the load may be lowered without stopping if the load or conveyance is within full view of a bottom signalman who is in constant voice communication with the operator.

26.G.03 Before maintenance, repairs, or other work is commenced in a shaft served by a cage, skip, or bucket, the operator and other employees shall be informed and given suitable safety precautions. A sign warning that work is being performed in the shaft shall be installed at the shaft collar, at the operator's station, and at each underground landing.

26.G.04 Any connection between the hoisting rope and the cage or skip shall be compatible with the type of wire rope used for hoisting.

26.G.05 Spin-type connections, where used, shall be maintained in a clean condition and protected from foreign matter that could affect their operation.

26.G.06 Cage, skip, and load connections to the hoist rope shall be made so that the force of the hoist pull, vibration, misalignment, release of lift force, or impact will not disengage the connection. Moused or latched open-throat hooks do not meet this requirement.

26.G.07 When using wire rope wedge sockets, means shall be provided to prevent wedge escapement and to ensure that the wedge is properly seated.

26.H Caissons.

26.H.01 In caisson work in which compressed air is used and the working chamber is less than 11 ft (3.3 m) in length, whenever such caissons are at any time suspended or hung while work is in progress so that the bottom of the excavation is more than 9 ft (2.7 m) below the deck of the working chamber, a shield shall be erected for the protection of the workers.

26.H.02 Shafts shall be subjected to a hydrostatic test, at which pressure they shall be tight. The shaft shall be stamped on the outside shell about 12 in (30.4 cm) from each flange to show the safe working pressure.

26.H.03 Whenever a shaft is used, it shall be provided, where space permits, with a safe, proper, and suitable staircase for its entire length, including landing platforms (not more than 20 ft (6 m) apart). Where this is impractical, ladders not more than 20 ft (6 m) high shall be installed with each section offset from adjacent sections and a guarded landing provided at each offset.

26.H.04 All caissons having a diameter or side greater than 10 ft (3 m) shall be provided with a man lock and shaft for the exclusive use of employees.

26.H.05 In addition to gauges in the locks, an accurate gauge shall be maintained on the outer and inner side of each bulkhead. These gauges shall be accessible at all times and kept in accurate working order.

26.H.06 In caisson operations where employees are exposed to compressed air working environments, the requirements of Section 26.I shall be complied with.

26.I Compressed Air Work.

26.I.01 All safety requirements for compressed air work will be carefully detailed in a Compressed Air Work Plan that shall be included as a part of the Accident Prevention Plan or AHA.

26.I.02 The Compressed Air Work Plan shall include the following considerations:

a. Requirements for a medical lock and its operation;

b. An identification system for compressed air workers;

c. Communications system requirements;

d. Requirements for signs and recordkeeping;

e. Special compression and decompression requirements;

f. Man lock and decompression chamber requirements;

g. Requirements for compressor systems and air supply;

h. Ventilation requirements;

i. Electrical power requirements;

j. Sanitation considerations;

k. Fire prevention and fire protection considerations, and

l. Requirements for bulkheads and safety screens.

26.I.03 Work in compressed air environments shall be performed in compliance with the requirements of 29 CFR 1926.803.

26.J Underground Blasting. A Blasting Plan must be developed and submitted for this work. > See also Section 29.

26.J.01 Explosives.

a. Dynamite used in tunnel blasting shall be Fume Class 1. Fume Class 2 and Fume Class 3 explosives may be used if adequate ventilation is provided.

b. Storage of explosives, blasting agents, and detonators in tunnels or underground work areas shall be prohibited.

c. Trucks used for the transportation of explosives underground shall have the electrical system checked weekly to detect any failures that may constitute an electrical hazard. A written record of such inspections shall be kept on file and available for review. The installation of auxiliary lights on truck beds that are powered by the truck's electrical system shall be prohibited.

d. Explosives or blasting agents, not in original containers, shall be placed in a suitable container when transported manually. Detonators, primers, and other explosives shall be carried in separate containers when transported manually.

26.J.02 Blasting circuits.

a. All underground blasts fired by external power shall be by a power blasting switch system.

b. Blasting power circuits shall be separate and distinct from, and kept clear of, other power and lighting circuits and pipes, rails, and other conductive material (excluding earth) to prevent explosives initiation or employee exposure to electric current.

c. Sectioning switches or equivalent shall be installed in the firing line at 500-ft (150.4-m) intervals.

26.J.03 Loading.

a. Prior to loading, all power, water, and air lines shall be disconnected from the loading jumbo and power lines, including lighting circuits, shall be moved back a minimum of 50 ft (15.2 m).

b. The loading area shall be illuminated a minimum 10 ft-candles (107.6 lx) by floodlights located 50 ft (15.2 m) from the face. If additional illumination is needed, the loading crew shall be provided with head lamps approved by the United States Bureau of Mines.

c. Equipment used for pneumatic placement of non-cap-sensitive blasting agents shall be designed for that purpose and shall be grounded while in use.

26.J.04 Blasting.

a. The person in charge of blasting shall be the last to leave the blast area, shall see that no one remains in the blast area, and shall operate the sectioning switches in the firing line while proceeding out of the blast area.

b. No persons shall enter the tunnel blast area until the ventilation system has cleared the heading of harmful gases, smoke, and dust.

c. After each blast, the underground supports in the blast area shall be inspected and secured as necessary work is resumed. Rock surfaces shall be inspected, scaled, and if required, provided with shoring, bracing, rock bolts, shotcrete, or chain-link fabric, before mucking is started. Rock bolts within 100 ft (30.4 m) of a blast shall be tested after each blast before drilling for the next round begins.

d. The muck pile shall be wet down prior to mucking and kept wet during mucking operations.

26.J.05 Blasting in excavation work under compressed air.

a. When detonators or explosives are brought into an air lock, no employee (except the blaster, lock tender, and employees necessary for transport) shall be permitted to enter the air lock; no other material, supplies, or equipment shall be locked through with the explosive materials.

b. Detonators and explosives shall be taken separately into pressure working chambers.

c. All metal pipes, rails, air locks, and steel tunnel lining shall be electrically bonded and grounded at or near the portal or shaft. Such pipes and rails shall be cross-bonded at not less than 1000-ft (304.8-m) intervals throughout the length of the tunnel. In addition, each low air supply pipe shall be grounded at its delivery end.

d. The explosive suitable for use in wet holes shall be water resistant and shall be Fume Class 1.

e. When tunnel excavation in rock face is approaching mixed face, and when tunnel excavation is in mixed face, blasting shall be performed with less explosive per drilled hole and with less dimension in hole spacing and to the free face. Advance drilling shall be performed as tunnel excavation in rock face approaches mixed face to determine the nature and extent of rock cover and the remaining distance ahead to soft ground.

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SECTION 27

Concrete, Masonry, Roofing and Residential Construction

27.A General. The fall protection threshold height requirement is 6 ft (1.8 m) for ALL work covered by this Section, unless specified differently below, whether performed by Government or Contractor work forces, to include residential (wood) construction and scaffolding work. > See Section 21.

27.A.01 Construction loads shall not be placed on a structure or portion of a structure unless the employer determines, based on information from a person who is qualified in structural design, that the structure or portion of the structure is capable of supporting the loads.

27.A.02 Employees shall not be permitted to work above or in positions exposed to protruding reinforcing steel, fasteners, or other impalement hazards unless provisions have been made to control the hazard.

27.A.03 Working under loads.

a. No employee shall be permitted to work under concrete buckets, bundled material loads, or other suspended loads.

b. Elevated concrete buckets and loads shall be routed, to the extent practical, to minimize the exposure of workers to hazards associated with falling loads or materials from the loads. Vibrator crews shall be kept out from under concrete buckets suspended from cranes of cableways.

c. Riding on concrete buckets or other suspended loads shall be prohibited.

27.A.04 Based on hazard evaluations conducted by supervisors, employers shall identify and select, and each affected employee shall use, personal protective equipment (PPE) and safety equipment that will provide appropriate protection for the work being performed. All PPE (i.e., for eyes, face, head and extremities, protective clothing, respiratory devices and protective shields and barriers) shall be provided, used, and maintained in a sanitary and reliable condition whenever the hazard dictates. > See 29 CFR 1910.132.

27.B Concrete.

27.B.01 Equipment.

a. Bulk storage bins, containers, or silos shall have conical or tapered bottoms with mechanical or pneumatic means of starting the flow of material.

b. Concrete mixers equipped with 1 yd^3 (0.8 m^3) or larger loading skip shall be equipped with a mechanical device to clear the skip of material and shall have guardrails installed on each side of the skip.

c. Handles on bull floats used where they may contact energized electrical conductors shall be constructed of nonconductive material or insulated with a nonconductive sheath whose electrical and mechanical characteristics provide equivalent protection.

d. Powered and rotating concrete troweling machines that are manually guided shall be equipped with a control switch that will automatically shut off the power whenever the operator removes his/her hands from the equipment handles.

e. Concrete pumping systems using discharge pipes shall be provided with pipe supports designed for 100% overload.

f. Handles of concrete buggies shall not extend beyond the wheels on either side of the buggy.

g. Concrete buckets equipped with hydraulic or pneumatically operated gates shall have positive safety latches or similar safety devices installed to prevent premature or accidental dumping. The buckets shall be designed to prevent material from accumulating on the top and sides of the bucket.

h. Sections of tremies and similar concrete conveyances shall be secured with wire rope (or equivalent material) in addition to the regular couplings or connections.

27.B.02 Structural and reinforcing steel for walls, piers, columns, and similar vertical structures shall be supported and/or guyed to prevent overturning or collapse. Support systems for reinforcing steel that are independent of other form or shoring support systems shall be designed by a Registered Professional Engineer (RPE).

a. Connections of equipment used in plumbing-up shall be secured.

b. The turnbuckles shall be secured to prevent unwinding while under stress.

c. Plumbing-up guys and related equipment shall be placed so that employees can get at the connection points.

d. Plumbing-up guys shall be removed only under the supervision of a Competent Person (CP).

e. Measures shall be taken to prevent unrolled wire mesh from recoiling.

27.B.03 Post-tensioning operations.

a. No employee (except those essential to the post-tensioning operations) shall be permitted to be behind jacks or end anchorages during post-tensioning operations.

b. Signs and barriers shall be erected to limit employee access to the post-tensioning area during tensioning operations.

27.C Formwork and Shoring.

27.C.01 Formwork, shoring, and bracing shall be designed, fabricated, erected, supported, braced, and maintained so that it will safely support all vertical and lateral loads that might be applied until such loads can be supported by the structure.

27.C.02 Planning and design.

a. The planning and design of formwork and shoring shall be in accordance with provisions of American Concrete Institute (ACI) Publication 347.

b. The design of the shoring shall be prepared by a QP (designer) and the Erection and Removal Plan for Formwork and Shoring shall be submitted for review to the GDA. The erected shoring shall be inspected by an engineer qualified in structural design.

c. The manufacturer's specifications for fabricated shoring systems shall be available at the job site during job planning and execution.

27.C.03 Base support.

a. Supporting ground or completed construction upon which formwork and shoring is to be placed shall be of adequate strength to carry the vertical and lateral loads to be imposed.

b. Sills for shoring shall be sound, rigid, and capable of carrying the maximum intended load.

c. Base plates, shore heads, extension devices, or adjustment screws shall be in firm contact with the footing sill and form material and when necessary, shall be secured to them.

27.C.04 Splices shall be designed and constructed to prevent buckling and bending.

27.C.05 Diagonal bracing shall be provided in vertical and horizontal planes to provide stiffness and to prevent buckling of individual members.

27.C.06 Inspection.

a. Shoring equipment shall be inspected prior to erection to determine that it is as specified in the shoring design. Any equipment found to be damaged shall not be used.

b. Erected shoring equipment shall be inspected immediately prior to, during, and immediately after the placement of concrete. Any shoring equipment that is found to be damaged, displaced, or weakened shall be immediately reinforced or re-shored.

27.C.07 Re-shoring shall be provided to safely support slabs and beams after stripping or where such members are subjected to superimposed loads due to construction.

27.C.08 Fabricated shoring shall not be loaded beyond the safe working load recommended by the manufacturer.

27.C.09 Single post shores.

a. Wherever single post shores are used in more than one tier, the layout shall be designed and inspected by an RPE qualified in structural design.

b. Single post shores shall be vertically aligned and spliced to prevent misalignment.

c. When shoring is at an angle, sloping, or when the surface shored is sloping, the shoring shall be designed for such loading.

d. Adjustment of single post shores to raise formwork shall not be made after concrete is in place.

e. Fabricated single post shores and adjusting devices shall not be used if heavily rusted, bent, dented, re-welded, or have broken welds or other defects; if they contain timber, they shall not be used if timber is split, cut, has sections removed, is rotted, or otherwise structurally damaged.

f. All timber and adjusting devices to be used for adjustable timber single post shores shall be inspected before erection.

g. All nails used to secure bracing or adjustable timber single post shores shall be driven home and the point of the nail bent over if possible.

h. For stability, single post shores shall be horizontally braced in both the longitudinal and transverse directions.

(1) Single-post shores shall be adequately braced in two mutually perpendicular directions at the splice level.

(2) Each tier shall also be diagonally braced in the same two directions.

(3) Bracing shall be installed as the shores are erected.

(4) Each post (near the slab perimeter) shall be secured during assembly and dismantling/re-shoring to prevent the post from “fall out”.

27.C.10 Tube and coupler shoring.

a. The material used for the couplers shall be of a structural type such as drop-forged steel, malleable iron, or structural grade aluminum. Gray cast iron shall not be used. No dissimilar metals shall be used together.

b. Couplers shall not be used if they are deformed, broken, or have defective or missing threads on bolts, or other defects.

c. When checking the erected shoring towers with the shoring design, the spacing between posts shall not exceed that shown on the layout and all interlocking of tubular members and tightness of couplings shall be checked.

27.C.11 Tubular welded-frame shoring.

a. All locking devices on frames and braces shall be in good working order, coupling pins shall align the frame or panel legs, pivoted cross braces shall have their center pivot in place, and all components shall be in a condition similar to that of original manufacture.

b. When checking the erected shoring frames with the shoring design, the spacing between towers and cross brace spacing shall not exceed that shown in the design and all locking devices shall be closed.

c. Devices for attaching external lateral stability bracing shall be fastened to the legs of the shoring frames.

27.C.12 Vertical slip forms.

a. Vertical slip forms shall be planned and designed by an RPE.

b. The steel rods or pipe on which the jacks climb or by which the forms are lifted shall be designed specifically for that purpose. Such rods shall be braced where not encased in concrete.

c. Jacks and vertical supports shall be positioned in such a manner that the vertical loads are distributed equally and do not exceed the capacity of the jacks.

d. The jacks or other lifting devices shall be provided with mechanical dogs or other automatic holding devices to provide protection in case of failure of the power supply or the lifting mechanism.

e. Lifting shall proceed steadily and uniformly and shall not exceed the predetermined safe rate of lift.

f. Lateral and diagonal bracing of the forms shall be provided to prevent excessive distortion of the structure during the jacking operation.

g. During jacking operations, the form structure shall be maintained in line and plumb.

h. All vertical lift forms shall be provided with scaffolding or work platforms completely encircling the area of placement.

27.C.13 Removal of formwork.

a. Forms and shores (except those on slab or grade and slip forms) shall not be removed until the individual responsible for forming and/or shoring determines that the concrete has gained sufficient strength to support its weight and all superimposed loads. Such determination shall be based on one of the following:

(1) Satisfaction of conditions stipulated in the plans and specifications for removal of forms and shores, or

(2) Concrete testing (in accordance with ASTM standard test methods) indicates that the concrete has achieved sufficient strength to support its weight and superimposed loads.

b. Re-shoring shall not be removed until the concrete being supported has attained adequate strength to support its weight and all loads placed on it.

27.D Precast Concrete Operations.

27.D.01 Precast Concrete operations shall be planned and designed by a RPE. Precast Concrete Plans and designs shall include detailed instructions and sketches indicating the prescribed method of erection and shall be submitted to the GDA for review.

27.D.02 Precast concrete members shall be adequately supported to prevent overturning or collapse until permanent connections are complete.

27.D.03 Lifting inserts and hardware.

a. Lifting inserts which are embedded or otherwise attached to tilt-up precast concrete members shall be capable of supporting at least two times the maximum intended load applied or transmitted to them.

b. Lifting inserts which are embedded or otherwise attached to precast concrete members, other than tilt-up members, shall be capable of supporting at least four times the maximum intended load applied or transmitted to them.

c. Lifting hardware shall be capable of supporting at least five times the maximum intended load applied or transmitted to the lifting device.

27.D.04 No employee shall be permitted under precast concrete members being lifted or tilted into position except employees required for the erection of those members.

27.E Lift-Slab Operations.

27.E.01 Lift-slab operations shall be planned and designed by an RPE. Lift-Slab Plans and designs shall include detailed instructions and sketches indicating the prescribed method of erection and shall be submitted to the GDA for review.

27.E.02 Jacking equipment.

a. The manufacturer's rated capacity shall be legibly marked on all jacks and shall not be exceeded.

b. All jacking equipment such as threaded rods, lifting attachments, lifting nuts, columns and other members that transmit loads to the jacks shall be capable of supporting at least two and one-half times the load being lifted.

c. Jacks shall be designed and installed so that they will not continue to lift when overloaded.

d. All jacks shall have a positive stop to prevent over-travel.

e. Hydraulic jacks used in lift-slab construction shall have a safety device that will cause the jacks to support the load in any position if the jack malfunctions.

27.E.03 Jacking operations.

a. When it is necessary to provide a firm foundation, the base of the jack shall be blocked or cribbed. Where there is a possibility of slippage of the metal cap of the jack, a wood block shall be placed between the cap and the load.

b. The maximum number of manually-controlled jacks on one slab shall be limited to 14, and in no event shall the number be too great to permit the operator to maintain the slab level within specific tolerances.

c. Jacking operations shall be synchronized to ensure even and uniform lifting of the slab.

d. During lifting, all points of the slab support shall be kept within ½ in (1.2 cm) of that needed to maintain the slab in a level position.

(1) If leveling is automatically controlled, a device shall be installed which will stop the operation when the ½ in (1.2 cm) leveling tolerance is exceeded.

(2) If leveling is manually controlled, such controls shall be located in a central location and attended by a trained operator while lifting is in progress.

e. No one shall be permitted under the slab during jacking operations.

27.F Masonry Construction. > See also Standard Practice for Bracing Masonry Walls under Construction, by the Council for Masonry Wall Bracing.

27 F.01 Prior to the beginning of the erection of any structural masonry, a Masonry Bracing Plan shall be submitted to the GDA for review and acceptance. The plan will include the identification of the site and project and will be signed and dated by the Qualified Person(QP) responsible for its preparation and modifications. The plan shall include the following information, as applicable to the particular project:

a. The sequence of erection activity, developed in coordination with the controlling contractor that includes the following:

(1) Material deliveries;

(2) Material staging and storage; and

(3) Coordination with other trades and construction activities.

b. A description of the bracing selection and placement procedures, including the following:

(1) Site preparation;

(2) Restricted Zone perimeters;

(3) Supportive calculations;

(4) Stability considerations requiring temporary bracing;

(5) Terminus point; and

(6) Connections.

c. Activity Hazard Analysis (AHA) in accordance with Section 1 of this manual;

d. A list of the QPs and CPs; and

e. A description of the procedures that will be utilized in the event of rescue or emergency response.

27.F.02 A restricted zone shall be established whenever a masonry wall is being constructed. The restricted zone is created to keep masons and other tradesmen away from a wall under construction when winds exceed critical velocities until the wall is completely tied into the rest of the structure. The restricted zone shall:

a. Be established prior to the start of construction on the wall;

b. Be equal to the height of the wall being constructed plus 4 ft (1.2 m), and shall run the entire length of the wall;

c. Be established on the side of the wall that will be not be scaffolded;

d. Be restricted to entry only by employees actively engaged in constructing the wall; no other employees shall be permitted to enter the zone;

e. Be evacuated during the initial period of construction when wind speeds exceed 20 mph;

f. Be evacuated during the intermediate period of construction when wind speeds exceed 35 mph;

g. Remain in place until the wall is adequately supported to prevent overturning and to prevent collapse unless the height of the wall is over 8 ft (2.4 m), in which case the restricted zone shall remain in place until the requirements of this Section 27.F.02 have been met.

h. For multi-story structures, the restricted zone shall be determined by a QP.

27.F.03 All masonry walls over 8 ft (2.4 m) in height shall be adequately braced to prevent overturning and to prevent collapse unless the wall is adequately supported so that it will not overturn or collapse. The bracing shall remain in place until permanent supporting elements of the structure are in place.

27.F.04 Each employer having workers in the restricted zone shall monitor the wind speed continuously while the work is in progress and evacuate employees as required above.

a. Wind speeds shall be 3-second gust speeds.

b. Instrument methods shall accurately measure wind speed to +/- 2 mph and instruments shall be properly maintained.

27.F.05 The CP shall inspect unsupported masonry walls, including the wall bracing system, for visible defects at the beginning of each shift and after any occurrence that could affect the structural integrity of the wall or wall bracing system.

27.F.06 Any damaged or weakened brace element shall be repaired or replaced before work is permitted in the restricted zone in the vicinity of the damaged brace or weakened brace element. A CP shall supervise the repairs.

27.F.07 A structural engineer, familiar with the work being performed, shall design the repairs to the wall. Repairs shall not be performed without the approval of the project structural designer of record.

27.F.08 Scaffolds for masonry construction workers shall not be used to provide temporary lateral support of masonry walls.

27.F.09 Cleanouts shall be on the side of the masonry wall opposite to the scaffolding.

27.F.10 Fall protection shall be provided to masonry workers exposed to falls of 6 ft (1.8 m) or more. > See Section 21.

27.G Roofing.

27.G.01 Before work begins, a CP for Fall Protection shall complete a daily inspection of each job site. The CP for Fall Protection, designated by management, shall be capable of identifying existing predictable fall hazards and has the authority to take prompt corrective action to eliminate them. Hazards shall be eliminated by engineering methods and if this cannot be accomplished, guarding to isolate the hazard from the exposed employees shall be implemented. In no case shall warnings or instructions be used as a substitute for elimination of hazards by engineering means or guarding.

27.G.02 Prior to the start of work, a structural analysis of the roof shall be conducted by a QP to assure that the load capacity of the roof deck will not be exceeded.

27.G.03 Where the work presents a potential hazard to the public, the Contractor shall set up and maintain barricades with proper postings to alert public to the hazards in accordance with ANSI D6.1. Applicable statutes and local regulations shall be examined and the more restrictive requirements shall be followed.

27.G.04 Work on the roof shall be halted during severe weather such as strong winds, electrical storms, icing conditions, heavy rain, or snow as soon as practical.

27.G.05 The employer shall establish emergency plans and fire prevention plans. All employees shall be trained in accordance with these plans.

27.G.06 Roof openings and holes shall be protected in accordance with Section 24.

27.G.07 In the construction, maintenance, repair, and demolition, of roofs, fall protection systems shall be provided which will prevent personnel from slipping and falling from the roof and prevent personnel on lower levels from being struck by falling objects in accordance with Section 21.

27.G.08 On all roofs greater than 16 ft (4.8 m) in height, a hoisting device, stairways, or progressive platforms shall be furnished for supplying materials and equipment.

27.G.09 Roofing materials and accessories that could be moved by the wind, including metal roofing panels, which are on the roof and unattached, shall be secured when wind speeds are greater than, or are anticipated to exceed, 10 mph (16.1 km/h).

27.G.10 Access to roofs and sections of roofs shall comply with Sections 22 and 24.

27.G.11 Materials may not be stored within 6 ft (1.8 m) of the roof edge unless guardrails are erected at the roof edge. Materials that are to be piled, stacked, or grouped shall be stable and self-supporting.

27.G.12 Proper PPE shall be worn by all personnel working with hot materials during roofing work. > See also 06.D.02.d.

27.H Residential Construction.

27.H.01 All wood used for residential construction shall meet applicable building codes and design criteria. Wood used for temporary work platforms and/ or fall protection must be inspected for compliance with Sections 21 and 22, as structural lumber from the site may not meet the requirements for protective systems.

27.H.02 Hand and power tools shall be equipped and used in accordance with the requirements of Section 13.

27.H.03 Raising Walls.

a. Before manually raising framed walls that are 10 ft (3 m) or more in height, temporary restraints such as cleats on the foundation/floor system or straps on the wall bottom plate shall be installed to prevent inadvertent horizontal sliding or uplift of the framed wall bottom plate.

b. Anchor bolts alone shall not be used for blocking or bracing when raising framed walls 10 ft (3 m) or more in height.

27.H.04 Employees shall not work from or walk on top plates, joists, rafters, trusses, beams or other structural members until they are securely braced and supported.

27.H.05 Truss Support Plate. Where a truss support plate is used during the installation of trusses, it shall be constructed of a 2-in x 6-in (5 cm x 15.2 cm) plank laid flat, secured linearly to a 2-in x 6-in plank laid on edge, supported with 2-in x 4-in (5.4 x 10.2 cm) wood members (legs) spaced no more than 6 ft (1.8 m) on center and attached to diagonal bracing adequately secured to support its intended load. All material dimensions are minimum and nominal.

27.H.06 Trusses installed without a ridge beam or other horizontal structural connection shall be connected temporarily to each other and to a secured end gable by a minimum of one 1-in x 4-in (2.5 cm x 10.2 cm) plank face-nailed to every rafter on each slope of the truss. The number of planks shall be sufficient to protect against wind-related collapse of the truss rows.

27.H.07 During construction, proper work platforms such as scaffolds and decks, in accordance with Section 22 shall be used. Walking on plates, beams, joists, and other members more than 6 ft (1.8 m) above the ground or floor is prohibited unless workers meet the fall protection practices outlined in Section 21.

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SECTION 28

Steel Erection

28.A General. The fall protection threshold height requirement is 6 ft (1.8 m) for ALL work covered by this manual, unless specified differently below, whether performed by Government or Contractor work forces, to include steel erection activities and systems-engineered activities (prefabricated) metal buildings. > See Section 21.

28.A.01 Construction loads shall not be placed on a structure or portion of a structure unless the employer determines, based on information from a person who is qualified in structural design, that the structure or portion of the structure is capable of supporting the loads.

28.A.02 Employees shall not be permitted to work above or in positions exposed to protruding reinforcing steel, fasteners, or other impalement hazards unless provisions have been made to control the hazard.

28.A.03 No employee shall be permitted to work under bundled material loads or other suspended loads. Riggers securing lower loads to multi-lift rigging assemblies and workers setting suspended structural components such as beams, trusses, and precast members are excluded from this requirement. In these cases, work controls should be used to minimize the time spent directly under loads.

28.B Structural Steel Assembly.

28.B.01 Prior to beginning the erection of any structural steel, a Steel Erection Plan shall be submitted to the GDA for review and acceptance. The plan will include the identification of the site and project; and will be signed and dated by the Qualified Person (QP) responsible for its preparation and modification. This plan shall include the following information, as applicable to the particular project.

a. The sequence of erection activity, developed in coordination with the Controlling contractor, that includes the following:

(1) Material deliveries;

(2) Material staging and storage; and

(3) Coordination with other trades and construction activities.

b. A description of the crane and derrick selection and placement procedures, including the following:

(1) Site preparation;

(2) Path for overhead loads; and

(3) Identification of any lifts classified as critical lifts, requiring separate plans.

(4) If load handling equipment (LHE) other than crane or derrick (e.g., All-Terrain Forklifts, Powered Industrial Trucks, etc.) is used, it must be used in accordance with the manufacturer's instructions. If LHE is used with rigging, see also Section 16.

c. A description of steel erection activities and procedures, including the following:

(1) Stability considerations requiring temporary bracing and guying;

(2) Erection bridging terminus point;

(3) Anchor rod (anchor bolt) notifications regarding repair, replacement and modifications;

(4) Columns and beams (including joists and purlins);

(5) Connections;

(6) Decking; and

(7) Ornamental and miscellaneous iron.

d. A description of the fall protection procedures that will be used;

e. A description of the procedures that will be used to comply with this section including;

(1) Activity hazard analysis in accordance with Section 1 of this manual;

(2) A certification for each employee who has received training for performing steel erection operations as required by 29 CFR 1926.761;

(3) A list of the QPs and CPs; and

(4) A description of the procedures that will be utilized in the event of rescue or emergency response.

28.B.02 Steel erection activities include:

a. Hoisting, laying out, placing, connecting, welding, burning, guying, bracing, bolting, plumbing, and rigging structural steel, steel joists and metal buildings;

b. Installing metal decking, miscellaneous metals, ornamental iron, and similar materials; and

c. Moving point-to-point while performing these activities.

28.B.03 Refer to 29 CFR 1926.750 (b)(2) for a list of activities that are covered (but may not normally be considered) and that occur during and are a part of steel erection activities.

28.B.04 Written notifications. Before authorizing the commencement of steel erection, the Controlling contractor shall ensure that the steel erector is provided with the following written notifications:

a. The concrete in the footings, piers, and walls has attained, on the basis of an appropriate ASTM standard test method of field-cured samples, either 75% of the intended minimum compressive design strength or sufficient strength to support the loads imposed during steel erection.

b. Any repairs, replacements, and modifications to the anchor bolts were conducted in accordance with contract specifications and/or project structural engineer of record.

c. A steel erection contractor shall not erect steel unless it has received written notification that the concrete in the footings, piers and walls has attained, on the basis of an appropriate ASTM standard test method of field-cured samples, either 75% of the intended minimum compressive design strength or sufficient strength to support the loads imposed during steel erection.

d. Both steel and concrete contractors will keep a copy of this written notification on-site.

28.B.05 Site layout. The Controlling contractor shall ensure that the following is provided and maintained:

a. Adequate access roads into and through the site for the safe delivery and movement of derricks, cranes, trucks, other necessary equipment, and the material to be erected; and means and methods for pedestrian and vehicular control.

➢ Exception: This requirement does not apply to roads outside of the construction site.

b. An adequately compacted, properly graded, drained area readily accessible to the work with adequate space for the safe storage of materials and the safe operation of the erector's equipment.

c. Pre-planning of overhead hoisting operations. All hoisting operations in steel erection shall be pre-planned.

28.B.06 Load Handling Equipment (LHE) and rigging. All applicable requirements of Sections 15 and 16 apply to this Section.

28.B.07 Inspection of LHE (cranes, hoists, etc). A CP shall visually inspect LHE being used in steel erection activities prior to each shift as per Section 16.D.

28.B.08 Deficiencies. If any deficiency is identified on the LHE, an immediate determination shall be made by the CP as to whether the deficiency constitutes a hazard.

a. If the deficiency constitutes a hazard, the LHE shall be removed from service until the deficiency has been corrected.

b. The operator shall be responsible for the operations under his/her's direct control. Whenever there is any doubt as to safety, the operator shall have the authority to stop and refuse to handle loads until safety has been assured.

28.B.09 A Qualified Rigger shall inspect the rigging prior to each shift.

28.B.10 The headache ball, hook, or load shall not be used to transport personnel.

28.B.11 LHE may be used to hoist employees on a personnel platform when all applicable provisions of Section 16.T have been met.

28.B.12 Safety latches on hooks shall not be deactivated or made inoperable.

28.B.13 Structural steel assembly.

a. Structural stability shall be maintained at all times during the erection process.

b. The following additional requirements shall apply for multi-story structures:

(1) The permanent floors shall be installed as the erection of structural members progresses, and there shall be not more than eight stories between the erection floor and the upper-most permanent floor, except where the structural integrity is maintained as a result of the design.

(2) At no time shall there be more than four floors or 48 ft (14.6 m), whichever is less, of unfinished bolting or welding above the foundation or uppermost permanently secured floor, except where the structural integrity is maintained as a result of the design.

28.B.14 Walking/working surfaces.

a. Shear connectors and other similar devices.

(1) Tripping hazards. Shear connectors (such as headed steel studs, steel bars, or steel lugs), reinforcing bars, deformed anchors or threaded studs shall not be attached to the top flanges of beams, joists, or beam attachments so that they project vertically from or horizontally across the top flange of the member until after the metal decking, or other walking/working surface, has been installed.

(2) Installation of shear connectors on composite floors, roofs, and bridge decks. When shear connectors are used in construction of composite floors, roofs, and bridge decks, employees shall lay out and install the shear connectors after the metal decking has been installed, using the metal decking as a working platform.

b. Bracing.

(1) When deemed necessary by a CP, temporary erection bracing equipment shall be installed in conjunction with the steel erection process to ensure the stability of the structure.

(2) When used, bracing equipment shall be in place and properly installed before the structure is loaded with construction material such as loads of joists, bundles of decking, or bundles of bridging.

(3) Bracing equipment shall be removed only with the approval of a CP.

c. Metal decking - Hoisting, landing, and placing of metal decking bundles.

(1) Bundle packaging and strapping shall not be used for hoisting unless specifically designed for that purpose.

(2) If loose items such as dunnage, flashing, or other materials are placed on the top of metal decking bundles to be hoisted, such items shall be secured to the bundles.

(3) Bundles of metal decking on joists shall be landed in accordance with Section 28.B.26.

(4) Metal decking bundles shall be landed on framing members so that enough support is provided to allow the bundles to be unbanded without dislodging the bundles from the supports.

(5) At the end of the shift or when environmental or jobsite conditions require, metal decking shall be secured against displacement.

(6) Roof and floor holes and openings. Metal decking at roof and floor holes and openings shall be installed as follows:

(a) Framed metal deck openings shall have structural members turned down to allow continuous deck installation except where not allowed by structural design constraints or constructability.

(b) Roof and floor holes and openings shall be decked over or protected in accordance with Section 24.

(c) Metal decking holes and openings shall not be cut until immediately prior to being permanently filled with the equipment or structure needed or intended to fulfill its specific use and that meets the strength requirements of Section 24, or shall be immediately covered or guarded.

28.B.15 Installation of metal decking.

a. Metal decking shall be laid tightly and secured upon placement to prevent accidental movement or displacement. A maximum of 3,000 ft^2 (278.7 m^2) may be laid before securing.

b. During initial placement metal-decking panels shall be placed to ensure full support by structural members.

28.B.16 Derrick floors.

a. A derrick floor shall be fully decked and/or planked and the steel member connections completed to support the intended floor loading.

b. Temporary loads placed on a derrick floor shall be distributed over the underlying support members so as to prevent local overloading of the deck material.

28.B.17 Column anchorage.

a. General requirements for erection stability.

(1) All columns shall be anchored by a minimum of four anchor rods or anchor bolts.

(2) Each column anchor rod or anchor bolt assembly, including the column-to-base plate weld and the column foundation, shall be designed to resist a minimum eccentric gravity load of 300 lbs (136.2 kg) located 18 in (45.7 cm) from the extreme outer face of the column in each direction at the top of the column shaft.

(3) Columns shall be set on level finished floors, pre-grouted leveling plates, leveling nuts, or shim packs. If shim packs are used, they must be used at the direction of a qualified person.

(4) All columns shall be evaluated by a CP to determine whether guying or bracing is needed; if guying or bracing is needed, it shall be installed.

b. Repair, replacement or field modification of anchor rods or anchor bolts.

(1) Anchor rods or anchor bolts shall not be repaired, replaced, or field-modified without the approval of the project structural engineer of record.

(2) Prior to the erection of a column, the Controlling Contractor shall provide written notification to the steel erector if there has been any repair, replacement, or modification of the anchor rods or anchor bolts of that column.

28.B.18 Beams and columns.

a. During the final placing of solid web structural members, the load shall not be released from the hoisting line until the members are secured with at least two bolts per connection (of the same size and strength as shown in the erection drawings) drawn up wrench-tight or the equivalent as specified by the project structural engineer of record, except as specified in Section 28.B.19.

b. A CP shall determine those pieces that require more than two bolts in each end before the piece is released from the crane. Column erection splices shall be completely bolted prior to adding more than two floors.

28.B.19 Diagonal bracing. Solid web structural members used as diagonal bracing shall be secured by at least one bolt per connection drawn up wrench-tight or the equivalent as specified by the project structural engineer of record.

28.B.20 Double connections.

a. Double connections at columns and/or at beam webs over a column. When two structural members on opposite sides of a column web, or a beam web over a column, are connected sharing common connection holes, at least one bolt with its wrench-tight nut shall remain connected to the first member unless a shop-attached or field-attached seat or equivalent connection device is supplied with the member to secure the first member and prevent the column from being displaced. > See Figures 28-1 and 28-2.

b. If a seat or equivalent device is used, the seat (or device) shall be designed to support the load during the double connection process. It shall be adequately bolted or welded to both a supporting member and the first member before the nuts on the shared bolts are removed to make the double connection.

28.B.21 Column splices. Each column splice shall be designed to resist a minimum eccentric gravity load of 300 lbs (136.2 kg) located 18 in (45.7 cm) from the extreme outer face of the column in each direction at the top of the column shaft.

28.B.22 Perimeter columns. Perimeter columns shall not be erected unless:

a. The perimeter columns extend a minimum of 48 in (121.9 cm) above the finished floor to permit installation of perimeter safety cables prior to erection of the next tier, except where constructability does not allow.

b. The perimeter columns have holes or other devices in or attached to perimeter columns at 42-45 in (106.6-114.3 cm) above the finished floor and at the midpoint between the finished floor and the top cable to permit installation of perimeter safety cables except where constructability does not allow.

28.B.23 Open web steel joists.

a. Except as provided in paragraph 28.B.23.b(2) below, where steel joists are used and columns are not framed in at least two directions with solid web structural steel members, a steel joist shall be field-bolted at the column to provide lateral stability to the column during erection. For the installation of this joist:

(1) A vertical stabilizer plate shall be provided on each column for steel joists. The plate shall be a minimum of 6-in x 6-in (15.2-cm x 15.2-cm) and shall extend at least 3 in (7.6 cm) below the bottom chord of the joist with a 13/16-in (2.1-cm) hole to provide an attachment point for guying or plumbing cables.

(2) The bottom chords of steel joists at columns shall be stabilized to prevent rotation during erection.

(3) Hoisting cables shall not be released until the seat at each end of the steel joist is field-bolted, and each end of the bottom chord is restrained by the column stabilizer plate.

b. Where constructability does not allow a steel joist to be installed at the column:

(1) An alternate means of stabilizing joists shall be installed on both sides near the column and shall:

(a) Provide stability equivalent to Section 28.B.23.a (1) above,

(b) Be designed by a QP,

(c) Be shop installed, and

(d) Be included in the erection drawings.

(2) Hoisting cables shall not be released until the seat at each end of the steel joist is field-bolted and the joist is stabilized.

FIGURE 28-1

Controlling Risk for Double Connections in Steel Erection (Side View)

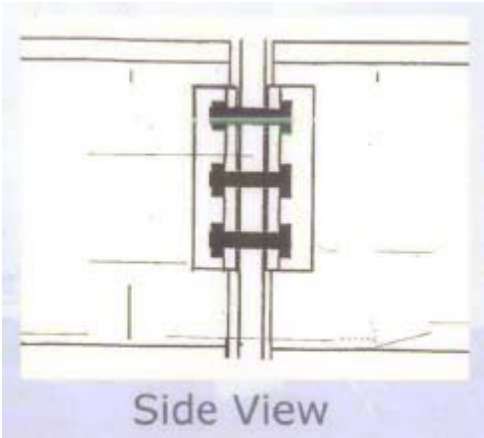
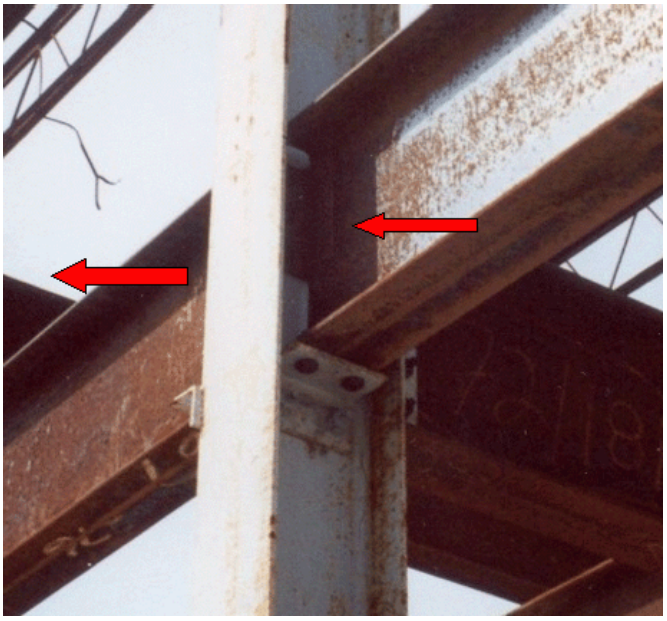


FIGURE 28-2

Double Connection With Seat to Support First Section While Second Section is Being Installed



c. Where steel joists at or near columns that span 60 ft (18.3 m) or less, the joist shall be designed and erected by either:

(1) Installing bridging or otherwise stabilizing the joist prior to releasing the hoisting cable or,

(2) Releasing the cable without having a worker on the joist.

d. Where steel joists at or near columns span more than 60 ft (18.3 m), the joists shall be set in tandem with all bridging installed unless an alternative method of erection, which provides equivalent stability to the steel joist, is designed by a QP and is included in the site-specific Steel Erection Plan.

e. A steel joist or steel joist girder shall not be placed on any support structure unless such structure is stabilized.

f. When steel joist(s) are landed on a structure, they shall be secured to prevent unintentional displacement prior to installation.

g. No modification that affects the strength of a steel joist or steel joist girder shall be made without the approval of the project structural engineer of record.

h. Field-bolted joists.

(1) Except for steel joists that have been pre-assembled into panels, connections of individual steel joists to steel structures in bays of 40 ft (12.1 m) or more shall be fabricated to allow for field bolting during erection.

(2) These connections shall be field-bolted unless constructability does not allow.

i. Steel joists and steel joist girders shall not be used as anchorage points for a fall arrest system unless written approval to do so is obtained from a QP.

j. A bridging terminus point shall be established before bridging is installed.

28.B.24 Attachment of steel joists and steel joist girders.

a. Each end of "K" series steel joists shall be attached to the support structure with a minimum of two 1/8-in (0.3-cm) fillet welds that are 2 in (5 cm) long, or with two 1/2-in (1.2-cm) bolts, or the equivalent.

b. Each end of "LH" and "DLH" series steel joists and steel joist girders shall be attached to the support structure with a minimum of two1/4-inch (0.6-cm) fillet welds 2 in (5 cm) long, or with two 3/4-in (1.9-cm) bolts, or the equivalent.

c. Except as provided in paragraph d below, each steel joist shall be attached to the support structure, at least at one end on both sides of the seat, immediately upon placement in the final erection position and before additional joists are placed.

d. Panels that have been pre-assembled from steel joists with bridging shall be attached to the structure at each corner before the hoisting cables are released.

28.B.25 Erection of steel joists.

a. Both sides of the seat of one end of each steel joist that requires bridging under Tables 28-1 and 28-2 shall be attached to the support structure before hoisting cables are released.

b. For joists over 60 ft (18.2 m), both ends of the joist shall be attached as specified in Section 28.B.24 and the provisions of Section 28.B.26 are met before the hoisting cables are released.

c. On steel joists that do not require erection bridging under Tables 28-1 and 28-2, only one employee shall be allowed on the joist until all bridging is installed and anchored.

d. Employees shall not be allowed on steel joists where the span of the steel joist is equal to or greater than the span shown in Tables 28-1 and 28-2 in accordance with Section 28.B.26.

e. When permanent bridging terminus points cannot be used during erection, additional temporary bridging terminus points are required to provide stability.

28.B.26 Erection bridging.

a. Where the span of the steel joist is equal to or greater than the span shown in Tables 28-1 and 28-2, the following shall apply:

(1) A row of bolted diagonal erection bridging shall be installed near the mid-span of the steel joist,

(2) Hoisting cables shall not be released until this bolted diagonal erection bridging is installed and anchored, see Figure 28-1, and

(3) No more than one employee shall be allowed on these spans until all other bridging is installed and anchored.

b. Where the span of the steel joist is over 60 ft (18.2 m) through 100 ft (30.4 m), the following shall apply:

(1) All rows of bridging shall be bolted diagonal bridging,

(2) Two rows of bolted diagonal erection bridging shall be installed near the third points of the steel joist,

(3) Hoisting cables shall not be released until this bolted diagonal erection bridging is installed and anchored, and

(4) No more than two employees shall be allowed on these spans until all other bridging is installed and anchored.

c. Where the span of the steel joist is over 100 ft (30.4 m) through 144 ft (43.9 m), the following shall apply:

(1) All rows of bridging shall be bolted diagonal bridging,

(2) Hoisting cables shall not be released until all bridging is installed and anchored, and

(3) No more than two employees shall be allowed on these spans until all bridging is installed and anchored.

d. For steel members spanning over 144 ft (43.9 m), the erection methods used shall be in accordance with Sections 28.B.18 through 28.B.22.

e. Where any steel joist specified in paragraph b above or Section 28.B.26.a-c is a bottom chord-bearing joist, a row of bolted diagonal bridging shall be provided near the support(s). This bridging shall be installed and anchored before the hoisting cable(s) is released.

f. When bolted diagonal erection bridging is required by this section, the following shall apply:

(1) The bridging shall be indicated on the erection drawing;

(2) The erection drawing shall be the exclusive indicator of the proper placement of this bridging;

(3) Shop-installed bridging clips, or functional equivalents, shall be used where the bridging bolts to the steel joists, see Figures 28-3, 28-4 and 28-5;

(4) When two pieces of bridging are attached to the steel joist by a common bolt, the nut that secures the first piece of bridging shall not be removed from the bolt for the attachment of the second; and

(5) Bridging attachments shall not protrude above the top chord of the steel joist.

28.B.26 Landing and placing loads.

a. During the construction period, the employer placing a load on steel joists shall ensure that the load is distributed so as not to exceed the carrying capacity of any steel joist.

b. Except for paragraph d below, no construction loads are allowed on the steel joists until all bridging is installed and anchored and all joist-bearing ends are attached.

c. The weight of a bundle of joist bridging shall not exceed a total of 1,000 lbs (454 kg). A bundle of joist bridging shall be placed on a minimum of three steel joists that are secured at one end. The edge of the bridging bundle shall be positioned within 1 ft (0.3 m) of the secured end.

d. No bundle of decking may be placed on steel joists until all bridging has been installed and anchored and all joist bearing ends attached, unless all of the following conditions are met:

(1) The employer has first determined from a QP and documented in a site-specific Steel Erection Plan that the structure or portion of the structure is capable of supporting the load,

(2) The bundle of decking is placed on a minimum of three steel joists,

(3) The joists supporting the bundle of decking are attached at both ends,

(4) At least one row of bridging is installed and anchored,

(5) The total weight of the bundle of decking does not exceed 4,000 lbs (1816 kg), and the edge of the construction load shall be placed within 1 ft (0.3 m) of the bearing surface of the joist end.

28.C Systems-Engineered Metal Buildings.

28.C.01 All of the requirements of the previous section apply to the erection of systems-engineered metal buildings except Sections 28.B.17 (column anchorage) and 28.B.23 (open web steel joists).

a. Each structural column shall be anchored by a minimum of four anchor rods or anchor bolts.

b. Rigid frames shall have 50% of their bolts or the number of bolts specified by the manufacturer (whichever is greater) installed and tightened on both sides of the web adjacent to each flange before the hoisting equipment is released.

c. Construction loads shall not be placed on any structural steel framework unless such framework is safely bolted, welded, or otherwise adequately secured.

d. In girt and eave strut-to-frame connections, when girts or eave struts share common connection holes, at least one bolt with its wrench-tight nut shall remain connected to the first member unless a manufacturer-supplied, field-attached seat or similar connection device is present to secure the first member so that the girt or eave strut is always secured against displacement.

e. Purlins and girts shall not be used as an anchorage point for a fall arrest system unless written approval is obtained from a QP for Fall Protection.

f. Purlins may only be used as a walking/working surface when installing safety systems after all permanent bridging has been installed and fall protection is provided.

g. Construction loads may be placed only within a zone that is within 8 ft (2.4 m) of the centerline of the primary support member.

h. Both ends of all steel joists or cold-formed joists shall be fully bolted and/or welded to the support structure before:

(1) Releasing the hoisting cables,

(2) Allowing an employee on the joists, or

(3) Allowing any construction loads on the joists.

28.C.02 Falling object protection.

a. Securing loose items aloft. All materials, equipment, and tools, which are not in use while aloft, shall be secured against accidental displacement.

b. Protection from falling objects other than materials being hoisted shall be provided. The Controlling contractor shall bar other construction processes below steel erection unless overhead protection for the employees below is provided.

28.C.03 Controlled Decking Zones (CDZ) are not permitted.

TABLE 28-1

Erection Bridging for Short Span Joists

JOIST	SPAN	JOIST	SPAN
8K1	NM	22K6	36-0
10K1	NM	22K7	40-0
12K1	23-0	22K9	40-0
12K3	NM	22K10	NM
12K5	NM	22K11	NM
14K1	27-0	24K4	36-0
14K3	NM	24K5	38-0
14K4	NM	24K6	39-0
14K6	NM	24K7	43-0
16K2	29-0	24K8	43-0
16K3	30-0	24K9	44-0
16K4	32-0	24K10	NM
16K5	32-0	24K12	NM
16K6	NM	26K5	38-0
16K7	NM	26K6	39-0
16K9	NM	26K7	43-0
18K3	31-0	26K8	44-0
18K4	32-0	26K9	44-0
18K5	33-0	26K10	49-0
18K6	28-0	26K12	NM
18K7	NM	28K6	40-0
18K9	NM	28K7	43-0
18K10	NM	28K8	44-0
20K3	32-0	28K9	45-0
20K4	34-0	28K10	49-0
20K5	34-0	28K12	53-0
20K6	36-0	30K7	44-0
20K7	39-0	30K8	45-0
20K9	39-0	30K9	45-0
20K10	NM	30K10	50-0
22K4	34-0	30K11	52-0

TABLE 28-1 (Continued)

Erection Bridging for Short Span Joists

JOIST	SPAN	JOIST	SPAN
22K5	28-0	30K12	54-0
10KCS1	NM	22KCS2	36-0
10KCS2	NM	22KCS3	40-0
10KCS3	NM	22KCS4	NM
12KCS1	NM	22KCS5	NM
12KCS2	NM	24KCS2	39-0
12KCS3	NM	24KCS3	44-0
14KCS1	NM	24KCS4	NM
14KCS2	NM	24KCS5	NM
14KCS3	NM	26KCS2	39-0
16KCS2	NM	26KCS3	44-0
16KCS3	NM	26KCS4	NM
16KCS4	NM	26KCS5	NM
16KCS5	NM	28KCS2	40-0
18KCS2	28-0	28KCS3	45-0
18KCS3	NM	28KCS4	53-0
18KCS4	NM	28KCS5	53-0
18KCS5	NM	30KCS3	45-0
20KCS2	36-0	30KCS4	54-0
20KCS3	39-0	30KCS5	54-0
20KCS4	NM		
20KCS5	NM		

NM=diagonal bolted bridging not mandatory for joists under 40 ft (12.1 m).

TABLE 28-2

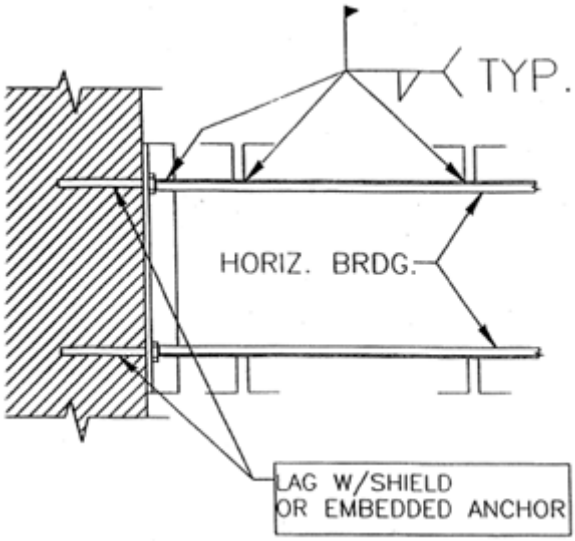
Erection Bridging for Long Span Joists

JOIST	SPAN	JOIST	SPAN
18LH02	33-0	28LH05	42-0
18LH03	NM	28LH06	46-0
18LH04	NM	28LH07	54-0
18LH05	NM	28LH08	54-0
18LH06	NM	28LH09	NM
18LH07	NM	28LH10	NM
18LH08	NM	28LH11	NM
18LH09	NM	28LH12	NM
20LH02	33-0	28LH13	NM
20LH03	38-0	32LH06	47-0 THROUGH 60-0
20LH04	NM	32LH07	47-0 THROUGH 60-0
20LH05	NM	32LH08	55-0 THROUGH 60-0
20LH06	NM	32LH09	NM THROUGH 60-0
20LH07	NM	32LH10	NM THROUGH 60-0
20LH08	NM	32LH11	NM THROUGH 60-0
20LH09	NM	32LH12	NM THROUGH 60-0
20LH10	NM	32LH13	NM THROUGH 60-0
24LH03	28-0	32LH14	NM THROUGH 60-0
24LH04	39-0	32LH15	NM THROUGH 60-0
24LH05	40-0	36LH07	47-0 THROUGH 60-0
24LH06	45-0	36LH08	47-0 THROUGH 60-0
24LH07	NM	36LH09	57-0 THROUGH 60-0
24LH08	NM	36LH10	NM THROUGH 60-0
24LH09	NM	36LH11	NM THROUGH 60-0
24LH10	NM	36LH12	NM THROUGH 60-0
24LH11	NM	36LH13	NM THROUGH 60-0
		36LH14	NM THROUGH 60-0
		36LH15	NM THROUGH 60-0

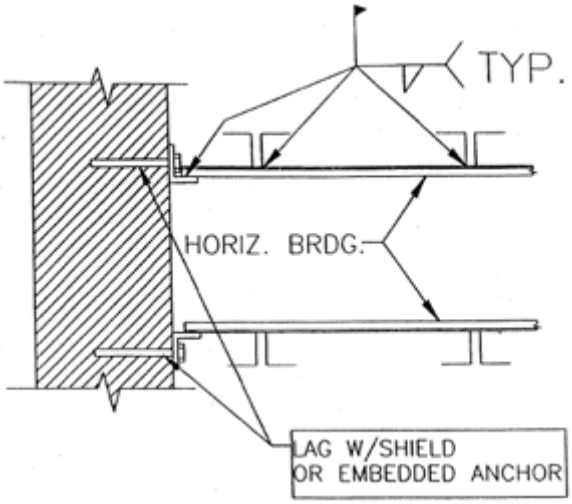
NM = Diagonal bolted bridging not mandatory for joists under 40 feet (12.1 m).

FIGURE 28-3

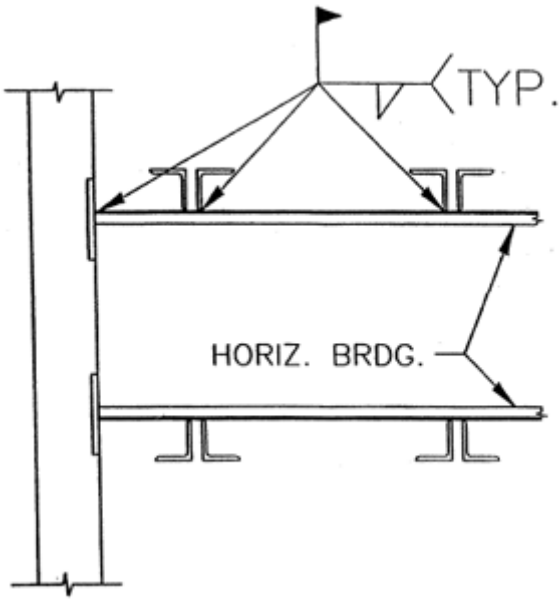
Illustrations of OSHA Bridging Terminus Points



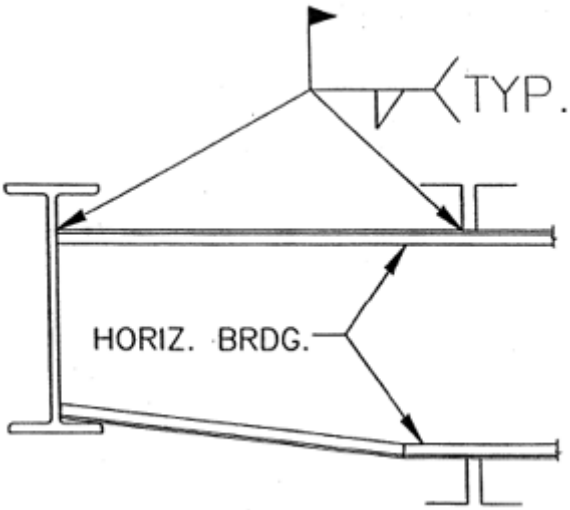
Horizontal Bridging
Terminus at Wall



Horizontal Bridging
Terminus at Wall



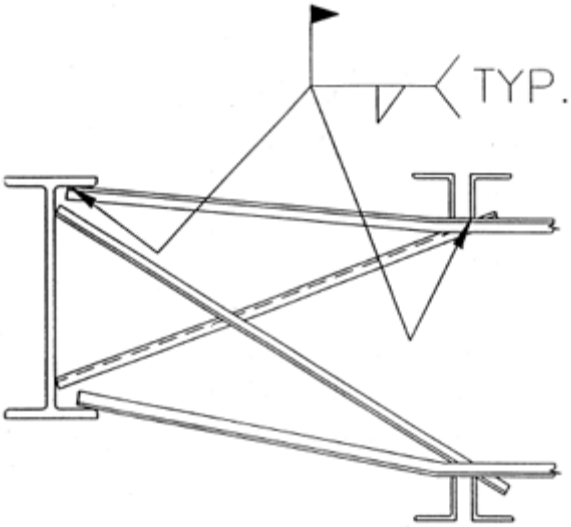
Horizontal Bridging
Terminus at Panel



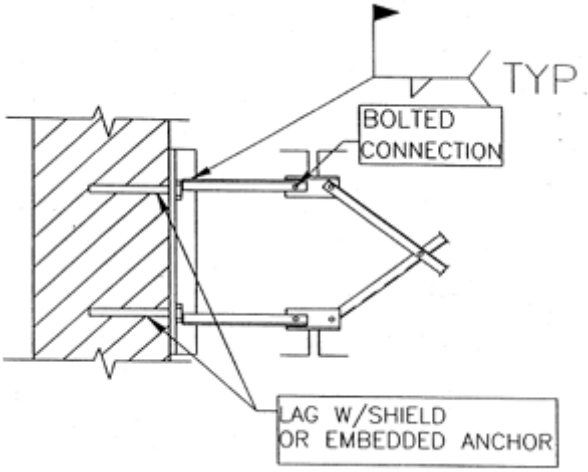
Horizontal Bridging
Terminus at Structural Shape Wall

FIGURE 28-3 (Continued)

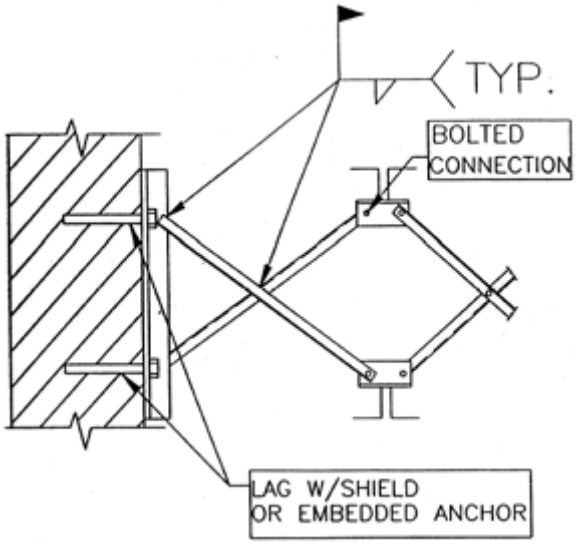
Illustrations of OSHA Bridging Terminus Points



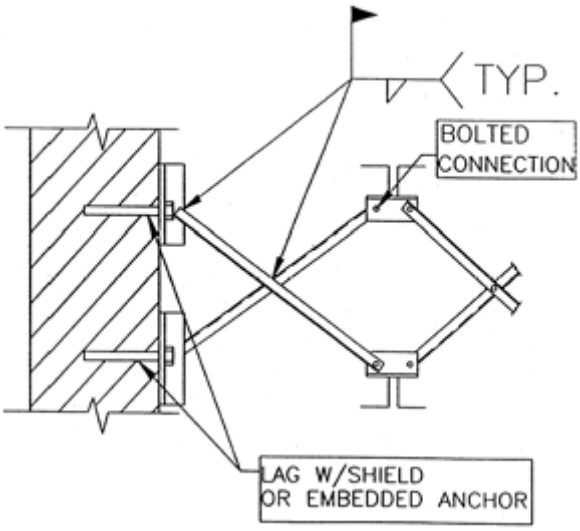
Horizontal Bridging
Terminus at Structural
Shape with Optional "X-Bridging"



Bolted Diagonal Bridging
Terminus at Wall



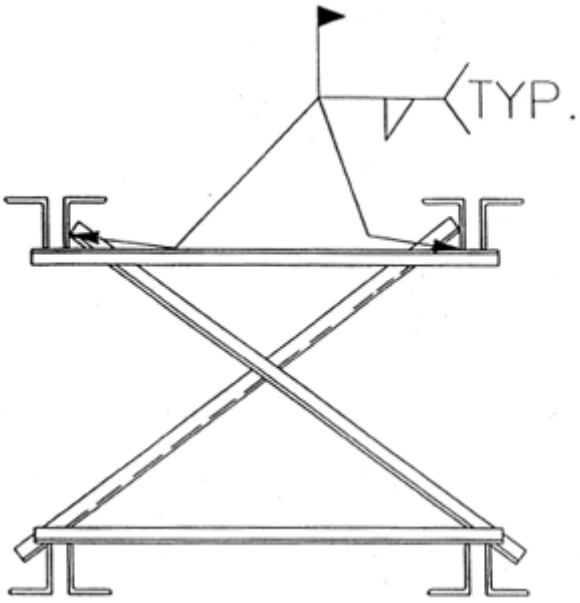
Bolted Diagonal Bridging
Terminus at Wall



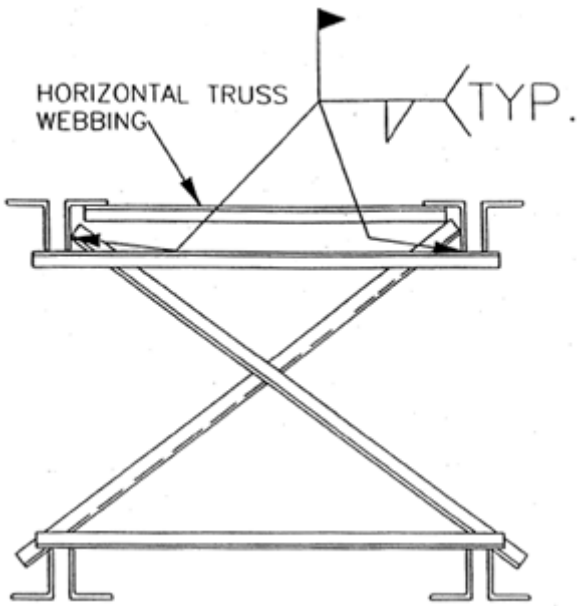
Bolted Diagonal Bridging
Terminus at Wall

FIGURE 28-3 (Continued)

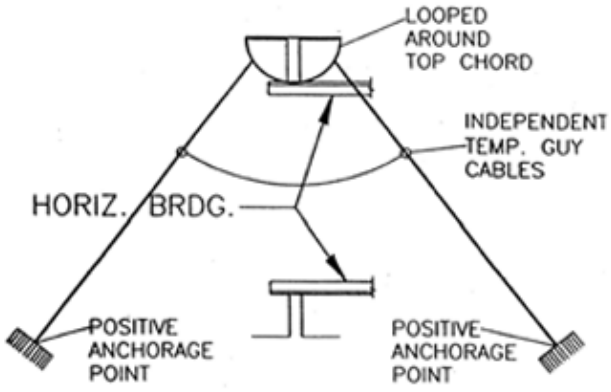
Illustrations of OSHA Bridging Terminus Points



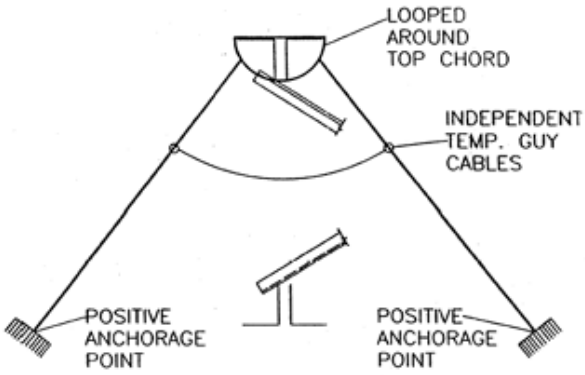
Joists Pair Bridging
Terminus Point



Joists Pair Bridging
Terminus Point with Horizontal Truss



Horizontal Bridging
Terminus Point
Secured By Temporary Guy Cables



Diagonal Bridging
Terminus Point
Secured by Temporary Guy Cables

FIGURE 28-4

Clip End Connection

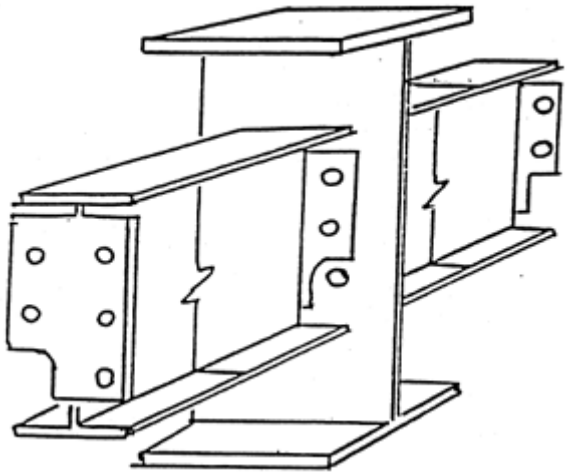
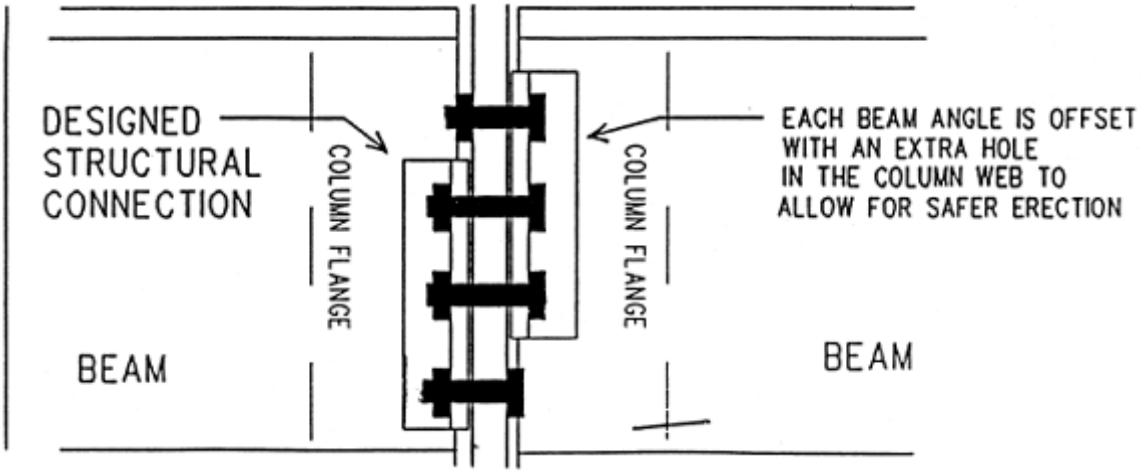


FIGURE 28-5

Staggered (High/Low Connection)



Guidelines for Complying with OSHA Steel Erection Standard, Paragraph §1926.757(a)(10) and §1926.757(c)(5).

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Section 29
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SECTION 29

Blasting

29.A General. This section applies to blasting activities performed by DA civilians or under DA contract with the use of commercial explosives on non-military lands/installations. For all other blasting activities, see Section 01.G.

29.A.01 Prerequisites.

a. An Explosives Safety Site Plan (ESSP), approved by DoD Explosives Safety Board (DDESB), IAW DA Pam 385-64 and DA Pam 385-65, is required prior to the placement of explosives on site or the start of explosives-related operations.

b. Permission in writing shall be obtained from the GDA before explosive materials are brought onto the job site. Periodic replenishment of approved supplies does not require written approval.

c. A Blasting Plan shall be developed by the contractor, submitted and accepted by the GDA prior to the placement of explosives on site or the start of any explosives-related operations. As a minimum, it shall include the following:

(1) List the names, qualifications, and responsibilities of personnel involved with explosives;

(2) The Contractor's requirements for handling, transportation, and storage of explosives; employee training programs and certifications; types of explosives; schedule of activities and loading procedures; detailed blasting schedule; explosives transportation route; safety signals methods and locations; danger area clearance; methods for securing the site; seismograph, vibration and damage control; test shots, post-blast inspection and misfire procedures; provisions for disposal of explosives, blasting agents, unused and associated material; and post-blast ventilation requirements;

(3) Public relations requirements before and after blasting (e.g. community communication, protection of structures and personnel).

29.A.02 The transporting, handling, storage, and use of explosives, blasting agents, and blasting equipment shall be directed and supervised by a person of proven experience and ability in blasting operations in accordance with ANSI A10.7; 29 CFR 1910.109; 29 CFR 1926, Subpart U; 27 CFR 555; the manufacturers, the Institute of Makers of Explosives (IME), and, where applicable, DoD 6055.9M.

29.A.03 All persons working with explosives shall be in good physical condition and be able to understand and give written and verbal orders.

29.A.04 Warning signs shall be provided at points of access to blasting area.

29.A.05 Operations involving the handling or use of explosive materials shall be discontinued and personnel moved to a safe area during the approach or progress of a thunderstorm or dust storm; controls will be established to prevent accidental discharge of electric blasting caps from extraneous electricity.

29.A.06 Blasting operations near overhead power lines, communications lines, utility services, or other structures shall not be carried on until the operators and/or owners have been notified and measures for safe control have been taken.

29.A.07 All loading and firing shall be directed and supervised by one designated person.

29.A.08 A positive system to detect and measure the probability of lightning or massive static electrical discharges shall be used.

29.A.09 Before adopting any system of electrical firing, a thorough survey shall be made for extraneous currents and all dangerous currents shall be eliminated before any holes are loaded.

29.A.10 Blasts using electric detonators shall be fired with an electric blasting machine or a properly designed power source.

a. Blasts using non-electric detonators shall be fired by a blasting machine or starting device prescribed by the manufacturer.

b. When blasting near radar or radio transmission facilities or near electrical energy sources where testing has shown that RF energy or stray electrical current may present a hazard to electrical blasting, an approved non-electrical initiation system shall be employed.

c. When electric detonators are used, leg wires shall be short circuited (shunted) until connected into the circuit for firing.

29.A.11 Detonating cord shall be initiated by non-electric detonator (cap and fuse), electric detonator, shock tube detonator or gas initiated detonator in accordance with the manufacturer's recommendation.

29.A.12 Delay electric detonators, non-electric delay detonators, detonating cord connectors, or sequential blasting machines shall be used for all delayed blasts; the practice shall conform to the manufacturer's recommendations.

29.A.13 Blasting machines.

a. Blasting machines shall be operated, maintained, tested, and inspected as prescribed by the manufacturer.

b. Blasting machines shall be tested prior to use and periodically thereafter as prescribed by the manufacturer.

c. Blasting machines shall be secured and accessible only to the blaster; only the blaster shall connect the leading wire to the machine.

29.A.14 When energy for blasting is taken from power circuits, the voltage shall not exceed 550 volts. The wiring controlling arrangements shall conform to the following (see Figures 29-1 and 29-2):

a. The blasting switch shall be an ungrounded UL (or other nationally-recognized testing laboratory) listed, enclosed, externally operated double-pole double-throw switch that, when locked in the open position, will shunt the firing lines.

b. A grounded switch shall be installed between the blasting switch and the power circuit at a distance not less than 15 ft (4.5 m) from the blasting switch.

c. A lightning gap of at least 15 ft (4.5 m) shall be provided between the two switches; the gap connection shall be made by cable, plug, and receptacle.

FIGURE 29-1

Power Firing Systems for Series and Parallel Series Firing (No Arcontroller)

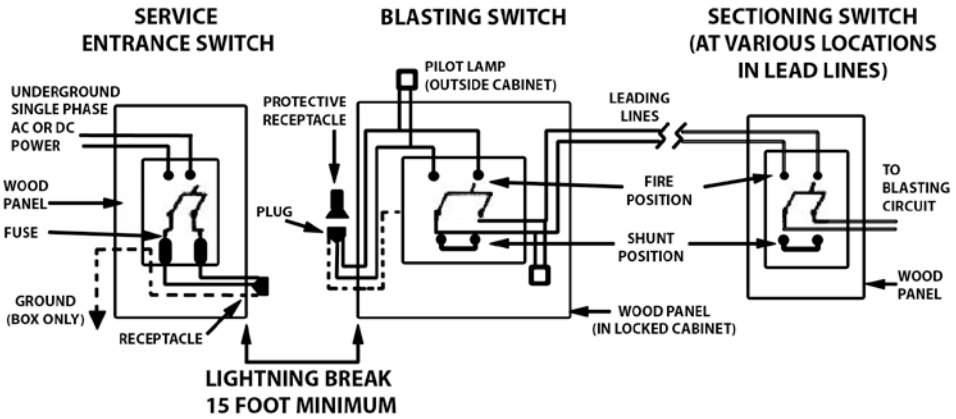
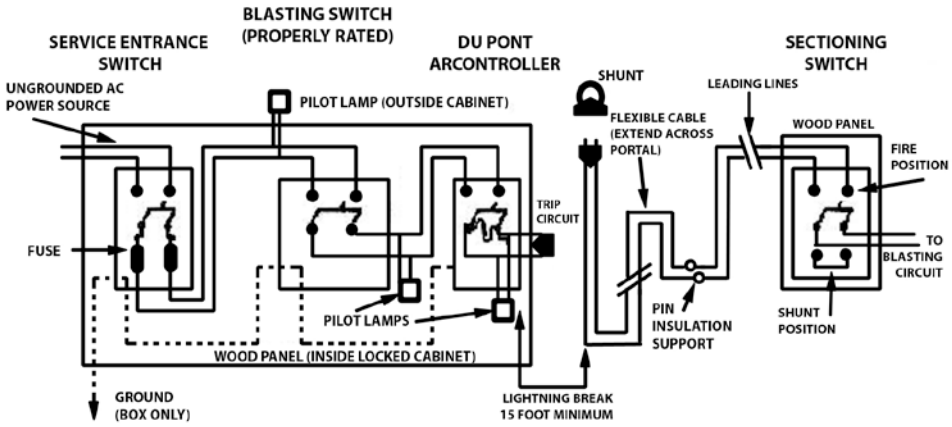


FIGURE 29-2

Recommended Installation of Shooting Station and Accessory Arrangement for Using Arcontroller



29.A.15 The cable between switches shall be disconnected and both switches shall be locked in the open position immediately after firing the shot.

29.A.16 Keys to the switches shall remain in the possession of the blaster at all times.

29.A.17 Insulated solid core wires of an appropriate gage in good condition shall be used for all lines.

29.A.18 Sufficient firing line shall be provided to permit the blaster to be located at a safe distance from the blast.

29.A.19 Mechanized equipment (including drills) shall not be operated within 50 ft (15.2 m) of a loaded hole.

➢ Exception**:** Mechanized equipment may be permitted to operate within 50 ft (15.2 m) of a loaded hole when placing blasting mats or back covering.

29.A.20 The use of black powder is prohibited.

29.A.21 All refuse from explosive loading such as empty boxes, paper, and fiber packing shall not be used again for any purpose, but shall be destroyed by burning at an approved location.

29.A.22 Storage of explosives.

a. The storage of explosives shall be in accordance with requirements of the Bureau of Alcohol, Tobacco, and Firearms (as outlined in 27 CFR 555, Subpart K) or the State in which they are stored.

b. An accurate running inventory of all explosives and blasting agents stored at the project shall be maintained: two copies shall be maintained - one at the magazine and one in a facility which is at least 50 ft (15.2 m) from the magazine.

29.A.23 Security of Explosives.

a. Area shall be guarded to control access to the explosives and ensure no tapping with explosives during non-working times.

b. Explosive materials shall not be abandoned.

29.B Transportation of Explosive Materials.

29.B.01 Transportation of explosives by the following modes shall be in accordance with the prescribed federal regulations and the applicable state requirements.

a. Transportation of explosive materials over public highways shall be in accordance with DOT requirements.

b. Marine transportation of explosive materials shall be in accordance with USCG requirements.

c. Transportation of explosive materials by aircraft shall be in accordance with FAA requirements.

29.B.02 Vehicles used for transportation of explosive materials shall not be loaded beyond their rated capacity and the explosive materials shall be secured to prevent shifting of load or dislodgment from the vehicle; when explosive materials are transported by a vehicle with an open body, a magazine or closed container shall be securely mounted on the bed to contain the cargo.

29.B.03 Vehicles transporting explosive materials shall display all placards, lettering, and/or numbering required by DOT.

29.B.04 Explosive materials and blasting supplies shall not be transported with other materials or cargoes. Blasting caps (including electric) shall not be transported in the vehicle or conveyance with other explosives unless the conditions of 49 CFR 177.835(g) are met.

29.B.05 Personnel.

a. Vehicles for transportation of explosive materials shall be in the charge of and operated by a person who is physically fit, careful, reliable, able to read and understand safety instructions, and not under the influence of intoxicants or narcotics.

b. Only the authorized driver and a properly trained helper shall be permitted to ride on any conveyance transporting explosive materials or detonators.

29.B.06 Vehicles used in the transportation of explosives shall be substantially constructed, in good repair, and shall have tight beds to prevent explosives from falling from the vehicle. The ends and sides of vehicles shall be high enough to prevent containers from falling off.

29.B.07 Explosives shall not be exposed to sparking metal during transportation. When steel or part steel bodies are used, non-sparking cushioning materials shall separate the containers of explosives from the metal.

29.B.08 No spark-producing tools, carbides, oils, matches, firearms, electric storage batteries, flammable substances, acids, or oxidizing or corrosive compounds shall be carried in the bed or body of any vehicle transporting explosive materials.

29.B.09 Vehicles transporting explosive materials shall be equipped with one or more fire extinguishers having a rating of 10-B:C and placed at strategic points.

a. The extinguishers shall be of a type listed by a nationally- recognized testing laboratory and shall be ready for use.

b. The driver will be trained in the use of the extinguisher.

29.B.10 A vehicle containing explosive materials shall not be taken into a garage or repair shop, parked in congested areas, or stored at any time in a public garage or similar building.

29.B.11 Vehicles transporting explosive materials shall be operated with extreme care. Full stops shall be made at approaches to all railroad crossings and main highways, and the vehicles shall not proceed until it is known that the way is clear.

29.B.12 No vehicle shall be refueled while explosive materials are on the motor vehicle except in an emergency.

29.B.13 Persons employed in the transportation, handling, or other use of explosive materials shall not smoke or carry on their persons or in the vehicle, matches, firearms, ammunition, or flame-producing devices.

29.B.14 Provision shall be made for safe transfer of explosive materials to magazine vessels including substantial ramps or walkways free of tripping hazards.

29.B.15 Vehicles transporting explosive materials shall not be left unattended.

29.B.16 The hoist operator shall be notified before explosive materials are transported in a shaft conveyance.

29.B.17 Explosive materials shall be hoisted, lowered, or conveyed in a powder car. No other materials, supplies or equipment shall be transported in the same conveyance at the same time.

29.B.18 No person shall ride in any shaft conveyance transporting explosive materials. Loading and unloading shall be accomplished only when the conveyance is stationary.

29.B.19 No explosive materials shall be transported on any locomotive. At least two car lengths shall separate the locomotive from the powder car.

29.B.20 No explosive materials shall be transported on a man haul trip.

29.B.21 The car or conveyance containing explosive materials shall be pulled, not pushed, whenever possible.

29.B.22 The powder car or conveyance built for transporting explosive materials shall bear a reflectorized sign with a sharply contrasting background on each side with the word "EXPLOSIVES" in letters not less than 4 in (10.1 cm) in height.

29.C Handling of Explosive Materials.

29.C.01 There shall be no smoking, open lights, or fire of any kind within 50 ft (15.2 m) of any area where explosives are being handled. No source of ignition, except necessary means to light fuses or fire electric detonators, shall be permitted in an area containing loaded holes.

29.C.02 Containers of explosive materials shall be opened only with non-sparking tools or instruments. Metal cutters may be used for opening fiberboard boxes, paper bags or plastic tubes.

29.C.03 Explosive materials shall be removed from containers only as they are needed for immediate use.

29.C.04 Explosive materials and detonators or primers shall be separated and taken to the blasting area in original containers, Type 3 Magazines, or containers prescribed by 49 CFR 177.835.

29.C.05 Primers shall not be made up in excess of immediate need for holes to be loaded.

29.C.06 Primers shall not be made up in or near magazines or excessive quantities of explosive materials.

29.C.07 After loading of a blast is completed, all excess explosive materials and detonators shall be removed to a safe location or returned at once to the storage magazines, observing the same rules as when being conveyed to the blasting area.

29.C.08 The quantity of explosive materials taken to an underground loading area shall not exceed the amount estimated to be necessary for the blast.

29.C.09 Detonators and explosive materials shall be taken separately into pressure working chambers.

29.D Electromagnetic Radiation.

29.D.01 Blasting operations or storage of electrical detonators shall be prohibited in vicinity of operating RF transmitters or other RF producing devices except where the clearances in ANSI C95.4 can be maintained.

29.D.02 When necessary to perform blasting operations at a distance less than those shown in ANSI C95.4 tables, an approved non-electric initiation system shall be used.

29.D.03 Mobile radio transmitters, which are less than 100 ft (30.4 m) away from electric blasting caps in other than original containers, shall be de-energized and effectively locked, except in blasting areas where a non-electric initiation system as described in Section 29.A.11 is used.

29.E Vibration and Damage Control.

29.E.01 Blasting operations in or adjacent to cofferdams, piers, underwater structures, buildings, structures, or other facilities shall be carefully planned with full consideration for all forces and conditions involved.

29.E.02 Prior to initiation of vibration controlled blasting operations, a written plan for monitoring the operations shall be established.

29.E.03 When appropriate, owners, occupants, and the public shall be notified of the nature of blasting operations to be undertaken and controls to be established.

29.E.04 Where vibration damage may occur, energy ratios and peak particle velocities shall be limited in accordance with state requirements or the requirements in Table 29-1, whichever is more stringent. When any recording indicates either energy ratio or peak particle velocity limits have been exceeded, blasting shall be suspended and the designated authority (Government and Contractor) shall be immediately notified; blasting shall not be resumed until the probable cause has been determined and corrective measures taken.

29.E.05 Where required by State regulations, scaled distances shall be determined before each shot and included in the records. Scaled distances shall not exceed limitations set by the State.

29.E.06 Air blast pressure exerted on structures resulting from blasting shall not exceed 133 dB (0.013 psi).

29.E.07 The monitoring, recording, and interpreting of vibrations shall be by qualified personnel. Records and interpretations shall be furnished to the GDA.

29.F Drilling and Loading.

29.F.01 All drill holes shall be sufficiently large enough to freely allow for the insertion of the explosives.

29.F.02 Drilling shall not be done in an area already blasted until remaining "bootlegs" are examined for unexploded charges and the total area has been examined to make sure that there are no unexploded charges remaining.

a. Never insert a drill, pick, or bar into bootlegs even if examination fails to disclose explosives.

b. When misfires have occurred and drilling must be done in an area where undetonated holes may exist, holes shall not be drilled where there is danger of intersecting a misfired hole.

c. All drilling necessary to neutralize misfires must be done under the supervision of a competent person who has a working knowledge of the explosive materials involved and is familiar with the conditions under which the misfired holes were drilled, loaded, primed, and initiated, and is familiar with the drilling equipment capabilities that will be used during the neutralization.

29.F.03 Drilling and loading operations shall not be carried on in the same area. Drilling shall be separated from loaded holes by at least the depth of the loaded hole but in no case less than 50 ft (15.2 m).

TABLE 29-1

Energy Ratio and Peak Particle Velocity Formula

The maximum total energy ratio (ER) shall be limited to 1.0, calculated as follows: $ER = (3.29FA)^2$ Where: F = frequency in cycles per second A = amplitude in inches The total energy ratio is equal to the arithmetic sum of the energy ratios in the 3 mutually perpendicular planes of motion in the vertical and horizontal directions at any one instant of time.
The maximum total peak particle velocity (PV) shall be limited to 1.92, calculated as follows: $PV = A/t$ Where: A = amplitude in inches t = time in seconds The total peak particle velocity is equal to the vector sum of the particle velocities in the 3 mutually perpendicular planes of motion in the vertical and horizontal directions at any one instant of time.

29.F.04 No person shall be allowed to deepen drill holes that have contained explosives or blasting agents.

29.F.05 Holes shall not be drilled so that they disturb or intersect a loaded hole.

29.F.06 See Section 18.H for earth drilling requirements.

29.F.07 The loading or loaded area shall be kept free of any equipment, operations, or persons not essential to loading; no vehicle traffic shall be permitted over loaded holes; the blast site shall be guarded or barricaded and posted with danger signs to restrict unauthorized entry.

29.F.08 No holes shall be loaded except those to be fired in the next round of blasting; after loading, all remaining explosive materials and detonators shall be immediately returned to an authorized magazine; no explosive materials or loaded holes shall be left unattended at the blast site at any time.

29.F.09 Loading of sprung or jet-pierced holes shall be prohibited until it is established that the hole has cooled sufficiently to allow loading.

29.F.10 No explosive shall be loaded or used underground in the presence of combustible gases or combustible dusts unless the conditions of use have been thoroughly identified and accepted, in writing, as safe by a competent person qualified by a thorough knowledge of the factors to be evaluated or by the written permission of the authority having jurisdiction where an authority exercises jurisdiction.

29.F.11 Cartridges shall be primed only in the number required for a single round of blasting.

29.F.12 No detonator shall be inserted in explosive materials which do not have a cap well without first making a hole in the cartridge with a non-sparking punch of proper size, or the appropriate pointed handle of a cap crimper.

29.F.13 Cartridges shall be seated by even steady pressure only.

29.F.14 Tamping shall be done with wood rods without exposed metal parts. Non-sparking metal connectors may be used for joint poles. An approved plastic tamping pole may also be used.

29.F.15 Springing boreholes.

a. A borehole shall never be sprung when it is adjacent to or near a hole that is loaded.

b. Flashlight batteries shall never be used as a power source to replace a blasting machine when springing boreholes.

29.F.16 Use of detonating cord.

a. Detonating cord shall be handled and used with the same respect and care given other explosives. Care shall be made to avoid damaging or severing cord during and after loading and hooking-up.

b. When using a detonating cord down line, after the primer is loaded in the hole, the detonating cord shall be cut from the supply reel before loading the rest of the charge.

c. Detonating cord connections shall be positive in accordance with recommended methods. Knot or other cord-to-cord connections shall be made only with detonating cord in which the explosive core is dry.

d. All detonating cord trunk lines and branch lines shall be free of loops, sharp kinks, or angles that direct the cord back toward the oncoming line of detonation.

e. When connecting a detonator to detonating cord, the detonators shall be taped or otherwise attached securely along the side or the end of the detonating cord, with the end of the detonator containing the explosive charge pointing in the direction in which the detonation is to proceed.

f. Detonators for firing the trunk line shall not be brought to the loading area nor attached to the detonating cord until everything else is in ready for the blast.

29.F.17 The blaster shall keep an accurate, up-to-date record of explosives, blasting agents, and blasting supplies used in a blast.

29.F.18 Loaded holes shall be stemmed to the collar with non-combustible material.

29.F.19 All loaded holes or charges shall be checked and located and all detonating cord connections shall be inspected before firing the blast.

29.F.20 All charges shall be covered with blasting mats or back covered before firing where blasting may cause injury or damage by flying rock or debris. Where mats are used, care shall be taken to protect electric blasting circuits.

29.G Wiring.

29.G.01 In any blast using electric detonators, all blasting caps shall be from the same manufacturer.

29.G.02 Wiring.

a. Bus wires shall be single solid wires of sufficient current carrying capacity.

b. The insulation on all firing lines shall be adequate and in good condition.

29.G.03 The number of electric blasting caps in a circuit shall not exceed the capacity of blasting machine or power source.

29.G.04 A power circuit used for firing electric detonators shall not be grounded.

29.G.05 Whenever the possibility exists that a leading wire might be thrown onto a live power source by the force of the explosion, care shall be taken to see that the total length of wires is kept too short to contact the source or that the wires are securely anchored to the ground. Alternatively, de-energize the live power until it is certain during the post blast inspection that the lines have not crossed. If these requirements cannot be met, a non-electric system shall be used.

29.G.06 The manufacturer's shunt shall not be removed from the cap leg wires until the cap is connected to the lead line or to another cap in preparation for the assembly of two or more caps into a series circuit or when the cap is to be tested.

29.G.07 No lead wire shall be connected to the circuit until it has been grounded to dissipate any static charge.

29.G.08 The circuit, including all caps, shall be tested with an approved blasting instrument (blasting galvanometer, blasting ohmmeter, blaster's ohmmeter, or blaster's multimeter) before being connected to a firing line.

29.G.09 No firing line shall be connected to a blasting machine or other power source until the shot is to be fired. The firing line shall be checked with an approved blasting instrument before being connected to the blasting machine or other power source.

29.G.10 When a single series of caps is to be fired, or a number of series of caps is to be fired as a series-in-parallel circuit, the resistance of the circuit shall be checked with an approved blasting instrument.

29.G.11 For series-in-parallel circuits, each series shall have the same resistance.

29.G.12 Each series circuit shall be separately tested for two readings:

a. To ensure that the series is complete; and

b. To ensure that each series shows the same resistance and that this resistance is as close to the calculated resistance for such a series of caps as the testing instrument will read. If the first reading shows a series to be incomplete, the faulty cap or connection shall be located and corrected. If the second reading shows incorrect resistance, the cause shall be found and corrected.

29.H Firing.

29.H.01 Prior to the firing of a shot, all persons in the danger area shall be warned of the blast and ordered to a safe distance from the area. Blasts shall not be fired until it is certain that every person has retreated to a safe distance and no one remains in a dangerous location.

29.H.02 Prior to the firing of a shot, a competent flag person shall be posted at all access points to danger areas.

29.H.03 Prior to the firing of a shot, drill boats and other vessels shall be moved a safe distance from the danger area.

a. Prior to and while the drill boat or vessel is being moved from the danger area, a series of short signals by horn or whistle similar to the usual navigation warning signals shall be given.

b. No blast shall be fired while any vessel under way is closer than 1,500 ft (457.2 m) to the underwater blasting area. Those on board vessels or craft moored or anchored within 1,500 ft must be notified before a blast is fired.

c. No blast shall be fired closer than 250 ft (76.2 m) to a boat or vessel containing an explosive magazine; personnel engaged in drilling operations on another drill boat within 500 ft (152.4 m) shall leave the drill frames for cover if any holes have been loaded.

d. No blast shall be fired while any swimming or diving is in progress near the blasting area.

e. Whenever a drill boat is moved from the drilling setting, all loaded under water holes shall be fired.

29.H.04 Safety signals.

a. All blasting operations shall use the following safety signals:

(1) WARNING SIGNAL - a one-minute series of long audible signals 5 minutes prior to blast signal;

(2) BLAST SIGNAL - a series of short audible signals 1 minute prior to the shot; and

(3) ALL CLEAR SIGNAL - a prolonged audible signal following the inspection of blast area.

b. The safety signals shall be given by use of a compressed air whistle, a horn, or equivalent means, and shall be clearly audible at the most distant point in the blast area. The boat whistle on a drill boat shall not be used as a blasting signal.

c. The code for safety signals and warning signs and flags shall be posted at all access points.

d. Employees shall be made familiar with the signals and instructed accordingly.

29.H.05 The person making leading wire connections shall fire the shot. All connections shall be made from the borehole back to the source of firing current and the leading wire shall remain shorted and not be connected to the blasting machine or other source of current until the charge is to be fired.

29.H.06 After firing an electric blast, the leading wires shall be immediately disconnected from the power source and shunted.

29.H.07 When firing a circuit of electric blasting caps, care shall be exercised to ensure that an adequate quantity of delivered current is available in accordance with the manufacturer's recommendations.

29.I Post-Blast Procedures.

29.I.01 Immediately after blast has been fired, the firing line shall be disconnected from the blasting machine or power source. Power switches shall be locked open. Atmospheres in confined areas shall be tested and/or ventilated after blast.

29.I.02 An inspection shall be made by the blaster to determine that all charges have been exploded. All wires shall be traced and search made for unexploded cartridges.

29.I.03 Other persons shall not be allowed to return to the area of the blast until an "all clear" signal is given.

29.I.04 Loose pieces of rock and other debris shall be scaled down from the sides of the face of excavation and the area made safe before proceeding with the work.

29.I.05 Misfires.

a. Misfires shall be handled under the direction of the blaster. The blaster shall determine the safest method for handling the hazards of misfires (some misfires may require consultation with the supplier or manufacturer of the explosive material).

b. When a misfire is declared, the blaster shall wait 1-hour before inspecting the site and provide proper safeguards for excluding all employees, except those necessary to do the work, from the danger zone.

c. No other work shall be done except that necessary to remove the hazard of the misfire. Only those employees necessary to do the work shall remain in the danger zone.

d. No drilling, digging, or picking shall be permitted until all misfire holes have been detonated or the blaster has approved that work can proceed.

e. Based on contractor experience, a secondary/dual initiation system to prevent misfires should be considered.

29.J Underwater Blasting.

29.J.01 A blaster shall conduct all blasting operations. No shot shall be fired without his approval.

29.J.02 Loading tubes and casings of dissimilar metals shall not be used because of possible electric transient currents from galvanic action of the metals and water.

29.J.03 Only water-resistant blasting caps and detonating cords shall be used for all marine blasting. Loading shall be done through a non-sparking metal loading tube when necessary.

29.J.04 Blasting flags shall be displayed.

29.J.05 The storage and handling of explosive materials aboard vessels used in underwater blasting operations shall be according to provisions in Sections 29.A and 29.C.

29.J.06 When more than one hole is loaded to be fired underwater, a steel shot line shall be anchored and floated over the row of loaded holes.

a. The detonation down line from each loaded hole shall be tied to the steel line and the loose end shall be tied to the detonation trunk line.

b. After the trunk line fires, the steel shot line shall be inspected for misfires. Misfires shall be handled in accordance with the requirements of Section 29.I.05.

29.J.07 When drilling near or adjacent to a loaded hole, drilling shall be limited to vertical holes only. Drilling shall be separated from loaded holes by the depth of water plus the depth of the loaded hole.

a. If a solid casing or drill mast - vertically plumbed with an inclinometer - is extended from the barge and firmly seated on bedrock, the distance between a loaded hole and one being drilled shall be 1/3 the depth of the hole, with a minimum of 8 ft (2.4 m) between the loaded hole and the one being drilled.

b. Drilling shall be halted to check alignment with an inclinometer every 4 ft (1.2 m) of hole depth.

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SECTION 30

Diving Operations

30.A General. All USACE diving operations, both government and contractor shall be performed in accordance with this manual. Failure to meet these requirements will be cause for rejection or cessation of operations.

30.A.01 Unless otherwise delegated in this section, requests for waivers or variance to the requirements of this section must be made in accordance with Appendix D of this manual through the local Designated Dive Coordinator (DDC) or the Alternate Dive Coordinator (ADC) acting on their behalf.

30.A.02 Diving shall not be used as a work method if the work objective can be more safely and efficiently accomplished by another means, including but not limited to, using Remotely Operated Vehicles (ROV's), and/or camera systems, or by dewatering the work area so work may be accomplished in the dry.

30.A.03 Surface-Supplied Air (SSA) shall be used whenever possible in accordance with the practical constraints of the diving operations.

30.A.04 Live boating will not be used without prior specific acceptance by the DDC.

30.A.05 Training documentation shall be in compliance with the OSHA Diving Standards 29 CFR 1910.410 and shall show that dive team members, including dive tenders, have successfully completed training to the appropriate level (e.g., SSA diver's certificate, surface supplied mixed-gas diver certificate). Copies of all dive-related training certificates are required. Such training shall be provided by:

a. A commercial diving school, military school, Federal school (e.g., USACE), or an Association of Commercial Diving Educators (ACDE) accredited school;

b. An in-house training program that meets the requirements contained in ANSI/ACDE-01, or in the Association of Diving Contractors International (ADCI) Consensus Standards;

c. Training for Scientific Divers using compressed air (SCUBA or SSA), shall be in compliance with 29 CFR 1910.410 and shall meet the above requirements or the training guidelines in the Standards for Scientific Diving published by the American Academy of Underwater Scientists (AAUS).

30.A.06 Proof of certification (a diploma and/or official transcript) as a commercial working diver from an accredited commercial dive school and other dive-related training certificates (e.g. chamber operator, saturation diver, etc.) are required as proof of a dive team member's certification and/or experience. An ADCI card or similar certification from an internationally recognized commercial diving organization may be substituted as proof of training for divers demonstrating more than five (5) years of diving experience within the six (6) years preceding beginning of dive operations.

30.A.07 Contractors shall provide dive-log evidence that each dive team member has training and experience consistent with the performance requirements of the scope of work.

a. As a minimum, each diver, back-up diver, and dive team supervisor shall have at least 1 year of commercial experience in the applicable position.

b. Divers shall have completed at least 4 working dives with similar decompression techniques as in the dive plan, using the particular diving techniques and equipment. Divers shall demonstrate that at least 1 of the 4 qualification dives was performed in the last 9 months prior to the start of dive operations.

c. Dive tenders must have previous experience and training as a dive tender.

30.A.08 Each dive team member shall have current certification in first aid and CPR from the American Red Cross (ARC), the American Heart Association (AHA), or from an organization whose training adheres to the standards of the International Liaison Committee on Resuscitation, or from a Licensed Physician (LP).

a. Additionally, each dive team member shall have current certification in the use of emergency oxygen systems, and, if provided on the dive site, the use of Automated External Defibrillators (AEDs).

b. All classes shall contain a hands-on component and cannot be taken online. Evidence of this will be a photocopy of the certificates. The certificate(s) shall state the date of issue and length of validity.

➢ Note: Training in the use of emergency oxygen systems shall be specific to underwater diving and shall meet the requirements of a nationally recognized training organization such as Divers Alert Network (DAN), Professional Association of Diving Instructors (PADI), National Association of Underwater Instructor s (NAUI), the YMCA or other recognized sources.

30.A.09 Divers shall receive an annual diving physical according to ADCI or similar standards preferably by a hyperbaric physician (MD or DO) or other licensed physician knowledgeable in the physiology of diving.

a. A "Fit to Dive" statement that each diver has been medically examined within the previous 12 months and has been determined fit and approved to dive shall be signed and signature stamped by the examining physician.

b. The DDC will maintain a file of physician "Fit to Dive" statement for all USACE qualified divers.

c. Contractors shall submit physician's "Fit to Dive" statement to the DDC in accordance with Section 30.A.13.

d. After any serious diving-related injury or illness such as an over-pressurization injury and/or decompression illness, divers shall be re-examined by a hyperbaric physician and be re-certified as "Fit to Dive".

30.A.10 Divers will wait at least 12 hours before flying after any dive. This interval should be extended to 24 hours following multiple days of repetitive dives.

30.A.11 When diving at altitudes of 1000 ft (304.8 m) or more of elevation above sea level, dive supervisors shall use appropriate high altitude decompression tables that compensate for the increased elevation.

30.A.12 Contract diving operations will be monitored and/or inspected by personnel qualified as USACE Dive Inspectors. Individual USACE Dive teams shall be inspected during operations at least once annually by the DDC, ADC and/or Dive Safety Representative (DSR).

a. Qualified Dive Inspectors shall hold current USACE training certification as Dive Inspector, Diver/ Dive Supervisor, Dive Safety Administrator, or Dive Coordinator. All USACE personnel used as dive inspectors must be approved by the DDC prior to performing inspector duties.

➢ Note: Use of trained monitors/inspectors with other credentials will be considered on a case-by-case basis and may be approved in writing by the DDC and HQUSACE Program Manager (PM) for Diving Safety.

b. Inspectors shall conduct on-site monitoring/inspections of contractor dive sites during pre-dive conference, equipment inspection, and initial dives. Monitoring should be continuous for the duration of the contract dive activity but may be intermittent, as determined by the DDC based on an evaluation of the job complexity and degree of hazards.

30.A.13 The following documents are required for all Contractor diving operations. All documents will be reviewed and found acceptable by two of the following: DDC/ADC/DSR, prior to start of diving operations. Contractors shall submit the documents to the DDC through the Contracting Officer (KO). Additional documentation may be required depending on the scope of the diving operation:

a. Safe Practices Manual; > See Section 30.A.15.

b. Dive Operations Plan(s); > See Section 30.A.16.

c. AHA to cover all aspects of the job; > See Section 30.A.17.

d. Emergency Management Plan; > See Section 30.A.18.

e. Dive Personnel Qualifications. > See Sections 30.A.05 – 30.A.09.

➢ Note: The above review requirement is that two USACE Qualified Personnel independently evaluate the documents prior to acceptance. The ADC may substitute for either the DDC or DSR in the review and/or acceptance process if these personnel are not available at the time of review.

30.A.14 A Dive Operations Plan, AHA, emergency management plan, and personnel list with qualifications will be developed for each separate diving operation.

a. These documents will be submitted to the DDC through the KO for review, and found acceptable, prior to commencement of diving operations and will be at the diving location at all times. Each of these documents will become a part of the project file.

b. Potential high-hazard conditions, such as penetration diving, contaminated environment diving, dives outside the no decompression limits, and in areas where differential pressure entrapment hazards exist, will be specifically addressed in the Dive Operations Plan and AHA when they are anticipated as part of the diving operation.

c. Diving in contaminated water is prohibited for all USACE projects unless supporting documentation is provided that demonstrates that divers and topside personnel are not exposed to, or will be protected from, known or potential contamination hazards that would pose a chronic or acute health risk.

(1) All divers and topside personnel shall be trained, equipped and resourced to dive in contaminated water.

(2) The dive plan shall be accepted by the GDA within 10 business days prior to dive operations and shall specifically address the areas below in accordance with the U.S. Navy Guidance For Diving In Contaminated Waters, SS521-AJ-PRO-010 located at the U.S. Navy SEA 00C3 website:

(a) Types of contaminants and Category (CAT 1, 2, 3, 4). Additional hazard scenarios and control measures shall be considered for surface, mud-line/sediment, rainfall, points of discharge, and vertical and bottom water contamination (i.e., a diver walking/crawling/working including swim fin action that stirs up bottom sediments);

(b) Levels of protection and protective equipment;

(c) Contaminated water diver and topside personnel training and qualifications;

(d) Sources of information used to determine water quality;

(e) Dive Station Decontamination Procedures for Divers and Topside Personnel;

(f) Medical evaluation support and post dive monitoring;

(g) Hazardous waste minimization and disposal.

30.A.15 Safe Practices Manual. Contractors and USACE Districts/Labs with in-house dive teams shall develop and maintain a safe practices manual that encompasses their entire diving program. The safe practices manual shall be available at all times to the Government representative and all dive team members at each diving location. The safe practices manual shall include, as a minimum, the following:

a. Dive safety procedures and checklists;

b. Assignments and responsibilities of dive team members;

c. Equipment certifications, procedures, and inspection checklists;

d. Emergency procedures for fire, equipment failure, adverse weather conditions, and medical illness or injury and specific procedures for:

(1) Entrapped or fouled diver including fouled umbilical (suction and entanglement/debris);

(2) Actions upon loss of vital support equipment;

(3) Actions upon loss of gas supply;

(4) Action upon loss of communication;

(5) Lost diver plan (SCUBA Operations only);

(6) Injured diver plan;

(7) Actions upon discovery of fire;

(8) Diver blow up/over rapid ascent to surface;

(9) Diver loss of consciousness; and

(10) Injury/illness of member of surface crew with diver in the water.

e. Procedures for internal safety inspections (frequency, checklists, etc.);

f. A complete copy of OSHA, 29 CFR 1910, Subpart T, and a statement of the employer's policy for ensuring compliance with the standard;

g. The appropriate U.S. Navy Table(s), including as a minimum:

(1) U.S. Navy Table of No-Decompression Limits and Repetitive Group Designation for No-Decompression Air Dives;

(2) U.S. Navy Residual Nitrogen Timetables for Repetitive Air Dives;

(3) U.S. Navy Standard Air Decompression Table.

h. A sample of the diving log sheets to be used;

i. A sample of the repetitive dive worksheets or equivalent (dive profile method) to be used;

j. An outline of the fitness for duty (including medical) requirements for dive team members, and

k. An outline of administrative and record-keeping procedures.

30.A.16 Dive Operations Plan. This plan is a general overview of all tasks to be performed, dive modes and equipment, site access, etc. Complex projects involving more than one work task, location, and/or dive team require task-specific dive plans as part of the overall Dive Operations Plan. As a minimum, the Dive Operations Plan will contain the following:

a. Date of dive plan submission;

b. Name and contact information for diving supervisor preparing the dive plan;

c. Names and duties of on-site dive team members, including diving supervisor;

d. List of diving equipment to be used;

e. Type of diving platform to be used;

f. Detailed description of the mission; Identify how/if work will be divided into separate tasks or phases of work;

g. Date(s), time(s), duration, and location of operation;

h. Diving mode used (SCUBA, SSA, and snorkeling) including a description of the back-up air supply, as required;

i. Nature of work to be performed by the divers, including tools used and materials to be handled or installed;

j. Anticipated surface and underwater conditions, to include visibility, temperature, currents, etc. Thermal protection will be considered as appropriate;

k. Maximum single dive bottom time for the planned depth of dive for each diver. Altitude adjustments to dive tables will be calculated for dives made at altitudes of 1000 ft (304.8 m) or more above sea level;

l. Identification of topside assistance/support to the dive team (i.e., crane operator, lock operator, etc.);

m. Means of direct communication between the dive site and the DDC, project office, the lockmaster or USACE project manager, and the contracting officer (if applicable);

n. Plans submitted for Contractor operations shall also include the name of Contractor (and diving subcontractor if applicable), Contract number, and names and contact information for key personnel.

➢ Note: The dive plan will include the following statement: "If for any reason the dive plan is altered in mission, depth, personnel, or equipment, the DDC will be contacted in order to review and accept the alteration prior to actual operation."

30.A.17 Activity Hazard Analysis (AHA). An AHA represents the dive team's best effort to anticipate and mitigate or prevent the adverse effects of equipment failure, extreme weather and environmental conditions, or other hazardous/unexpected situations.

a. AHA's shall address risk to personnel, property and to impacts to the overall USACE mission. When required, a new AHA shall be conducted to reflect changes in site conditions, operational changes, etc.

b. Each AHA will be job specific and address each phase of work, to include the hazards associated with flying after diving.

c. For USACE dive teams, a Risk Assessment Code (RAC) shall be applied to all underwater diving activities, with residual risk being approved by the appropriate level of command.

d. Hazardous Energy Control (HEC) procedures in accordance with Section 12 of this manual and procedures for dealing with differential pressures will be included if appropriate.

(1) If HEC procedures are required for the diving operation, the diving supervisor will visually check all lockout/tagout and other control procedures/devices to assure they are in place and redundant where possible prior to the commencement of the diving operation.

(2) A copy of any clearances/permits to be issued to deal with identified hazards will be attached to the AHA.

e. Some dives may be sufficiently complex to warrant several separate analyses.

f. The AHA will be covered in detail at the pre-dive conference.

30.A.18 Emergency management plan. An emergency management plan will be prepared for each dive operation. The minimum content of the plan will be as follows:

a. Location and phone number of nearest operational recompression chamber if not located at the dive site and the Divers Alert Network (DAN) phone number (919-684-9111);

b. Location, directions to and phone number(s) of nearest hospital(s) or available physicians capable of treating dive injuries;

c. Location and phone number of nearest USCG Rescue Coordination Center, where appropriate;

d. Description of an emergency victim transport plan including phone numbers of appropriate emergency transport services;

e. Procedures and phone numbers or other means of communications to activate emergency services at the facility where the work is being performed;

f. Diver rescue procedures conducted by the dive team, including responsibilities of team members, best location(s) where injured divers may be removed from the water, and best location(s) for performing first aid/stabilization prior to emergency medical assistance arrival.

30.A.19 Prior to the initial work on each dive operation, a Pre-Dive Conference shall be held with key personnel designated by the DDC to discuss the Dive Operations plan, AHA, and Emergency Management Plan and any modifications needed. For contractor operations, the pre-dive conference will also be attended by the USACE dive inspector or DDC and a representative of the Contractor with sufficient authority to implement any changes required by the USACE diving inspector or coordinator.

30.A.20 Prior to each dive, the entire dive team will be briefed in detail on the following (as a minimum):

a. Description of mission and location, including drawings and/or photographs pertinent to the mission and equipment and materials that are to be installed as part of the mission;

b. Description of diving apparatus/equipment and craft to be used;

c. Maximum working depth with estimated bottom times and water temperatures;

d. Names and duties of personnel on the team (when possible, incorporate at least one person on the dive that has previously performed the same or similar mission);

e. Discussion of AHA; and

f. Emergency procedures.

30.A.21 Upon completion of each diving operation or at the conclusion of each day, a dive team debriefing shall be conducted by the dive supervisor. At the debriefing divers are advised of the location of the nearest recompression chamber (if not located on site), the phone number for DAN or local dive medical facility, and cautioned on the limitations of their post dive activities including repetitive dives, traveling to higher altitude, and flying.

30.A.22 If for any reason the dive mission is altered:

a. Minor to moderate revisions to the accepted dive plan will be reviewed and accepted by the DDC or ADC prior to continuing the operation. These revisions may include differences in time, date, dive team members, work methods/tools used, and other changes that do not affect overall risk. This review may be conducted electronically or verbally and confirmed in writing after completion of the dive operation.

b. Major changes or those which modify high-risk activities, such as modifying pressure differential and hazardous energy controls, adding penetration diving, changing dive equipment modes (i.e. from SCUBA to SSA), discovery of unexpected contaminated diving conditions, etc. require a two-person review as outlined in Section 30.A.13.

c. For contract operations, the project superintendent or the dive supervisor shall submit/request the revised plan through the GDA for DDC acceptance.

30.A.23 All diving activities shall be conducted with full knowledge and close coordination with the GDA and on-site authorities such as the dive inspector, lockmaster/project manager, etc.

30.A.24 For each diver and dive, the following dive log information, as a minimum, shall be recorded and maintained at the dive location:

a. Full name;

b. Date, time and location of dive;

c. Maximum depth and bottom time;

d. Surface interval between dives;

e. Breathing medium and type of equipment used;

f. Group classification at the beginning and end of each interval and repetitive dive worksheet;

g. Underwater and surface conditions;

h. Depth(s) and duration(s) of any decompression stops;

i. Date and time of last previous dive if it occurred in the last 24 hours;

j. Name of Dive Supervisor(s) during dive;

k. General description of work performed; and

l. For dives outside the no-decompression limits, deeper than 100 ft salt water (fsw) (30.5m), or using mixed-gas, include depth-time and breathing-gas profiles and decompression tables (including any modifications).

30.A.25 For each dive in which decompression sickness and/or pulmonary barotraumas is suspected or symptoms are evident, the following information shall be recorded and maintained:

a. Descriptions of signs and symptoms (including depth and time of onset);

b. Description and results of treatment; and

c. Name, address, and phone number of attending physician.

30.A.26 Prior to the dive, the Dive Supervisor shall assure, as a minimum, the following pre-dive checks are performed:

a. Breathing air tanks contain sufficient air supply to perform the required work (i.e., standby air tanks are on site and full to the necessary capacity);

b. All diving equipment shall be checked for proper function prior to diver entry;

c. All necessary safety equipment specified herein is on site and functioning properly;

d. Lockout/tagout procedures are followed;

e. When applicable, crane signals are reviewed and radio communication with the crane operator is functioning properly;

f. When applicable, welding or cutting procedures are clearly reviewed, the proper welder polarity is set, and precautions have been taken to ensure that electrocution will not occur;

g. When applicable, blasting procedures are clearly reviewed and precautions have been taken to ensure unplanned/unscheduled blasts will not occur;

h. A pre-dive briefing shall be given that includes, but is not limited to, the accident management plan, AHA, equipment checklist, diving logs, diving conditions, and diving procedures;

i. When applicable, manbaskets used for diver access shall be inspected and load tested prior to use, and a Critical Lift Plan shall be submitted per Section 16.H and Section 30.B.06).

30.A.27 Copies of the dive logs shall be submitted to the DDC after completion of the dive operation. For USACE dive teams, these records shall be maintained on file for two years.

30.B Diving Operations.

30.B.01 Staging areas, where the fully suited and equipped diver enters the water, shall be selected and configured based on a hazard analysis that includes an examination of:

a. Ease of diver access to the water;

b. Hazards to diver (currents, equipment, etc.) in route from surface to work area;

c. Ability of standby diver to access the water immediately and to reach the diver quickly;

d. If used as the topside dive team station, the ability to protect topside members and the standby diver from weather, operational, and other hazards;

e. Whether topside equipment can be stowed safely and function properly;

f. If diver entry to water is remote from the staging area, the standby diver shall be placed at the water entry or immediately accessible to it.

30.B.02 All Dive teams shall be manned in accordance with the criteria established in Appendix G.

30.B.03 A standby diver will be provided whenever a diver(s) is in the water to serve as immediate emergency assistance to the primary diver(s).

a. Untethered SCUBA divers, working in “buddy” pairs, shall have one tethered standby diver at the surface for each pair.

b. A standby diver will deploy only after the dive supervisor assesses the situation and instructs him/her to do so.

c. The standby diver shall be fully equipped to dive and immediately available the entire time the diver is in the water.

(1) The standby shall don all specific gear (suits, harnesses, and equipment) they will wear/use and test all for proper operation before the primary diver leaves the surface.

(2) With the exception of Appendix G, Table G-3, the stand-by diver shall not assume other work responsibilities, other than communications, as required, with the diver.

(3) All gear shall be maintained operational and ready for immediate use for the duration of the dive. If any of the tested gear is exchanged or replaced during the dive, it shall be donned and tested by the standby.

d. The standby diver shall be dressed appropriately for the water and air temperature and remain fully suited up with helmet/mask ready for immediate donning from the time the primary diver leaves the surface until reaching the work area/working depth. The standby may remove the portions of his or her gear needed to prevent heat/cold stress and prevent fatigue. If the AHA identifies a need for the standby diver to remain fully dressed to deploy, it will address measures that will be taken to control these hazards (i.e., standby in water at surface). Any gear that has been removed must be maintained ready for immediate donning and use, accessible to the standby at the entry to the water.

e. If configuration of the surface staging area prevents safe, immediate entry of the standby into the water, the standby diver will be placed in the water fully dressed prior to the primary diver leaving the surface, and remain at the surface ready for deployment if needed.

30.B.04 Dive operations that require surface decompression as an integral part of the dive operation shall have a trained competent person (CP)/operator, whose sole purpose is to attend to the chamber operation.

a. In dive operations where the chamber is required for emergency, first aid, or used for other unexpected recompression events, a team member with other team duties (tender, console operations, etc.) not diving during the current dive may serve as the chamber operator so long as he is specifically trained and competent in hyperbaric chamber operations. If used for the latter purpose, all diving shall be suspended during the chamber operations.

b. Whenever a chamber is on site, the chamber CP/operator shall be capable of communicating with a diving physician.

c. Divers completing a recompression dive will remain within 60 minutes drive time from a fully operable and staffed recompression chamber for a minimum of 2 hours after completing the recompression dive.

30.B.05 Dive operations will be conducted in full coordination with external operations and processes that may impact the safety of the dive.

a. When the operation of machinery or release of hazardous energy will affect the diver or dive team safety, the dive supervisor will develop a HECP. > See Section 12. When diving at a facility with an existing HECP, the dive supervisor will review the facility's plan and establish positive control procedures with the facility leader.

b. When water traffic, land-based traffic, industrial operations, heavy equipment operation, or other operations exist that present a hazard to the diver or dive team, the dive supervisor shall coordinate with the controlling authorities to minimize the hazards. This shall include coordination with the USCG, as required, for establishing a safety zone.

30.B.06 Crane operations conducted to support diving operations shall follow the requirements of Section 16 of this manual.

a. All working dives requiring communications between the divers and topside to direct crane load movements, etc., shall be performed in SSA mode.

b. The crane operator will take direction from the tender or supervisor directly in communication with the diver.

c. Crane operations where the load is placed or removed while a diver is underwater shall be considered Critical Lifts and the diver/load director will participate in the Critical Lift Plan development as outlined in Section 16.H.

d. If divers are required to perform rigging duties, they must be a qualified rigger and meet the personnel qualifications listed in Section 15.B.

30.B.07 When dives will take place in an area or facility where potential or actual pressure differentials exist (i.e., locks, dams, spillways, powerhouses, etc.), the dive supervisor will develop specific plans and procedures, in coordination with the facility operator, to prevent diver exposure to pressure differentials. The plans and procedures shall be site-specific and include the following:

a. Identification of all potential exposure points (gate sills, valve openings, holes, etc.);

b. Means for identifying whether control structures/mechanisms are fully in place (measurements of stop gates and openings, valve indicators, etc.);

c. Methods for checking pressure differential openings (observing current/water flow, remote testing of opening area with objects (rope, sandbags, cinders, etc.);

d. Route diver will take from staging area to work area with specific designs to prevent diver and umbilical from uncontrolled pressure differential openings;

e. Procedures for immediate emergency pressure equalization or reduction, if possible, and

f. Procedures for emergency diver extraction or rescue due to pressure differential exposure, including standby diver deployment precautions.

30.B.08 Underwater Welding and Burning Operations.

a. Underwater welding and burning shall be limited to SSA mode only.

b. Equipment configuration and procedures shall be in accordance with the U.S. Navy Underwater Cutting & Welding Manual, S0300-BB-MAN-010.

c. Divers performing underwater welding and burning operations shall be equipped with the following as a minimum:

(1) A rubber or neoprene dive suit in good condition that provides electrical insulation to the diver;

(2) Insulating gloves with a cuff that, as a minimum, reaches and fully covers the wrist;

(3) A welding/burning eye shield attached to the dive helmet with appropriate shade for the conditions at the working area.

30.C SCUBA Operations.

30.C.01 SCUBA diving operations shall not be conducted:

a. At depths greater than 100 ft (30.5 m);

b. On dives outside the no-decompression limits unless a dual lock, multi-place, recompression chamber (capable of recompressing diver at the surface to a depth equivalent to 165 ft (50.3 m) of sea water) is available at the dive location and is immediately available for use, a trained competent operator is on site, and the chamber is of sufficient size to accommodate the diver as well as an inside tender;

c. Against currents exceeding one knot;

d. In enclosed or physically confining spaces;

e. Using closed circuit or semi-closed circuit SCUBA;

f. In visibility less than 3 ft (0.9 m) unless line tended with diver/surface two-way voice communications;

g. In areas where pressure differentials exist and it cannot be positively verified that all potential leaks have been eliminated;

h. When the diver does not have direct access to the surface.

30.C.02 Specific operational requirements for SCUBA operations are as follows:

a. The minimum sized SCUBA tank allowed as primary air is a standard 80 ft^3 aluminum tank pressurized to at least 2,700 PSI at the beginning of dive operations.

(1) Divers shall terminate their dive so that they reach the surface with a minimum tank pressure of 500 PSI.

(2) Each diver shall be equipped with a minimum 30 ft^3 bailout bottle for emergency use pressurized to at least 90 percent of its working PSI rating and equipped with a separate 1st and 2nd stage regulator. An “octopus” is not considered to be an alternate air source.

b. Each diver shall be equipped with a buoyancy compensation device (BCD) having a manually activated inflation source, an oral inflation device, and an exhaust valve.

c. Each SCUBA diver shall be equipped with a submersible cylinder pressure gauge capable of being monitored by the diver during the dive.

d. Each SCUBA diver shall be equipped with a weight belt or assembly capable of quick release.

e. Each SCUBA diver shall be equipped with a depth gauge and knife.

f. SCUBA air cylinders shall comply with the following requirements:

(1) Air cylinders of seamless steel or aluminum that meet DOT 3AA and DOT 3AL specifications are approved for used on USACE projects;

(2) Each cylinder used on USACE projects must have identification symbols stamped into the shoulder of the tank; and

(3) SCUBA tanks used on USACE projects must be visually inspected internally at least annually and hydrostatically tested at least once every 5 years in accordance with DOT and the CGA regulations; hydrostatic test dates will be stamped into the shoulder of each tank.

g. A timekeeping device shall be used for recording diving times for all SCUBA diving operations. When two-way voice communications are not used, each dive supervisor and diver shall have a timekeeping device. When two-way voice communications are used, the dive supervisor, at a minimum shall have a timekeeping device.

h. Each tethered SCUBA diver shall wear a safety harness with a positive buckling device, attachment point for the safety line, and a lifting point to distribute the pull force of the line over the diver's body while maintaining the body in a heads-up vertical position when unconscious or inert.

30.D Surface Supplied Air (SSA) Operations.

30.D.01 SSA operations shall not be conducted at depths greater than 190 ft (57.9 m) except that dives with bottom times of 30 minutes or less may be conducted to depth of 220 ft (67 m). Exceptional exposure dives, as defined by the US Navy Diving Manual, shall not be conducted except in emergency lifesaving situations. USACE in-house SSA operations shall not exceed a depth of 110 ft (33.5 m) unless a waiver is requested by the DDC and approved by the HQUSACE Dive Safety Program Manager.

30.D.02 SSA equipment components shall be a type specifically designed to be used in diving support systems.

30.D.03 A recompression chamber shall be available for all SSA operations when diving outside the decompression limits, utilizing mixed gas, and/or when diving at or deeper than 100 ft (30.5 m) is planned.

a. Under these conditions, a dual lock, multi-place, recompression chamber (capable of recompressing a diver at the surface to a depth equivalent to 165 ft (50.3 m) of sea water) must be available at the dive location and immediately available for use.

b. The chamber must be of sufficient size to accommodate the diver as well as an inside tender, and a trained chamber operator must be immediately available.

c. Sufficient oxygen shall be available to complete chamber operations.

30.D.04 A bell shall be used for dives with an in-water decompression time greater than 120 minutes, unless heavy gear is worn or diving is conducted in physically confining spaces.

30.D.05 Minimum specific operational requirements for SSA diving operations are as follows:

a. Each diver shall be continuously tendered while in the water, with one diver per tender, regardless of depth. The tender shall not perform any other duties outside of tending the diver except as allowed by Appendix G;

b. An underwater tender/diver shall be stationed at the immediate underwater point of entry when any overhead obstruction limiting direct access to the surface is present and/or penetration diving is conducted or in enclosed or physically confining spaces;

c. Each diving operation shall have a primary breathing air supply sufficient to support divers for the duration of the planned dive, including decompression;

d. Each diver must have a reserve breathing supply available that can be turned on immediately by the diver in the event of loss of air. The reserve breathing air supply shall be of sufficient capacity to recover the diver and complete emergency recompression (if required) in the event of loss of primary air but no less than 30 ft^3 (0.85 m^3). Heavy-gear diving is exempted from these provisions because the gear carries its own reserve;

e. Each dive location shall have a reserve breathing air supply integral or in-line with the primary air source sufficient to safely terminate the dive and recover the diver(s) in the event of loss of the primary air supply;

f. For dives deeper than 100 ft (30.5 m) or outside the no decompression limits and using heavy gear, a spare air supply hose, to replace the diver's air hose should it become damaged, shall be available to the standby diver. An in-water support stage shall be provided to divers in water when using heavy gear, regardless of depth;

g. Electronic communication systems with an external speaker shall be incorporated so the entire dive team can monitor communications.

(1) Communications devices shall be tested prior to each dive, maintained in an operable condition, and protected from damage during use and storage IAW the manufacturer's recommendations.

(2) All dive operations will be terminated in a safe, orderly fashion using line-pull signals if voice communications are lost.

(3) Defective electronic communication equipment shall not prevent a standby diver from deploying in an emergency if the dive supervisor determines it is safe for the diver to deploy and line-pull signals are used.

30.E Mixed-Gas Diving Operations.

30.E.01 A dual lock, multi-place, recompression chamber with a trained, competent operator shall be available and ready for use at the dive location for any mixed-gas dive. Sufficient oxygen shall be available to complete chamber operations. At extreme depth, mixed gas diving can only be done if:

a. A bell is used at depths greater than 220 ft (67 m) or when the dive involves in-water decompression time of greater than 120 minutes (except when heavy gear is worn or when diving in physically confining spaces), or

b. A closed bell is used at depths greater than 300 ft (91.4 m), except when diving is conducted in physically confining spaces.

30.E.02 Each diving operation shall have a primary breathing gas supply sufficient to support divers for the duration of the planned dive, including decompression.

30.E.03 Each diving operation shall have a reserve breathing gas supply integral or in-line with the primary air source sufficient to safely recover the diver(s) in the event of failure of the primary breathing gas supply.

30.E.04 When heavy gear is worn:

a. An extra breathing gas hose capable of supplying breathing gas to the diver in the water shall be available to the standby diver, and

b. An in-water stage shall be provided to divers in the water.

30.E.05 An in-water stage shall be provided for divers without access to a bell for dives deeper than 100 ft (30.4 m) or outside the no-decompression limits.

30.E.06 When a closed bell is used, one dive team member in the bell shall be available and tend the diver in the water.

30.E.07 Oxygen Enriched Air.

a. The use of “Oxygen Enriched Air” (OEA) such as Nitrox (EANx) breathing mixtures by USACE in-house dive teams requires the specific initial approval of the HQUSACE Dive Safety Program Manager prior to the first use of such equipment. Requests for approval will be accompanied by a written program that identifies training, certification, and procedures for OEA use. Use of OEA by Contractors requires approval by the local DDC.

b. Navy or NOAA Nitrox Dive Tables or other decompression tables designed specifically for the OEA mixture being used shall be followed without exception.

c. The use of OEA/Nitrox is considered mixed gas diving and requires a decompression chamber on site and ready for use.

30.E.08 Contractors must provide evidence of training and experience with OEA breathing mixtures prior to actual diving operations.

30.E.09 OEA breathing mixture shall be analyzed/tested by the diver to assure proper mix prior to each use. No more than 40% OEA is allowed for normal diving operations. Higher OEA concentrations are allowable for in-water decompression at shallow safety stops.

30.E.10 Use of Surface Decompression with Oxygen (SUR-D-O2) and/or 100% oxygen in-water decompression by trained and certified dive teams, shall only be authorized as a decompression methodology upon submittal of an oxygen-specific decompression plan and schedule, and only with the expressed written approval of the District Dive Coordinator or alternate.

30.F Equipment Requirements.

30.F.01 Equipment modifications, repairs, tests, calibrations, or maintenance shall be recorded by means of a tagging or logging system, and include the date and nature of work performed and the name of the individual performing the work.

30.F.02 Air compressor systems used on-site as a direct source to supply air to SSA divers (Direct Source Compressors) shall be equipped with a volume tank with a check valve on the inlet side, a pressure gauge, a relief valve, and a drain valve.

30.F.03 Direct Source compressors shall be of sufficient capacity to overcome any line loss or other losses and deliver a minimum 4.5 ft^3 (2.1 l/s), actual, or a delivery amount (cfm) as set by the helmet manufacturer, to each diver at the maximum diving depth.

30.F.04 All air compressor intakes shall be located away from/upwind of areas containing exhaust or other contaminants.

a. All shall be equipped with appropriate in-line air purifying absorbent beds and/or filters inserted into the supply line to assure breathing air quality.

b. Oil-lubricated compressors containing a petroleum or potential CO-producing lubricant for the air pressurization pistons will not be used.

c. All monitor/alarm systems shall be so designed with a visual and/or audio alarm and placed so that the dive supervisor will be made aware of the hazardous conditions.

d. Direct Source compressors shall be equipped specifically for their intended use and shall have a suitable approved means to regulate the pressure and a low air pressure alarm in the system. In addition, they will have a Carbon Monoxide (CO) monitor with alarm in the following situations:

(1) The compressor is powered by an internal combustion engine,

(2) Compressors used in close proximity to internal combustion engines that may/will be running during dive operations (boat motors, generators, cranes, etc.). Air intake pipes shall be placed away from/upwind of the exhaust source;

(3) Fueling a compressor during operation shall not be allowed.

30.F.05 Air compressor systems will be tested by means of sampling at the connection to the distribution system.

a. All air compressors with a working pressure greater than 500 psi will be tested every six months by an accredited testing laboratory.

b. Compressors with a working pressure less than 500 psi may be tested in-house with documentation every six months and must be tested by an accredited testing laboratory every two years. Lab accreditation shall be from NIST/NVLAP, American Association of Laboratory Accreditation (A2LA – for environmental or calibration) or similar recognized accreditation.

c. Purchased air must be certified by the supplier that it has been tested and meets the standards below.

d. A copy of the certificate of analysis showing the breathing air meets the minimum acceptable criteria shall be provided to the GDA.

e. Air purity standards are as follows:

(1) Air shall not contain a level of carbon monoxide greater than 10 ppm;

(2) Air shall not contain a level of carbon dioxide greater than 1,000 ppm;

(3) Air shall not contain a level of oil mist greater than 5 mg/m3;

(4) Air shall not contain a level of hydrocarbons other than methane greater than 25 ppm; and

(5) Air shall not contain a noxious or pronounced odor.

30.F.06 Breathing supply hoses.

a. Breathing air supply hoses shall be suitable for breathing gas service or shall be specifically manufactured for SSA use. Hoses shall have a maximum allowable working pressure equal to or greater than supply pressure plus 150 psi.

b. Breathing air supply hoses shall have connectors made of corrosion resistant materials and have a working pressure at least equal to the working pressure of the hose to which they are attached: connectors must not be able to become accidentally disengaged.

c. Umbilicals shall be marked, beginning at the divers end, in 10 ft (3 m) increments to 100 ft (30.5 m) and in 50 ft (15.2 m) increments thereafter. > See Table 30-1. USACE in-house dive teams shall use the following umbilical marking system found in the ADCI Consensus Standard 006 in order to assure consistency and interoperability:

d. Umbilicals shall have a nominal breaking strength of 1000 lb (453.6 kg) and shall be made of kink resistant materials.

e. Hoses must be tested prior to being placed into initial service and after any repair, modification, or alteration, and at least every 12 months to 1.5 times the working pressure. Umbilical assemblies shall be tensile tested at the same time intervals by subjecting each hose-to-fitting connection to a 200 lb axial load.

f. When breathing gas hoses are not in use, their open ends must be closed by capping.

g. The umbilical assembly used for the standby diver must be of sufficient length to reach the primary diver at the furthest distance he can proceed from the dive station or beyond.

h. Umbilicals shall be carefully tended to maintain them and the diver clear of hazards such as propellers (including those of ROV's) or intakes present in the diving zone, so that the diver or umbilical cannot be drawn into them.

30.F.07 SSA and mixed-gas helmets and masks shall have a non-return valve at the attachment between the helmet or mask and hose which will close readily and also have an exhaust valve.

a. Helmets and masks shall have a minimum ventilation rate capacity of 4.5 ft^3 (2.1 L/s) (actual) at the depth at which they are operated.

b. The use of Jack Brown masks is prohibited on SSA operations unless it incorporates electronic communication and a means of incorporating a diver carried bailout system.

TABLE 30-1

Umbilical Markings

Distance (from diver's end)	Marking
10 ft [3 m]	one white band
20 ft [6.1 m]	two white bands
30 ft [9.2 m]	three white bands
40 ft [12.2 m]	four white bands
50 ft [15.2 m]	one yellow band
60 ft [18.3 m]	1 yellow/1 white
70 ft [21.3 m]	1 yellow/2 white
80 ft [24.4 m]	1 yellow/3 white
90 ft [27.4 m]	1 yellow/4 white
100 ft [30.5 m]	1 red band
150 ft [45.7 m]	1 red/1 yellow
200 ft [61 m]	2 red bands
250 ft [76.2 m]	2 red/1 yellow
300 ft [91.5 m]	3 red bands

➢ Note: For each 50 ft (15.2 m) thereafter the sequence continues by increasing the number of red bands at each even increment of 100 ft (30.5 m). In cases where the umbilical color matches an above band color, a reasonable substitute may be used (contrasting outline on same-color tape, contrasting diagonal pattern, replacement with color not used above).

30.F.08 SSA and mixed-gas helmets and masks must be capable of supporting a reserve breathing supply which can be immediately turned on by the diver in event of loss of air.

30.F.09 SSA and mixed-gas helmets and masks must be capable of supporting a two-way or four-way diver-surface communication system.

30.F.10 Weights and harnesses. Unless heavy gear is worn, each tethered diver shall wear a divers safety harness with a positive buckling device, attachment point for the safety line, and a lifting point to distribute the pull force of the line over the diver's body while maintaining the body in a heads-up vertical position when unconscious or inert.

30.F.11 The following emergency and first aid equipment shall be located at all dive sites:

a. A first aid kit meeting the requirements of Section 3;

b. An oxygen resuscitation system shall contain a pocket mask with O_2 inlet, non-rebreather mask, demand inhalator and/or demand resuscitator capable of delivering oxygen for a minimum of 30 minutes at 15 lpm or until emergency medical assistance can be administered; and

c. A stokes litter or backboard, equipped with at least four body straps and snap buckles, a head block and have flotation capability.

30.F.12 When diving from vessels, International alpha code and recreational dive flags with a minimum dimension of 23 in (58.4 cm) will be displayed a minimum of 3 ft (0.9 m) above the working surface at the dive location during diving operations. When diving from surfaces other than vessels in areas capable of supporting marine traffic, a rigid replica of the international code flag "A" at least 3 ft (1 m) in height shall be displayed at the dive location in a manner which allows all-round visibility, and shall be illuminated during night diving operations.

30.F.13 Hand-held power tools shall be tested and certified to be safe for underwater use. These tools shall be de-energized at the surface before being placed into or retrieved from the water and shall not be supplied with power until requested by the diver.

30.F.14 The use of one-atmosphere suits (e.g., Newt Suits) requires the specific approval of the MSC DDC and FOA DDC prior to the use of such equipment.

30.G Scientific Snorkeling.

30.G.01 Scientific snorkeling will be conducted only with prior acceptance of the DDC.

30.G.02 Scientific snorkeling will be allowed only for environmental assessments such as fish surveys, stream surveys, and the like. It will not be used for structural inspections or other work.

30.G.03 An on-site snorkeling team shall be made up of no less than two persons: snorkeler, and observer/assistant. Additional site personnel may be required by the DDC or Safety Office DSR based on site hazards and conditions. Snorkeling team plans and procedures shall be developed and enacted by a team supervisor who is qualified and experienced in scientific snorkeling.

30.G.04 Quality assurance for contractor snorkeling operations will be provided by USACE certified Diving Inspectors or qualified USACE scientific snorkelers.

30.G.05 Scientific snorkeling will only be done on the surface of the water. No diving of any kind is permitted.

a. Untethered scientific snorkeling will NOT be allowed in waters deeper than 5 ft (1.5 m), in bodies of water that a snorkeler cannot wade across, or anywhere a pressure differential may exist.

b. Scientific snorkeling in open waters greater than 5 feet deep may be allowed by the local DDC based on an acceptable AHA and compliance with all of the following:

(1) The snorkeler shall be tethered with a harness and a maximum of 40 ft (12.2 m) of floating line;

(2) The tether must be constantly tended from the shore or boat;

(3) The snorkeler must wear a device providing a minimum of 15.5 lbs (7 kg) of positive buoyancy (Type III PFD, fully inflated snorkeling vest, etc.), and

(4) There are no potential tether entanglement hazards in the snorkeling area (overhanging branches, surface stumps, rocks, etc.).

30.G.06 All snorkelers and observers/assistants will be certified as skin divers (snorkelers) or open water divers by a nationally-recognized organization (e.g., Professional Association of Diving Instructors (PADI), National Association of Underwater Instructors (NAUI), etc.) or the U.S. Forest Service Snorkel Safety Program.

30.G.07 An observer/assistant will accompany each untethered snorkeler either along the shore or in a boat and be within 50 ft (15.2 m) of the snorkeler at all times.

a. Two untethered snorkelers in the same body of water may act as observer/ assistant for each other if they remain within 50 ft (15.2 m) of each other.

b. Non-snorkeling observer/assistants shall wear a PFD and be equipped with a throw bag and/or ring buoy with at least 70 ft (21.3) of line, and must be capable of performing a rescue on the specific snorkeler(s) in an emergency.

30.G.08 Areas of extreme water velocity and turbulence will be avoided especially those immediately upstream from debris jams or bedrock outcrops.

30.G.09 Snorkelers will be provided with appropriate thermal protection.

30.G.10 Employees will be determined medically fit by a licensed physician (DO or MD) prior to snorkeling. This certification shall be signed by a physician familiar with sports medicine, and state that each snorkeler is physically and medically fit to perform snorkeling activities according to commonly accepted sports medicine guidelines. The Contractor shall submit such certification to the GDA for acceptance.

30.G.11 All snorkeling team members shall be certified in first aid and CPR. Certification shall be in accordance with most recent Emergency Cardiovascular Care (ECC) guidelines, and/or American Heart Association or ARC standards.

30.G.12 A first aid kit meeting the requirements of Section 3 will be available at each location where snorkeling is being performed. A means of securely transporting an unconscious person, such as a litter or stretcher, shall be provided when snorkeling is conducted in areas inaccessible to vehicles or boats.

30.G.13 A means of communication capable of contacting emergency services must be available at locations where snorkeling is performed.

30.G.14 Each snorkeler will be equipped with a Dive Equipment Manufacturer's Association (DEMA) rated professional grade mask, fins, snorkel and snorkeling vest.

30.G.15 A snorkeling protocol will be developed and included in the project file. It will contain as a minimum, the following:

a. An AHA for each specific snorkeling mission. Particular detail will be given to currents and other environmental considerations;

b. Records for snorkeling activities will be maintained and will include as a minimum:

(1) Snorkeler's annual physician certifications;

(2) AHAs, and

(3) A snorkeling plan that is based on the requirements of Section 30.A.15.a-e. Contractors shall submit these to the GDA for acceptance by the DDC/SOH Dive Safety Officer a minimum of 10 days prior to start of work.

30.G.16 Snorkelers will wear apparel which provides appropriate protection from environmental conditions. The apparel must include fins or other appropriate foot protection.

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SECTION 31

Tree Maintenance and Removal

31.A General. The references used in this section are: ANSI Z133, American National Standard for Arboricultural Operations – Safety Requirements; 29 CFR Part 1910 OSHA General Industry; 29 CFR 1910.269, Electrical Power Generation, Transmission, and Distribution; ANSI A300, American National Standard for Tree Care Operations – Tree, Shrub, and Other Woody Plant Management – Standard Practices; ANSI/SIA A92.2, American National Standard for Vehicle-Mounted Elevating and Rotating Aerial Devices.

31.A.01 Tree felling and maintenance shall be performed IAW a Tree Felling and Maintenance Program that has been developed by/under the direction of a qualified tree worker and in accordance with references above and this Section. This Program shall be submitted to the GDA for acceptance prior to work being performed.

a. The services of other licensed or credentialed professionals may be necessary to properly address the required maintenance to be performed and/or hazards that may be encountered.

b. Examples of credentialed professionals include but are not limited to: TCIA-accredited Tree Care Company, Certified Arborist, Licensed Tree Expert, Certified Tree Care Safety Professional (CTSP), Certified Crane Operator, Rigger or Signalperson, or Certified Utility Safety Professional (CUSP).

31.A.02 Personal protective equipment (PPE), as outlined in this section, shall be required when there is a reasonable probability of injury or illness that can be prevented by such protection.

a. A hardhat and eye protection should be worn for all tree maintenance and removal operations.

b. Training shall be provided in the use, care, maintenance, and proper fitting of PPE. > See also Section 05.

31.A.03 Working near electrical equipment and systems. > See Section 11 and 29 CFR 1910.269.

a. Employees working in the proximity of electrical equipment or conductors shall consider them to be energized.

b. A qualified tree worker shall make a visual inspection to determine whether an electrical hazard exists before climbing or performing any work in or on a tree.

(1) If electrical lines or equipment cannot be safely avoided, arrangements shall be made with the power company to mitigate the electrical hazard. Mitigation options should include de-energizing, testing, isolating and grounding the electrical conductors by the power company as well as all safe OSHA-compliant and practical work methods.

(2) The qualified tree worker and designated power company representative shall confirm that protective ground(s) have been installed as close to the work to be performed to prevent hazardous differences in electric potential.

c. Only a qualified line-clearance tree trimmer or line-clearance trainee under the direct supervision of a qualified person (QP) for electrical hazards shall be assigned to work in close proximity to electrical hazards.

➢ Note: Qualified line-clearance tree trimmers should be certified by the employer according to OSHA in 29 CFR 1910.269.

d. There shall be a second qualified line-clearance tree trimmer or line-clearance tree trimmer trainee within normal voice communication during the clearing operations aloft under the following conditions:

(1) When the line-clearance tree trimmer or line-clearance tree trimmer trainee must approach any closer than 10 ft (3 m) to any conductor or electrical apparatus energized in excess of 750 volts;

(2) When branches or limbs being removed cannot first be cut (with a pole pruner/pole saw) sufficiently clear of the equipment or conductors so as to avoid contact; or

(3) When roping is required to remove branches or limbs from such equipment or conductors.

e. Line-clearance tree trimmers and trainees shall maintain the distances from energized conductors as specified in Table 11-3. All other tree workers shall maintain a minimum separation distance of 10 ft (3 m) or greater according to Table 11-1.

f. Aerial devices that are electrically rated above the electrical voltages of adjacent power lines are exempt from the 10 ft (3 m) rule, and can follow Table 11-3 if operators have been electrically qualified. Operators shall be instructed that insulated aerial devices do not protect them from other potentially fatal electric paths to the ground, such as paths through trees, guy wires, or from phase-to- phase contact.

g. Electrically rated aerial devices shall be tested yearly with approved test methods and equipment, in accordance with ANSI/SIA A92.2.

31.A.04 Equipment.

a. Equipment shall be inspected, maintained, repaired, and used in accordance with manufacturers' instructions.

b. Employees shall be instructed in the safe and proper use of all equipment provided to them.

c. See Section 21 for Climbing Equipment Requirements.

31.A.05 Climbing lines shall not be used to lower limbs or other parts of trees or to raise or lower equipment, with the exception of hand tools.

31.A.06 Tool handles shall be used when raising and lowering tools.

31.A.07 Tools used for cabling, bark tracing, cavity work, etc., shall be carried in a bag, belt, or sheath designed to hold tools and not put in the pockets or stuck in the top of a boot.

31.A.08 Elevating Aerial Work Platforms (AWPs).

a. AWPs shall be provided with fall protection anchor(s) meeting design requirements of the ANSI/SIA A92.2 on which to secure an approved system of personal fall protection (e.g., full body harness with an energy-absorbing lanyard), which shall be worn by the operator(s) whenever aloft.

b. The operator may use a climber's belt and lanyard in place of a full body harness if he/she intends to transfer from the AWP to the tree. The employee shall be secured to the tree prior to removing the lanyard attached to the basket. Under no circumstances shall the employee perform any work while secured to both the tree and the basket.

c. See Section 21.H for all other fall protection requirements.

31.B Tree Climbing.

31.B.01 Tree Climbing Techniques.

a. All tree work operations above a height of 12 ft (3.6 m), whether there are electrical hazards or not, shall require a second worker in the area. If climbing is being performed, the second worker shall also be a qualified climber, capable and knowledgeable of rescue techniques, including self rescue.

b. Use of Rope Access techniques should only be used where other means of accessing the tree or undertaking the work, such as aerial devices or pole saws, are not

practical. > See Section 24 for recommended rope climbing equipment, techniques, and safety practices.

31.B.02 The climber shall inspect the tree and surrounding area for hazards and perform a risk assessment of the tree and work site. Some issues to be considered are: power lines, tree hangers or broken and dead branches, entanglement with adjacent or downed trees, shape and lean of the tree, tree damage from wind, lightning, disease, location of septic lines and tanks and other potential at-grade or below-grade utilities that could be impacted.

a. Debris and other objects shall be removed from beneath the climber whenever possible.

b. Weather conditions shall be assessed as well as location of adjacent structures. Adverse weather conditions may include lightning and thunderstorms in the area.

31.B.03 Where climbing is required, tree crews shall have a secondary climber who could assist in a rescue if necessary OR the crew shall be working in proximity to nearby crews with a climber who could assist in a rescue.

31.B.04 A climber shall have available a climbing line and at least one other means of being secured, on their person at all times (e.g., climbing line and a work positioning lanyard, etc.).

a. The climber shall be tied in with an approved type of climbing line and safety saddle while ascending the tree, including when using climbing spurs/gaffs.

b. The climber shall be tied in once the work begins and shall remain tied in until the work is completed and he or she has returned to the ground.

c. The climber shall be secured when repositioning the climbing line.

d. Work may be performed while standing on a ladder only when the worker is tied in or secured as required.

31.B.05 The climbing line shall be passed around the trunk of the tree as high above the ground as possible using branches with a wide crotch to prevent any binding of the safety line. The crotch selected for tying should be directly above the work area, or as close to such a position as possible, but located in such a way that a slip or fall would swing the climber away from any electrical conductor. The line shall be passed around the main leader or an upright branch, using the limb as a stop. Feet, hands, and ropes shall be kept out of tight V-shaped crotches.

➢ Exception: Palms and other trees with similar growth characteristics that will not allow a climbing line to move freely.

31.B.06 The climber shall tie a stopper knot (e.g., figure-eight knot) in the end of the line, particularly when the climber will be working at heights greater than half the length of the climbing line, to prevent pulling the climbing line accidentally through the climbing hitch and possibly falling.

31.B.07 If it is necessary to re-crotch the climbing line in the tree, the climber shall re-tie in or use the safety strap before releasing the previous tie.

31.B.08 The climber working from a stem or spar without a suitable natural crotch shall select tie-in points or a tie-in method that positively prevent the climbing line from sliding down or up, or off the stem during climbing operations.

a. Placing a climbing line around a stem in an area without a lateral limb is not acceptable unless the climbing line is cinched or choked around the stem or runs through a double-wrapped or adjustable false crotch, which is secured/cinched around the stem.

b. The tie-in point selected shall be able to withstand the forces being applied during the pruning/removal operation.

31.B.09 Climbers shall not carry tools in their hands while climbing. Chainsaws and tools shall be raised and lowered one at a time by means of a line, except when working from an aerial-lift device or during topping or removing operations.

31.B.10 Chainsaws used aloft shall be secured against falling. Climbers may attach chainsaws weighing less than 15 lbs (6.8 kg) to themselves by means of a saw lanyard.

31.B.11 Climbers shall carry a hand saw. When carried aloft, the hand saw shall be carried in a scabbard attached to the safety saddle.

31.B.12 Climbing of dead and dying trees shall only be performed where no other safe and feasible alternative exists for removal of the tree. Climbers shall not trust the capability of a dead branch to support his/her weight. If possible, dead branches should be broken off on the way up and hands and feet should be placed on separate limbs.

31.B.13 Climbing with tree spurs on live trees that are being pruned or otherwise maintained is generally not allowed, in accordance with tree care management standards found in ANSI A300.

a. Tree spurs used for thick bark trees shall have longer gaffs, such as 2 ¾ in (7 cm). Gaff lengths of 1 ¾ in (4.5 cm) are intended only for pole climbing.

b. Gaff lengths shall be suitable for the tree being climbed.

31.B.14 Climbing techniques. The climber may apply a variety of climbing techniques, but they must be approved by the GDA.

a. Climbing without the use of tree spurs may be required.

b. The most commonly used arborist rope climbing technique is the “Advancing the Rope and Body Thrusting/Alternate Lanyard Technique”.

c. If the climber can remain near the trunk of the tree, he may use both the belt lanyard/flip line and the Rope Advance (lifeline) technique. Otherwise, a single line access is permitted. If a lifeline (Access Line) cannot be set in the tree, then the use of two flip lines may be used.

d. The use of auto-locking belay devices or tree climber’s hitches is both permitted.

e. Climbers shall not ascend above their tie in point. Tie-in points shall be well above the climber to prevent an uncontrolled pendulum swing in the event of a slip.

f. Once in the tree, climbers shall be tied off at two points while working or using the chainsaw, (this includes the primary support of the access line or climbing line, and secondary support with a second climbing line or the flip line/lanyard/buck strap).

(1) Climbers may ascend or descend from the tree using only the access line by using approved single rope techniques.

(2) Once the worker is at the tie-in point, a secure climbing system shall be installed.

(3) The climber shall disconnect from the access line only when a new tie in point has been established.

g. Use of the three-point contact climbing is recommended if possible. Climbers may use ground personnel to help pull them up the tree.

h. Tree climbers shall be medically cleared every 2 years by a licensed healthcare provider for unlimited tree climbing. The examination will have an emphasis on identifying and providing mitigating factors for prior heat/cold injuries, the ability to work at heights on uneven surfaces, and any environmental allergens. Additionally it will ensure that there are no medical conditions or medications which could affect balance, the ability to communicate with others, level of consciousness, extremity sensation, fine motor movement, gross motor movement, or the ability to physically lift or lower oneself.

31.C Felling.

31.C. 01 Prior to felling operations, the employee shall consider the associated hazards that may include, but are not limited to:

a. Tree size (e.g., able to fit in landing zone);

b. Selected direction of fall;

c. Felling path obstacles to avoid or clear;

d. Vines or interlocking limbs;

e. Species and shape of tree;

f. Lean of tree;

g. Loose limbs, hangers, broken tops, chunks, or other overhead material;

h. Wind force and direction;

i. Decay, cavities, or weak spots throughout the tree;

j. Location of any electrical conductors or other wires;

k. Tree cables, bracing, lightning protection, or other tree hardware;

l. Size and terrain characteristics or limitations of work area;

m. Potential for flying debris from tree impact;

n. Adequate retreat path;

o. Evidence of bees or wildlife habitation in tree;

p. Poisonous plants, water hazards;

q. Ability to control access to work site;

r. Authority to remove tree;

s. Quality of wood fiber in hinge area;

t. Root mass stability;

u. Ice or snow load;

v. Throw-back or bounce-back potential;

w. Potential for spring poles;

x. Lodged trees or dead snags in area;

y. Access to tools or resources required for task;

z. Lightning damage;

aa. Barber chair potential;

bb. Foreign objects, nails, wire fence, concrete, etc. in the tree.

31.C.02 Prior to felling operations, the work area shall be cleared to permit safe working conditions and an escape route shall be planned. Workers shall ensure that homes and structures are evacuated where trimming and felling operations are in close proximity.

31.C.03 Felling paths shall be at least twice the distance as the height of the tree (due to limbs and debris being thrown after hitting the ground. Where this distance cannot be maintained, limbing may be required. Power lines may also need to be dropped or de-energized.

31.C.04 Each worker shall be instructed as to exactly what he is to do. All workers not directly involved in the operation shall be kept clear of the work area.

31.C.05 Before starting to cut, the chainsaw operator shall be sure of his footing and must clear away brush, fallen trees, and other materials that might interfere with cutting operations.

31.C.06 A notch and backcut shall be used in felling trees over 5 in (12.7 cm) in diameter (measured at breast height). No tree shall be felled by “slicing” or “ripping” cuts.

a. The two cuts that form the notch shall meet at a point called the apex, and shall not cross that point or go beyond the point where they meet.

b. The notch cut used shall be a conventional notch, an open-face notch, or a Humboldt notch.

c. Notches shall be 45 degrees or greater and large enough to guide the fall of the tree or trunk.

d. Notch depth should not exceed one-third the diameter of the tree. The hinge width should be 80 percent of the tree's diameter, as measured at the hinge.

e. Saw cuts made to form the notch and back cut shall leave suitable amounts of hinge wood to adequately control the directional fall of the tree.

f. With a conventional notch or Humboldt notch, the back cut shall be 1 to 2 in (2.5 to 5 cm) above the apex of the notch to provide an adequate platform to prevent kickback of the tree or trunk. With an open-face notch (greater than 70 degrees), the back cut should be at the same level as the apex of the notch.

31.C.07 If sections of the tree are to be removed, sections shall be limited in lengths to one-third of the distance to the nearest structure [e.g. If the tree is 30 ft (9 m) from the structure, sections shall be no more than 10 ft (3m)].

➢ Note: The discretion of the chainsaw operator must be used. In some instances it may be safer to fell a large trunk away from the structure rather than to remove it in small sections, especially where the tree has grown very close to the house or structure. If this is done, a tag line shall be used to help guide the direction of the fall along with the use of proper notch and backcut.

31.C.08 The chainsaw operator shall work from the uphill side whenever possible. Tag lines may be used to help guide the direction of the fall provided the workers on the tag line are well clear of the fall path, such as twice the distance of the fall area.

31.C.09 Just before the tree of limb is ready to fall, an audible warning shall be given to all those in the area. All persons shall be safely out of range when the tree falls.

31.C.10 If there is danger that the trees being felled may fall in the wrong direction or damage property, wedges, block and tackle, rope, or wire cable (except when an electrical hazard exists) shall be used. All limbs shall be removed from trees to a height and width sufficient to allow the tree to fall clear of any wires and other objects in the vicinity.

31.C.11 Special precautions shall be taken when roping rotten or split trees due to the potential for falling in an unexpected direction even though the cut is made on the proper side.

31.C.12 Persons shall be kept back from the butt of a tree that is starting to fall.

31.D Brush Removal and Chipping.

31.D.01 Brush and logs shall not be allowed to create a hazard at the work site.

31.D.02 Employees working with a brush chipper shall be trained in its safe operation. The chipper shall be operated in accordance with the manufacturer’s recommendations.

31.D.03 Brush chippers.

a. Rotary drum and disk-type tree or brush chippers not equipped with a mechanical in-feed system shall be equipped with an in-feed hopper not less than 85 in (2.2 m) (the sum of the horizontal distance from the chipper blade out along the center of the chute to the end of the chute and the vertical distance from the chute down to the ground).

b. Rotary drum and disk-type tree or brush chippers not equipped with a mechanical in-feed system shall have a flexible anti-kickback device installed in the in-feed hopper for the purpose of protecting the operator and other persons in the machine area from the hazards of flying chips and debris.

c. Disk-type tree or brush chippers equipped with a mechanical in-feed system shall have a quick stop and reversing device on the in-feed. The activating mechanism for the quick stop and reversing device shall be located across from the top, along each side of, and as close as possible to the feed end of the in-feed hopper and within easy reach of the operator.

d. The feed chute or feed table of a chipper shall have sufficient height on its side members to prevent operator contact with the blades or knives during normal operation.

e. Bush chippers shall be equipped with a discharge chute of sufficient length or design to prevent contact with the blade.

f. Brush chippers shall be equipped with a locking device on the ignition system to prevent unauthorized starting of the equipment.

g. Brush chipper cutting bars and blades shall be kept sharp, properly adjusted, and otherwise maintained in accordance with the manufacturer's recommendations.

h. Trailer brush chippers detached from trucks shall be chocked or otherwise secured.

i. All workers feeding brush into chippers shall wear eye protection. Loose clothing, gauntlet-type gloves, rings, and watches shall not be worn by workers feeding the chipper.

j. Employees shall never place hands, arms, feet, legs, or any other part of the body on the feed table when the chipper is in operation or the rotor is turning. Push-sticks (of material that can be consumed by brush chipper) or long branches shall be used to feed shorter material into the chipper.

k. Brush chippers shall be fed from the side of the centerline, and the operator shall immediately turn away from the feed table when the brush is taken into the rotor. Chippers shall be fed from the curbside whenever possible.

l. Material such as stones, nails, sweepings, etc. shall not be fed into brush chippers.

m. The brush chipper discharge chute or cutter housing cover shall not be raised or removed while any part of the chipper is turning or moving.

31.E Other Operations and Equipment.

31.E.01 Pruning and trimming.

a. Pole pruners, pole saws, and similar tools shall be equipped with wood or nonmetallic poles. Actuating cords shall be of a non-conducting material.

b. Pole pruners and pole saws shall be hung securely in a vertical position with the sharp edges away from employees. They shall not be hung on utility wires or cables or left overnight in trees.

c. When necessary, warning shall be given by the worker in the tree before a limb is dropped.

d. A scabbard or sheath shall be hooked to the climbing belt to carry a handsaw when not in use.

e. A separate lowering/rigging line shall be attached to limbs that cannot be dropped safely or are too heavy to be controlled by hand. The lowering/rigging line should be held by workers on the ground end of the rope. Use of the same crotch for both the climbing line and the lowering/rigging line shall be avoided.

f. Cut branches shall not be left in trees overnight.

g. A service line shall be installed for operations lasting overnight or longer and shall be used to bring the climbing line back into position at the start of the next day's work.

31.E.02 Limbing and bucking.

a. Chainsaw cut-resistant leg protection shall be worn by the chainsaw operator for all chainsaw operations on the ground.

b. When more than one worker is limbing or bucking a tree, each shall be positioned and their duties organized so that the actions of one worker will not create a hazard for any other worker.

c. Branches bent under tension shall be considered hazardous.

d. Chainsaws should be operated away from the vicinity of the legs and feet. Natural barriers, such as limbs between the saw and the body, should be employed where possible, while ensuring proper balance. While operating a chainsaw, the preferred working position is on the uphill side of the work.

e. The tree worker shall block the log to prevent rolling when necessary. Before bucking or limbing wind-thrown trees, precautions shall be taken to prevent the root ball or butt log from striking a worker.

f. When bucking, wedges shall be used as necessary to prevent binding of the guide bar or chain.

g. The worker shall make sure of firm footing before and during limbing and bucking. The worker shall not stand on loose chunks or logs that will roll when the cut is complete.

31.E.03 Stump removal.

a. Stump cutters shall be equipped with enclosures or guards that effectively protect the operator.

b. When flush cutting stumps with a chainsaw, all persons assisting the chainsaw operator shall wear the same level of PPE that is required of the chainsaw operator.

31.E.04 Cabling.

a. Branches that are to be cabled shall be brought together to the proper distance by means of a block and tackle, a hand winch, a rope, or a rope with a come-along.

b. No more than two persons shall be in a tree working at opposite ends during cabling installation.

c. In general, if an old cable system is being replaced, the old system should not be removed until after the new system is installed.

d. When the block and tackle is released, workers in trees shall be positioned off to one side in order to avoid injury in case the lag hooks pull out under the strain.

e. Ground persons shall not stand under the tree when cable is being installed.

31.E.05 Topping/Lowering Limbs.

a. Workers performing topping operations shall ensure the trees can stand the strain of topping procedures; if not, some other means of lowering the branches shall be used.

b. If large limbs are lowered in sections, the worker in the tree shall be above the limb being lowered.

31.E.06 Trucks.

a. A steel bulkhead or equivalent protection shall be provided to protect the occupants of vehicles from load shifts.

b. Logs or brush shall be securely loaded onto trucks in such a manner as not to obscure taillights or brake lights and vision, or to overhang the side.

c. In order to avoid the hazard of spontaneous combustion or the production of undesirable products, wood chips shall not be left in trucks for extended periods.

31.E 07 Power saws.

a. When used by a climber aloft, chainsaws weighing more than 15 lbs (6.8 kg) shall be supported by a separate line crotched in the tree. Where there are no lateral branches on which to crotch a separate support line, a false crotch shall be used.

b. Use of hydraulic or electric power saws is permissible. Corded electrical power saws or other corded electric tools shall not be used in the vicinity of overhead power lines.

c. The engine shall be started and operated only when all co-workers are clear of the saw and then in accordance with the manufacturer's recommendations and instructions.

d. The operator will shut off the saw when carrying it over slippery surfaces, through heavy brush, and when adjacent to personnel. The saw may be carried running (idle speed with the brake set) for short distances (less than 50 ft (15.2 m)) as long as it is carried to prevent contact with the chain or muffler.

e. All saws shall be equipped with a clutch, chain brake (gas only), throttle trigger latch, stop switch, rear hand guard, chain catcher, vibration damper, spark arrestor, and muffler.

f. Chainsaw chains shall be kept sharp and properly adjusted.

g. Chainsaws shall be operated per Section 13.F.

h. Additional PPE for chainsaw use includes chaps, safety boots, and hearing protection. Hearing protection may not be needed on hydraulic saws.

i. Gas-powered chainsaws shall be equipped with a control that will return the saw to idling speed when released.

j. A chainsaw shall not be left running while a climber is ascending, descending or moving any considerable lateral distance in the tree.

31.E.08 Chopping tools.

a. Chopping tools that have loose or cracked heads or splintered handles shall not be used.

b. Chopping tools shall never be used while working aloft.

c. Chopping tools shall be swung away from the feet, legs, and body, using the minimum power practical for control.

d. Chopping tools shall not be driven as wedges or used to drive metal wedges.

e. All edged tools and blades shall be properly sheathed when not in use.

31.E.09 Cant hooks, tongs, and carrying bars.

a. Hooks shall be firmly set before applying pressure.

b. Workers shall be warned and shall be in the clear before logs are moved.

c. The points of hooks shall be at least 2 in (5 cm) long and shall be kept sharp.

d. Workers shall stand to the rear and uphill when rolling logs.

31.E.10 Wedges and chisels.

a. Wedges and chisels shall be properly pointed and tempered.

b. Only wood, plastic, or soft metal wedges shall be used with power saws.

c. Wood-handled chisels should be protected with a ferrule on the striking end.

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SECTION 32

Airfield and Aircraft Operations

32.A General.

32.A.01 The following safety requirements shall be in addition to the airfield's safety requirements. When an airfield has safety requirements that differ from those of this Section, the more stringent requirements shall prevail.

32.A.02 Construction Safety and Phasing Plan (CSPP) and a Safety Plan Compliance Document (SPCD). Prior to the performance of any work upon or around an airfield, a CSPP and a SPCD will be prepared by a Competent Person (CP). The CSPP will follow the guidelines found in the most current edition of Federal Aviation Administration (FAA) Advisory Circular AC No: 150/5370-2F, Operational Safety on Airports During Construction.

a. The CSPP and SPCD shall be reviewed and accepted by the GDA. The GDA will ensure the airfield's appropriate FAA Regional or District Office is notified of the construction and will provide the FAA a copy of the CSPP and SPCD.

b. The Airfield Manager shall review and accept the CSPP and SPCD no later than 14 days prior to beginning work.

c. Ensure prompt submittal of a Notice of Proposed Construction or Alteration (FAA Form 7460-1) for conducting an aeronautical study of potential obstructions such as tall equipment (cranes, concrete pumps, etc.), stock piles, and haul routes. One form may be filed describing the entire construction area and maximum equipment height or a separate form can be filed for each potential obstruction. In the former case, a separate form must be filed for any object beyond or higher than the originally evaluated area/height.

d. The GDA and Airfield Manager shall be informed in writing of proposed revisions to the approved CSPP and SPCD.

e. The GDA shall keep the airport operator informed so that a Notice to Airmen (NOTAM) can be issued to reflect hazardous conditions or changes to the CSPP.

32.A.03 Unless a runway is closed by the airfield operator and properly marked, it shall not be used for purposes other than aircraft operation without permission of the GDA.

32.A.04 All paved surfaces, such as runways, taxiways, and hardstands, shall be kept clean at all times, particularly with regards to stones and other small objects that might damage aircraft propellers or jet aircraft. Sweeping operations shall be performed by truck mounted vacuum sweeper capable of regenerative air sweeping and water to minimize dust generation. When possible, magnetic bar assemblies should be attached to vehicles and used to pick up ferrous metal foreign object debris (FOB).

32.A.05 When mobile equipment is not actively being utilized to perform work on an airfield, it shall be removed to a location(s) that is approved by the GDA and at a minimum distance required by the GDA (plus any additional distance necessary to ensure the safety of airfield operations) from the runway centerline and outside the Runway Safety Area (RSA), the Obstacle Free Zone, and the Runway Object Free Area of active runways.

32.A.06 Excavations.

a. Open trenches or excavations are not permitted within the RSA while the runway is open or on the Taxiway Surface Area while the taxiway is open. If possible, backfill trenches before the runway or taxiway is opened. If the runway or taxiway must be opened before excavations are backfilled, cover the excavations appropriately. Covering for open trenches must be designed to allow the safe operation of the heaviest aircraft operating on the runway across the trench without damage to the aircraft.

b. Construction contractors must prominently mark open trenches and excavations at the construction site with red or orange flags, as approved by the airport operator, and light them with red lights during hours of restricted visibility or darkness.

c. Lights must be red, either steady burning or flashing, and must meet the luminance requirements of the State Highway Department. Lights must be mounted on barricades and spaced at no more than 10 ft (3 m). Lights must be operated between sunset and sunrise and during periods of low visibility whenever the airport is open for operations. They may be operated by photocell, but this may require that the contractor turn them on manually during periods of low visibility during daytime hours.

32.A.07 Nothing shall be placed upon the landing areas without authorization of the GDA.

32.A.08 All vehicle access shall be at an entry control point (ECP) and approved by the Airfield Manager. Effective control of vehicles required to enter or cross aircraft movement areas shall be maintained as directed by the Airfield Manager.

a. Training must be provided to vehicle drivers and equipment operators to ensure compliance with the airport operator's vehicle rules and regulations. Specific training should be provided to those vehicle operators providing escorts. See AC 150/5210-20, Ground Vehicle Operations on Airports, for information on training and records maintenance requirements.

b. Vehicles other than those that routinely traverse any portion of the AOA under the control of ATC, which are not escorted by a vehicle in constant two-way radio communication with ATC and properly equipped and authorized to operate in the AOA, must be provided with a flag on a staff attached to the vehicle so that the flag will be readily visible.

c. At airports without air traffic control facilities, flags must be provided on all vehicles.

d. The flag must be at least a 3-ft by 3-ft (0.9-m by 0.9-m) square having a checkered pattern of international orange and white squares at least 1 ft (.3 m) on each side.

32.A.09 Those landing areas hazardous to aircraft shall be submitted to the Air Field manager for a FAA NOTAM on displaced threshold or other changes on non use or caution (unless otherwise directed by the GDA).

a. During daylight, areas shall be outlined with highly reflective barricades, lights, signs, and/or orange or red flags, spaced in accordance with AC 150/5370-2F and as approved by the airfield manager. The flags will be at least 20-in by 20-in (.5-m by .5-m), with diagonal plastic stiffeners.

b. During periods of darkness, areas shall be outlined with battery-operated, low-intensity omni-directional red flashing lights spaced in accordance with AC 150/5370-2F and as approved by the airfield manager.

c. Lights must be red, either steady burning or flashing, and must meet the luminance requirements of the State Highway Department. Lights must be mounted on barricades and spaced at no more than 10 ft (3 m) and must be operated between sunset and sunrise and during periods of low visibility whenever the airport is open for operations. They may be operated by photocell, but this may require that the contractor turn them on manually during periods of low visibility during daytime hours.

32.A.10 When work is to be performed at an airfield where flying is controlled, permission to enter a landing area shall be obtained from the control tower operator every time entry is required, unless the landing area has been closed by the airfield operator and marked as hazardous in accordance with Section 32.A.09.

a. All vehicles which operate in landing areas shall be identified by means of a checkered flag on a staff attached to, and flying above, the vehicle. The flag shall be 3 ft (0.9 m) square and consist of a checkered pattern of international orange and white squares of 1 ft (0.3 m) on each side.

b. All other equipment and materials in the landing area shall be marked as specified in Section 32.A.09.

32.A.11 When working in landing areas, work shall be performed so as to leave that portion of the landing area that is available to aircraft free from hazards, including holes, piles, or material, and projecting shoulders that might damage an airplane tire. Each vehicle, piece of equipment, or work crew shall be equipped with a two-way radio capable of maintaining communications with the air traffic control tower while performing work in landing areas.

32.A.12 No equipment, materials or contractor plant shall be placed upon or within a safety precaution area without approval of the GDA.

32.A.13 All equipment and materials in a safety precaution area shall be marked as specified in Section 32.A.09.a-c. If an object in a safety precaution area projects above the approach-departure clearance surface or above the transitional surface, the object shall be marked with a red light.

32.A.14 Prohibitions.

a. No use of tall equipment (e.g., cranes, concrete pumps, etc.) unless an FAA Form 7460-1 determination letter is issued for such equipment.

b. No use of open-flame welding or torches unless fire safety precautions are provided and the airport operator has approved their use.

c. No use of electrical blasting caps on or within 1,000 ft (300 m) of the airport property.

d. No use of flare pots within the AOA.

32.B Aircraft.

32.B.01 All non-military aircraft shall be registered, certified in the appropriate category and maintained in accordance with the airworthiness standards of the FAA. (If used OCONUS, and not prohibited by other regulation such as ER 95-1-1, registration, certification and maintenance in accordance with the standards of a comparable governing body of foreign or international authority may be substituted for those of the FAA.)

32.B.02 All contract pilots or pilots of chartered aircraft shall hold at least a commercial pilot certificate with instrument rating. All pilots of non-military aircraft shall possess ratings to comply with the FAA Regulation governing the aircraft and operations involved.

32.B.03 All non-military aircraft shall be equipped with a two-way radio.

32.B.04 All non-military flight operations shall be in accordance with the FAA rules governing conduct for the specific operation (i.e., 14 CFR 133, 14 CFR 135 and 14 CFR 91).

32.B.05 All military flight operations shall be conducted under appropriate DOT/DOD regulations.

32.B.06 All USACE-owned aircraft will use approved Government Flight Representatives' (GFRs) approved procedures as outlined in AR 95-20 and AR 95-1. GFRs are appointed in accordance with AR 95-20.

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SECTION 33

Hazardous Waste Operations and Emergency Response (HAZWOPER)

33.A General.

33.A.01 This Section applies to:

a. Hazardous waste site operations performed under the Comprehensive Environmental Response, Compensation, Liability Act (CERCLA) or Resource Conservation and Recovery Act (RCRA) as specified by OSHA in 29 CFR 1910.120 and 29 CFR 1926.65 (a) (1) (i), (ii) and (iii) (e.g., site investigations, remedial action construction, treatment process operation, and maintenance at: Formerly Used Defense Sites (FUDS) projects, Installation Restoration Program (IRP) projects, Base Realignment and Closure (BRAC) projects, Formerly Used Sites Remedial Action Program (FUSRAP) projects, U.S. Environmental Protection Agency (EPA) Superfund projects, and hazardous waste site cleanup operations performed under the civil works program).

b. Facilities or construction projects holding RCRA Treatment Storage and Disposal (TSD) permits as specified by OSHA in 29 CFR 1910.120 and 29 CFR 1926.65 (a) (1) (iv).

c. Facilities or construction projects where emergency response as specified by OSHA in 29 CFR 1910.120 and 29 CFR 1926.65 (a) (1) (v) may be required.

33.B Site Safety and Health Plan (SSHP).

33.B.01 Hazardous waste site cleanup operations require development and implementation of a SSHP that shall be attached to the Accident Prevention Plan (APP) as an appendix. Information from the APP should not be duplicated in the SSHP.

a. The APP/SSHP shall address all occupational safety and health hazards associated with site operations.

b. Contracted work on the projects shall be performed in compliance with the APP/SSHP.

c. Hazardous waste operations performed by Government personnel do not require development of an APP, but do require a Project Safety and Health Plan and a SSHP in compliance with Section 01.A.09 and local safety and health policies for in-house activities. All activities shall comply with the written SSHP.

d. Changes and modifications to the SSHP are permitted and shall be made in writing with the knowledge and concurrence of the local Safety and Health Manager (SHM) and accepted by the GDA.

e. A SSHP is not required for contracts where the site has been fully characterized and there is no known OR anticipated potential for employee contamination-related exposures during the tasks being performed.

f. If the work meets the criteria in Section 33.B.01.e and the tasks being performed are limited in scope (e.g., mowing, routine maintenance, or utility checks of existing equipment as part of long-term maintenance or site management), an abbreviated APP as described in Section 01.A.12.e may be used in lieu of a full APP.

33.B.02 The SSHP shall cover the following in project-specific detail. General information adequately covered in the APP (introduction, site background, SOH organization and lines of authority, general site control and layout and general site safety procedures, logs, reports and inspections) need not be duplicated. Section 06.E Ionizing Radiation shall be used to develop appropriate sections of the SSHP for HTRW projects involving radioactive isotopes.

a. Site description and contamination characterization - a description of the contamination with the exposure potential to adversely affect safety and occupational health and likely to be encountered by the on-site work activities;

b. Activity Hazard Analysis (AHA). An AHA shall be developed for each task/operation to be performed per Section 01.A.13. The AHA shall account for all hazards (classic safety, chemical, physical, biological, ionizing radiation) likely to be encountered while performing the work;

c. Staff organization, qualifications, and responsibilities per Section 33.C;

d. Training, general and project-specific per Section 33.D;

e. Personal Protective Equipment (PPE). PPE used to protect workers from site-related hazards (construction safety and health and contaminant-related) shall comply with requirements specified in Section 5;

f. Medical surveillance. Certification of medical surveillance program participation shall be appended to the SSHP and shall include: employee name, date of last examination, and name of examining physician(s) and shall be per Section 33.E. The required written physician's opinion shall be made available upon request to the GDA;

g. Exposure monitoring/Air sampling program. Exposure monitoring and air sampling shall be performed to determine if the PPE provides adequate protection and to evaluate worker exposure to site-related contaminants and hazardous substances used in the cleanup process. Project-specific exposure monitoring/air sampling requirements shall comply with requirements specified Section 6;

h. Heat and cold stress. The procedures and practices for protecting workers from heat and cold stress shall comply with Section 06.J;

i. Standard operating safety procedures (SOPs), engineering controls, and work practices. SOPs, engineering controls and work practices shall be addressed for the following as appropriate:

(1) Site rules/prohibitions (e.g., buddy system, eating/drinking/ smoking restrictions, etc.);

(2) Work permit requirements (e.g., radioactive work, excavation, hot work, confined space, etc.);

(3) Material handling procedures (e.g., soil, liquid, radioactive materials, spill contingency);

(4) Drum/container/tank handling (e.g., opening, sampling, overpacking, draining, pumping, purging, inerting, cleaning, excavation and removal, disassembly and disposal, spill contingency);

(5) Comprehensive AHA of treatment technologies employed at the site;

j. Site control measures. Work zones shall be established so that on-site activities do not spread contamination. The site shall be set up so that there is a clearly defined exclusion zone (EZ) and a clearly defined support zone (SZ) with a contamination reduction zone (CRZ) as a transition between the EZ and SZ;

k. Personal hygiene and decontamination. A personal hygiene and decontamination station shall be set up in the CRZ for personnel to remove contaminated PPE and to wash when exiting the EZ;

l. Equipment decontamination. An equipment decontamination station shall be set up in the CRZ for equipment to be decontaminated when exiting the EZ;

m. Emergency equipment and first aid. The equipment and personnel required for first aid and CPR shall comply with the requirements in Section 3. Emergency equipment required to be on-site shall have the capacity to respond to project-specific emergencies. Site emergencies may require (but should not be limited to) PPE and equipment to control fires, leaks and spills, or chemical (contaminant or treatment process) exposure;

n. Emergency response and contingency procedures. Emergency Response Procedures shall be developed that address the following:

(1) Pre-emergency planning. An agreement shall be established between the Contractor (or the GDA for in-house work), local emergency responders, and the servicing emergency medical facility that specifies the responsibilities of on-site personnel, emergency response personnel, and the emergency medical facility in the event of an on-site emergency;

(2) Personnel and lines of authority for emergency situations;

(3) Criteria and procedures for emergency recognition and site evacuation (e.g., emergency alarm systems, evacuation routes and reporting locations, site security);

(4) Decontamination and medical treatment of injured personnel;

(5) A route map to emergency medical facilities and phone numbers for emergency responders;

(6) Criteria for alerting the local community responders.

33.C Responsibilities.

33.C.01 The Safety and Health Manager (SHM) must meet the qualifications and fulfill the responsibilities stated below for all hazardous waste operations. The SHM, dependent upon the contaminant-related hazards on the project, shall be a Certified Industrial Hygienist (CIH), Certified Safety Professional (CSP) or Certified Health Physicist (CHP).

a. The SHM shall have 3 years of experience managing SOH at hazardous waste site cleanup operations.

b. The SHM shall enlist the support of SOH professionals with appropriate education and experience when working on sites with multiple hazards (i.e., chemical, safety, ionizing radiation).

c. The SHM shall be responsible for the following actions:

(1) Developing, maintaining, and overseeing implementation of the SSHP;

(2) Visiting the project as needed to audit the effectiveness of the SSHP;

(3) Remaining available for project emergencies;

(4) Developing modifications to the SSHP as needed;

(5) Evaluating occupational exposure monitoring/air sampling data and adjusting SSHP requirements as necessary;

(6) Serving as a QC staff member;

(7) Approving the SSHP by signature.

33.C.02 Site Safety and Health Officer (SSHO). The SSHO is required at HTRW operations.

a. The SSHO shall have a minimum 1 year experience implementing SOH procedures at cleanup operations and shall meet 29 CFR 1910.120/29 CFR 1926.65 requirements for 40-hour initial and 8-hour supervisor training and, maintain 8-hour refresher training requirements. In addition, for supervision of safety and health at projects involving intrusive activities, the SSHO shall meet the qualifications specified in Section 01.A.17. b. Intrusive activities include, but are not limited to, drilling, demolition, and excavation.

b. The SSHO shall have training and experience to conduct exposure monitoring/air sampling and select/adjust protective equipment use.

c. The SSHO shall have the authority and is responsible for the following actions:

(1) Being present anytime cleanup operations are being performed to implement the SSHP;

(2) Inspecting site activities to identify SOH deficiencies and correct them;

(3) Coordinating changes/modifications to the SSHP with the SHM, site superintendent, and contracting officer; and

(4) Conducting project-specific training.

33.D Training. Personnel shall comply with the following general and project-specific training requirements:

33.D.01 General training. General training requirements apply to project personnel exposed to contaminant-related SOH hazards. General training must comply with the following requirements:

a. 40-hour off-site HTRW site instruction. Off-site instruction shall comply with the 40-hour training requirements in OSHA standards 29 CFR 1910.120 and 29 CFR 1926.65.

(1) Instructor qualifications: Personnel responsible for planning and teaching/facilitating the 40-hour training course shall be thoroughly knowledgeable of the 40-hour training topics specified by OSHA in 29 CFR 1910.120 and 29 CFR 1926.65 and shall possess the knowledge and experience to instruct on each of the topics. Instructors shall retain qualifications for teaching on organizationally relevant 40-hour training safety and occupational health topics by regularly attending and participating in formal industrial hygiene or safety related courses, seminars and conferences. Five (5) days of training over a 5-year period is required.

(2) 40-hour training course outline for HTRW operations. 40-hour training courses shall cover the following topics in a manner that is relevant to organizational operations:

(a) Names of personnel and alternates responsible for site safety and health;

(b) Safety, health and other hazards;

(c) Use of personal protective equipment;

(d) Work practices by which employees can minimize risks from hazards;

(e) Safe use of engineering controls and equipment to minimize exposure to hazards;

(f) Medical surveillance implemented for the protection of employees;

(g) Decontamination procedures for personnel and equipment;

(h) Emergency response plan development and implementation for site work;

(i) Confined space hazards and awareness;

(j) Spill containment.

(3) Computer-based interactive 40-hour training. Computer-based interactive training is acceptable as long as the following criteria are met:

(a) The course shall cover each of the topics required by OSHA for cleanup operations 40-hour training. > See Section 33.D.01.a (2);

(b) Students shall be able to ask questions and receive answers in a timely manner from a qualified instructor with hazardous waste site cleanup safety and health experience;

(c) Students shall participate in 16-hours of hands-on exercises to demonstrate equipment use and procedural proficiency.

b. Three (3)-Days On-the-Job-Training (OJT). In addition to the classroom training, the training shall include 3 days of OJT (in field) experience under the direct supervision of a trained, experienced supervisor.

c. 8-hour annual refresher training. Refresher training shall comply with the requirements in OSHA standards 29 CFR 1910.120 and 29 CFR 1926.65. USACE employees shall comply with local district hazardous waste refresher training policies.

(1) The 8-hour refresher training course outline for HTRW operations shall cover the topics identified in Section 33.D.01.a (2) above. Refresher training courses shall cover those topics in a manner that is relevant to organizational operations and shall address hazards that were encountered in the previous year:

(2) Computer-based interactive 8-hour refresher training. Computer based interactive training is acceptable as long as the criteria identified in Section 33.D.01.a (3) above are met.

d. Supervisory training. On-site supervisors shall comply with the 8-hour supervisory training requirements in OSHA standards 29 CFR 1910.120 and 29 CFR 1926.65.

33.D.02 Project-specific training. Training specific to other sections of this manual, OSHA standards applicable to site work and operations, and site specific hazards relevant to on-site contamination shall be provided to workers before on-site work begins. When relevant, assure that workers are made aware of contaminant-related hazards by use of a site specific map.

33.D.03 DOT and DOD training is required for all persons who prepare DOT shipping papers (including hazardous waste manifests), label, package and/or mark containers for purposes of transportation. Training shall be documented and employees should be issued an appointment letter by their command. > See EP 415-1-266 and DOD 4500.9-R.

33.E Medical Surveillance. All personnel performing on-site work that will result in exposure to contaminant-related SOH hazards shall be enrolled in a medical surveillance program that complies with OSHA standards 29 CFR 1910.120 (f) and 29 CFR 1926.65 (f).

33.E.01 Certification of medical surveillance program participation shall be appended to the SSHP. The certification shall include: employee name, date of last examination, and name of examining physician(s).

33.E.02 The required physician's written opinion shall be made available upon request to the GDA.

33.E.03 All medical records shall be maintained in accordance with 29 CFR 1910.1020.

33.E.04 USACE employees must comply with medical requirements in ER 385-1-40, Appendix B.

33.E.05 Should any unforeseen hazard become evident during the performance of work, the SSHO shall bring such hazard information to the attention of the SHM and the GDA (both verbally and in writing) for resolution as soon as possible. In the interim, necessary action shall be taken to reestablish and maintain safe working conditions.

33.F RCRA TSD Facilities. Requirements specified in 29 CFR 1910.120 and 29 CFR 1926.65(p), and the terms of the facility RCRA permit shall be complied with for operations at TSD facilities.

33.G Facility or Construction Project Emergency Response. Projects using, storing, or handling hazardous substances and whose employees will be engaged in emergency response operations shall comply with 29 CFR 1910.120 (q) and 29 CFR 1926.65 (q) (a) (1) (v) when a hazardous substance release may result in exposure causing adverse affects to the health or safety of employees.

➢ Exception: Projects that will evacuate their employees from the danger area when an emergency occurs, and do not permit any of their employees to assist in handling the emergency, (if they provide an Emergency Response Plan in accordance with 29 CFR 1910.38(a) and 29 CFR 1926.35).

33.G.01 If applicable, the site manager shall develop and implement an Emergency Response Plan that addresses the following items:

a. Operations. Identify operations requiring use of hazardous substances;

b. Pre-emergency planning with local emergency responders. Describe emergency response agreements, including roles and responsibilities, made with local emergency responders for hazardous material response, fire, rescue, emergency medical care, and security and law enforcement;

c. Personnel roles, lines of authority, training, and communication. Describe key personnel roles, command structure/lines of authority and communications requirements for responding to site-specific hazardous substance releases;

d. Emergency recognition and prevention. Identify the likely emergency scenarios for the project and how employees can expect to identify and recognize emergency scenarios;

e. Safe distances and places of refuge. Select safe places of refuge to be used in emergency situations, identify these locations in the ERP, and require employees to report to selected places of refuge during emergencies;

f. Site security and control. Describe how the facility will be secured and describe access to the site controlled during emergencies;

g. Evacuation routes and procedures. Describe and map out evacuation routes to safe places of refuge and any special safety and health procedures employees must follow while evacuating the facility;

h. Decontamination. Develop and describe plans and procedures for decontaminating personnel if/when they come in contact with leaking hazardous substances;

i. Emergency medical treatment and first aid. Explain how emergency medical treatment and first aid will be provided in the event of a hazardous substance spill;

j. Emergency alerting and response procedures. Describe how personnel will be alerted in the event of a hazardous substance spill, and how facility personnel must respond after emergency alerting procedures are initiated;

k. Critique of response and follow-up. Describe how lessons learned from emergency response will be documented and used to improve future emergency response actions;

l. PPE and emergency equipment. Describe the PPE and emergency response equipment that will be available for use by response personnel at the facility;

m. Emergency Response Team. Designate a facility-specific Emergency Response Team. Describe the team's emergency responsibilities for interacting with local emergency response providers (i.e., where the facility team's responsibilities end and the local response providers begin);

33.G.02 Personnel training requirements. At a minimum, Emergency Response Team personnel at the project shall be trained to the "First Responder Operations Levels" specified in 29 CFR 1910.120 (q)(6)(ii). Response above and beyond defensive requires additional training and highly qualified supervision under 29 CFR 1910.120(q) and 29 CFR 1926.65(q) and must be specified on a project specific basis.

33.G.03 Emergency Response Team responsibilities. The Emergency Response Team shall, at a minimum, respond in a defensive manner to hazardous substance releases at the facility or construction project using the equipment and procedures specified in the emergency response plan for defensive response. The Emergency Response Team shall only provide response services beyond defensive if qualified and only according the procedures specified in the facility or construction project-specific Emergency Response Plan.

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SECTION 34

Confined Space Entry

34.A General.

34.A.01 Confined Spaces – Non-Marine Facilities. Confined space (CS) work performed in permanent, fixed facilities and/or performed on construction sites shall be performed in accordance with this Section, 29 CFR 1910.146 and ANSI Z117.1. This section does not regulate underground construction work (tunneling) as a confined space. > See Section 26.

34.A.02 USACE-conducted CS work activities on or in a watercraft or vessel of any kind and/or associated with vessel repair and maintenance operations are covered in Section 34.B.

34.A.03 The definitions for CS that are applicable to all CSs, during operations, maintenance and construction are listed in Appendix Q, Definitions.

34.A.04 Confined Space Identification. Facilities and job sites shall assign a Safety Supervisor or Confined Space Competent Person (CSCP) to identify all CSs and determine entry rules and requirements. > See Figure 34-1.

a. On USACE facilities, all fixed permit-required CS (PRCS) shall be labeled as a PRCS. With the approval of the local Safety Office (SOHO), the CSCP may exclude from labeling those confined spaces that pose little or no hazard, (i.e., a navigation lock), but meet the strict definition of a permit-required confined space (PRCS).

b. On construction sites and/or during O&M activities, all fixed PRCS shall be labeled as a danger. PRCS that are created as part of construction work shall be labeled and have a barrier to restrict entry. All Non Permit-Required Confined Spaces (NPRCS) created as part of construction and/or O&M activities are not required to be labeled.

c. If activities in a NPRCS (i.e., welding), create or have a potential to create a hazardous atmosphere, that space shall be declared a PRCS.

d. All previously identified CSs shall be identified in writing to any contract personnel prior to the beginning of work if they are required to enter and/or work in this area.

(1) The contract documents shall list any known hazards and controls in the CS.

(2) If it is known that work to be conducted inside a CS would create a possible hazardous atmosphere, the contractor shall be notified prior to beginning work and shall be required to follow the requirements for PRCS.

(3) All entry into an identified or contractor-created PRCS shall be coordinated with the GDA and site security or emergency personnel before each entry.

e. For work conducted on military installations, the CSCP or designer shall coordinate with the installation CS program manager/team to identify all CSs and determine any specific installation requirements for entry.

34.A.05 Confined Space Entry (CSE) Procedures.

a. PRCS Entry Procedures. Entry into PRCSs shall comply with the requirements of 29 CFR 1910.146.

b. NPRCS Entry Procedures:

(1) There are no entry requirements if the space does not contain or have the ability to contain an atmospheric hazard capable of causing death or physical harm.

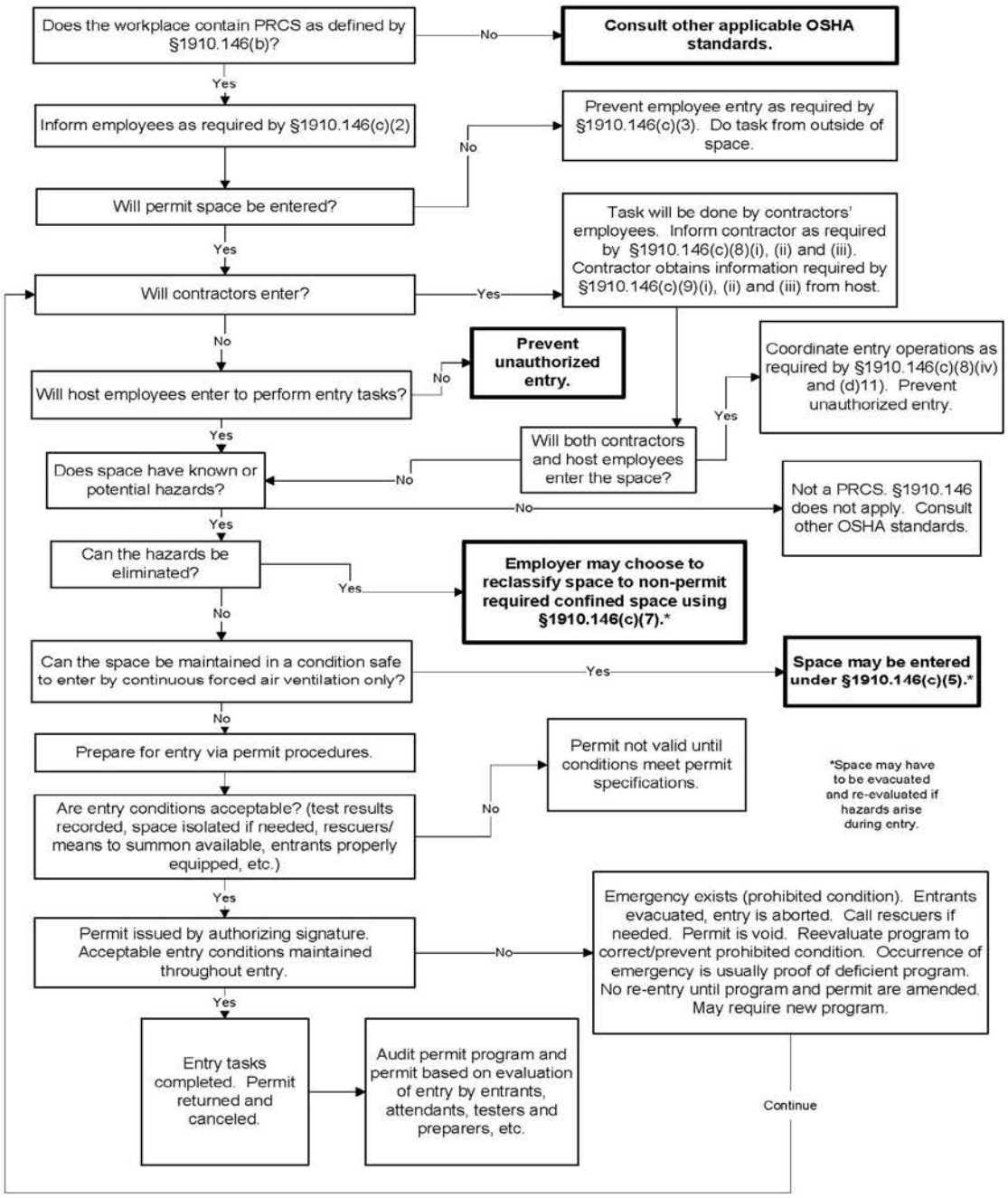
(2) If a NPRCS has an environment being controlled by permanent ventilation system and/or has an isolation barrier, then entry requires: continual air monitoring; the use of audible/visual alarms for failure of the ventilation system or isolation barrier; and training for the employees in visual contact with the CS and those working in the CS on the proper rescue procedures to be used shall be required. The alarm shall be capable of notifying both the entrants and rescue personnel. This shall be documented and written in the CSE Plan.

c. PRCS Permit. The CSCP shall complete or review and sign the completed PRCS permit (see Form 34-1 for non-mandatory example) and shall be responsible for enforcing the use of PRCS permits for entry into all PRCSs at the facility/site.

d. At the end of the work task where a PRCS was entered, there shall be an after action review by all parties on procedures used and if improvement can be gained. For USACE operations, this review should include safety personnel for the site, and any security or emergency responders. For contract operations, this review should include GDA and any security or emergency responders on site.

FIGURE 34-1

Confined Space Identification Flow Chart



34.A.06 CSCP/Safety Supervisor Responsibilities.

a. Identification and Labeling. The CSCP shall identify and label all PRCSs as noted in Section 34.A.04.b.

b. The CSCP shall develop and implement an activity/site-specific Confined Space program. The program shall contain and adequately address the CS program elements of 29 CFR 1910.146 and those defined in this section.

c. It is the responsibility of the site supervisor or project manager to ensure all entries into a CS are completed in a safe and protective manner. The procedures shall be documented in a CS program which is part of the APP or Project Safety and Health Plan.

d. Coordination with local emergency responders. The CSCP shall coordinate with local emergency responders to determine if they are capable of a timely (5 minutes) rescue from the specific CS. If the local emergency responders do not have the appropriate rescue capability, the rescue capability should be developed on-site.

e. Review CS program and all past entries annually.

34.A.07 CS Program Elements. The CS program shall address each of the following elements with facility-/site-specific detail:

a. Identification and Labeling. Describe the process for identifying a work area as a CS and rationale used for classifying the type of CSs. Describe labeling and enforcement procedures that will assure personnel do not enter CSs in an unauthorized fashion;

b. CS hazard identification. Describe the hazards in the CS and all potential hazards that may be created by potential work in the CS, any permanent air monitoring, physical isolation identification, or permanent ventilation;

c. Safe CSE conditions. Describe the practices and procedures that will be followed to assure that CSs will be entered safely. Procedures and practices shall include but are not limited to the following:

(1) NPRCSs. Describe any monitoring and employee training that will assure non-permit conditions are maintained and that employees entering the NPRCS understand how to maintain a safe working environment while working in it. Describe the potential atmospheric and/or physical hazards that are present in the CS and the necessary controls for these hazards, necessary training requirements of entrants and workers within visual contact.

(2) PRCSs. At a minimum, describe how each of the elements below will be enforced at each PRCS:

(a) Entry permit (See Form 34-1 34-2 for example) completion, review, processes, signature authority, and maintenance procedures for all PRCS. The entry supervisor or manager shall be required to sign all permits daily before entry;

(b) Acceptable entry conditions;

(c) Observation by the authorized entrant of monitoring or testing in PRCSs;

(d) Isolation and/or any alarms for physical hazards or atmospheric hazards of the PRCSs;

(e) Purging, inerting, flushing or ventilating the PRCS as necessary to eliminate or control atmospheric hazards;

(f) Installation of barriers to protect entrants from external hazards;

(g) Monitoring requirements and procedures used to verify that acceptable entry conditions are maintained for the duration of the authorized entry;

d. Equipment (and equipment maintenance procedures) to be used for CSE at the facility/site. All equipment shall be calibrated and functionally tested before each entry in accordance with the manufacturer's instructions. Equipment shall include the following at a minimum:

(1) Appropriate atmospheric testing and monitoring equipment necessary to assure safe entry and that safe entry conditions are maintained;

(2) Ventilation equipment to assure maintenance of safe entry conditions;

(3) Communication equipment for constant contact between the attendant and the entrants and means of communication to the emergency personnel;

(4) Personal Protective Equipment (PPE) necessary in the event that engineering controls and work practices do not adequately protect entrants;

(5) Lighting equipment for entry;

(6) Barriers and shields to keep unauthorized entrants out of the CS during entry;

(7) Ladders or other equipment necessary for entrant access and egress;

(8) Rescue and emergency equipment needed to remove entrants in the event of an emergency. Particular emphasis shall be placed on the use and implementation of appropriate self-rescue procedures and equipment;

(9) Any other equipment necessary for safe entry into or rescue from CSs;

e. Procedures for evaluating PRCS conditions when entry is conducted. Address each of the following in facility/site-specific detail:

(1) Atmosphere conditions required to be maintained during entry to ensure safe entry;

(2) At a minimum, test the PRCS atmosphere for the following in the order specified:

(a) Oxygen (before and continual while entrant is in the PRCS);

(b) Combustible gases and vapors; and

(c) Toxic gases and vapors.

f. Policies and procedures to assure that at least one attendant is immediately available outside the PRCS during entry operations to monitor the conditions of the space, to communicate with entrants, and to respond to emergencies;

g. Designate by name, personnel at the facility/site with active roles in CSE and their responsibilities for PRCS entry. All permits shall be signed by each employee entering the CS, the CSCP, attendant and a responsible entry supervisor;

h. Document procedures and agreements with local emergency responders for notifying emergency services of a pending entry and summoning rescue and emergency services for rescuing PRCS entrants;

i. Document a facility/site procedure for preparing, issuing, using and canceling PRCS entry permits;

j. Document procedures for coordinating with employees from outside organizations who will be participating in PRCS entry. The coordination shall include the type of CS, the known hazards, safety procedures, PPE and debrief following the entry;

k. Document procedures for concluding an entry after entry operations have been completed;

l. Develop procedures for reviewing PRCS entries and documenting lessons learned from them; and

m. Establish a policy to review cancelled, expired or revoked permits to modify the PRCS entry procedures annually.

n. Establish a policy to review the CS program annually.

34.A.08 Employee Training. All employees entering PRCS or NPRCS, authorized attendants, supervisors and managers, and workers within visual contact of the CS shall be trained to understand the requirements of the facility/site-specific CSE Program and procedures and emergency retrieval procedures.

a. Initial CS training. All entrants, authorized attendants, and supervisor or managers shall receive an initial CS training course that includes hands-on practical exercise with all the equipment; rescue exercise; and completing the CS permit. The training shall include, as a minimum: the roles and responsibilities in conducting an entry; specialized training on the use, calibration, and maintenance of monitoring, communications, and retrieval equipment; the hazards of the entry and the control of the hazards of the entry.

b. Before each activity requiring entry into a CS, the entrant, authorized attendants, supervisor/managers, and workers in close proximity, shall review the entry procedures, the use of the air monitoring, PPE, and retrieval equipment. Emergency responders shall be invited to the training review. If it has been over a year since the initial training, a rescue exercise shall be part of the training review.

c. Training shall be documented and include a roster of those attending and topics discussed.

34.A.09 Rescue and Emergency Services. The CSCP shall develop or establish rescue and emergency services for PRCS entry. Emergency responders shall be notified of the training and at least annually, or immediately prior to each entry, shall have participated in an emergency response drill for retrieval of an employee or dummy from the CSs.

FORM 34-1

Confined Space Entry Permit**{**PRIVATE **}**

Location of Work: _____

Description of Work (Purpose): _____

Authorized Attendants: _____
_____
_____

Authorized Entrants: _____
_____

Entry Date: _____ Entry Time: _____

Outside Contractors: _____

Isolation Checklist (Safe Clearance):
- Blanking and/or Disconnecting _____
- Electrical _____
- Mechanical _____
- Other _____

Hazardous Work:
- Burning _____
- Welding _____
- Brazing _____
- Open Flame _____
- Other _____

Hazards Expected:
- Corrosive Materials _____
- Hot Equipment _____
- Flammable Materials _____
- Toxic Materials _____
- Drains Open _____
- Cleaning (Ex: chemical or water lance) _____
- Spark Producing Operations _____
- Spilled Liquids _____
- Pressure Systems _____
- Other _____

Vessel Cleaned:
- Deposits _____
- Method _____
- Inspection _____

Neutralized with _____

Fire Safety Precautions: _____
_____

Personal Safety:
- Ventilation Requirements _____
- Respirators _____
- Life Lines and Harness _____
- Lighting _____
- Communications _____
- Buddy System _____
- Name of Attendant _____

Atmospheric Gas Tests:

	Tests Performed	Location	Reading
Example:	(Oxygen)	_____	(19.5%)
Example:	(Flammability)	_____	(< 10% LFL)
	_____	_____	
	_____	_____	
	_____	_____	
	_____	_____	

Remarks: _____
_____

Test Performed By: _____
Signature

Time: _____

Authorizations:
- Entry Supervisor: _____
- Safety Supervisor/Qualified Person: _____

Emergency Phone Numbers:
- Fire Department _____
- Ambulance _____
- Hospital _____
- Doctor _____

Permit Expires: _____

34.B Confined and Enclosed Spaces on Ships and Vessels (defined as any watercraft). The following applies only to ship and vessel repair and maintenance, not operational ship and vessel activities. > See Section 19; See Appendix Q for CS definitions.

34.B.01 All spaces on a vessel or ship or floating plant that could be considered a "Potential Confined Space", shall be posted as a "Potential Confined Space".

a. If the potential CS has an oxygen deficient atmosphere, the space shall be labeled "Not Safe for Workers".

b. If the potential CS has an oxygen-enriched atmosphere, the space shall be labeled "Not Safe for Workers – Not Safe for Hot Work".

c. If the potential CS contains a flammable gas or vapor at 10% or higher than the lower explosive limit (LEL) for the gas, then the space shall be labeled "Not Safe for Workers – Not Safe for Hot Work".

d. If the CS contains a potential atmosphere that is toxic, corrosive, or irritants that exceed the OEL, the space shall be labeled "Not Safe for Workers".

e. An inventory of these spaces shall be maintained in the pilot house and the land-based office.

34.B.02 Before and during entry into the types of spaces listed below, the Competent Person for Confined Spaces in ships and vessels (CPCSSV) shall test for oxygen content, flammability, and toxicity. These tests and all entries shall be recorded on an entry form or in an entry log which will be reviewed by the GDA. At a minimum, the entry log or form shall have the time and date, monitoring device type, model, serial number, and calibration date, and the name of the individual doing the testing.

a. Unventilated CSs that have been closed up or freshly painted;

b. CSs that have contained or do contain combustible or flammable liquids or gases;

c. CSs that have contained or do contain toxic, corrosive, or irritant liquid, gases, or solids.

34.B.03 Testing Requirements.

a. If the testing determines the oxygen is below 19.5% or above 23.5%, or the lower explosive limit (LEL) of 10% is exceeded, or other toxic substances are measured, then the space should be thoroughly ventilated and appropriate PPE used for entry as directed by the CPCSSV. Entry is prohibited when the LEL is greater than 10% unless it is required for emergency rescue.

b. Air monitoring shall be continuous during entry into the confined space if the oxygen level is not between 19.5% and 23.5% or ventilation was required to lower the explosive limit to below 10% of the LEL.

c. Air testing for toxic, corrosive, or irritant chemicals shall be made using a calibrated direct reader that provides a reading at a minimum of 50% of the OEL. If the reading is over the OEL, then the space shall be ventilated until the value is below the OEL and/or entry shall be made with appropriate PPE.

d. Before hot work is completed in a confined space with toxic, corrosive, or irritating chemicals, the CPCSSV shall conduct an evaluation to confirm the hot work will not create a toxic, corrosive, or irritant atmosphere. This evaluation shall be documented and signed by the CPCSSV. During the entry the air shall be continually monitored.

e. Air sampling shall be conducted at the ventilation discharge point if there is anyone in the area or if the discharge is a semi-enclosed or enclosed area.

34.B.04 Entry Precautions.

a. No hot work will be completed adjacent to flammable chemicals unless the area is well ventilated and continually tested.

b. No ignition source shall be taken into an area of flammable chemicals unless the area is well ventilated and continually tested.

34.B.05 Training.

a. Anyone required to enter a potential confined space shall be trained when the hazards change or annually, whichever is sooner. The training shall include discussion of the hazards of the space, including the symptoms of any hazardous materials; the controls, including blanking and ventilation; the warnings if the controls fail; personal protective equipment required; and emergency procedures.

b. The training on the emergency procedures shall include an exercise on retrieving a person from the confined space.

c. This training shall be documented on a certificate that includes the date of training, name of individual trained, the trainer, and the topics covered. The training certificate shall be available for GDA review.

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APPENDIX A

Minimum Basic Outline for Accident Prevention Plans

1. Accident Prevention Plan (APP) - General. An APP is a safety and health policy and program document that is contract- or job- specific. It is an integral part of the planning process. > See Section 01 and 01.A.12.

a. The APP shall interface with the employer's overall safety and health program. Any portions of the overall safety and health program that are referenced in the APP shall be included as appropriate.

b. The APP shall be submitted to the GDA for acceptance prior to work starting.

(1) Understanding that the APP is submitted prior to work starting and that some project-specific information is not yet known (e.g., subcontractors to be used, type of fall protection to be used at a certain point in time, specific cranes or other load handling equipment (LHE) to be brought on site, etc.), the known information shall be provided and additional information added at each preparatory phase/meeting along with the appropriate Activity Hazard Analyses (AHAs).

(2) A copy of the contractor's project-specific, accepted APP shall be available on the work site. > See ANSI/ASSE A10.38 for programmatic issues.

2. Abbreviated APP. In lieu of a fully-developed APP, for Limited-Scope Service, Supply and R&D Contracts (e.g. grass mowing, park attendant, rest room cleaning, etc.), the Contracting Officer (KO) and local Safety and Occupational Health Office (SOHO) may allow an Abbreviated APP to be developed and submitted for acceptance.

a. The non-mandatory Abbreviated APP Form, Form A-1 (or similar) may be used to insure each area of required information has been provided.

b. This APP is a short-version APP that can be used on low-risk, limited-scope contracts. > See 01.A.12.e, and Appendix A, paragraph 3.k.

c. Each sub-contractor shall be provided a copy of the APP by the prime contractor and be required to comply with it.

3. APP Format**.** The following areas are typically addressed in an APP, but besides being job-specific, the APP shall also address any unusual or unique aspects of the contract or job for which it is written. The non-mandatory Accident Prevention Plan (APP) Checklist, Form A-2 (or similar), may be used to insure each area of required information has been provided. > See ANSI A10.33 for multi-employer projects.

a. Signature Sheet: Include title, signature, and phone number of the following:

(1) Plan preparer (Qualified Person (QP), Competent Person (CP), Corporate safety staff person, QC) and their qualifications;

(2) Plan must be approved by company/corporate officers authorized to obligate the company;

(3) Plan concurrence (e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional, project QC). Contractors shall provide concurrence of other applicable corporate and project personnel.

b. Background Information. List the following:

(1) Contractor;

(2) Contract number;

(3) Project name;

(4) Brief project description, description of work to be performed, location (map), equipment to be used, anticipated high risk activities, and

(5) Major phases of work anticipated.

(6) Within these major phases of work identified, activities [includes Definable features of Work (DFOWs) and tasks] to be performed that will require an AHA shall be specifically highlighted. This information can then be used by QC, QA and Safety personnel to track AHA submittals. The AHAs for these activities, tasks of DFOWs are NOT submitted at this time (AHAs created/submitted at this time would not be activity-specific as they are intended to be). > See Sections 01.A.14 and 01.A.15.

c. Statement of Safety and Health Policy. Provide a copy of current corporate/company Safety and Health Policy Statement, detailing commitment to providing a safe and healthful workplace for all employees. The Contractor's written safety program goals, objectives, and accident experience goals for this contract shall also be provided.

d. Responsibilities and Lines of Authority. Provide the following:

(1) A statement of the employer's ultimate responsibility for the implementation of his SOH program for his own employees, all sub-contractors and all others on the worksite (includes the strict enforcement of the program).

(2) Identification and accountability of personnel responsible for safety at both corporate and project level. Contracts specifically requiring safety or industrial hygiene personnel shall include a copy of their resumes. Qualifications shall be in accordance with Section 01.A.17.

➢ Note: Only official OSHA 30-Hour cards will be accepted or, if equivalent training is provided, appropriate instructor qualifications. > See also Section 01.A.17.i, Exception 2.

(3) If equivalent training to the OSHA 30-hour classes is being presented as qualification, the training shall have covered the following areas:

(a) OSH Act/General Duty Clause;

(b) 29 CFR 1904, Recordkeeping;

(c) Subparts C, CC, D, E, F, K and M of OSHA;

(d) Rigging, load handling equipment (LHE), welding and cutting, scaffolding, excavations, concrete and masonry, demolition, health hazards in construction, materials handling, storage and disposal, hand and power tools, motor vehicles, mechanized equipment, marine operations, steel erection, stairways and ladders, confined spaces or any others that are applicable to the work being performed;

(4) The names of CP(s) and/or QP(s) and proof of competency/qualification to meet specific OSHA CP/QP requirements must be attached. The local SOHO will review the qualifications for acceptance;

(5) Requirements and details of the employer's Risk Management Process;

➢ Note: USACE uses the Activity Hazard Analysis (AHA) as part of a total risk management process. Contractors and other individual employer's may use the AHAs or their own version [Job Safety Analyses (JSAs), Job Hazard Analyses (JHAs), or similar Risk Management assessment tools]. These documents are considered equivalent to, and acceptable substitutes for, the USACE's AHA provided the data collected is the same as that required by the AHA.

(6) Requirements for initial activity-specific AHAs to be submitted and accepted at preparatory meetings, prior to work being performed;

(7) Requirements that no work by the Contractor shall be performed unless a designated CP/SSHO is present on the job site;

(8) Policies and procedures regarding non-compliance with safety requirements (to include disciplinary actions for violation of safety requirements) should be identified;

(9) Lines of authority;

(10) Provide written company procedures for holding managers and supervisors accountable for safety.

e. Subcontractors and Suppliers. If applicable, provide procedures for coordinating SOH activities with other employers on the job site:

(1) Identification of subcontractors and suppliers. If not known at the time of initial APP submittal, the contractor shall include the following statement in their initial APP: "The subcontractors for the following DFOWs/activities are not known at this time, but additional information will be submitted to the APP for acceptance prior to the start of any activities listed";

(2) Safety responsibilities of subcontractors and suppliers.

f. Training.

(1) Requirements for new hire SOH orientation training at the time of initial hire of each new employee.

(2) Requirements for mandatory training and certifications that are applicable to this project (e.g. explosive actuated tools, confined space entry, crane operator, underwater diver, vehicle operator, HAZWOPER training and certification, PPE, etc.) and any requirements for periodic retraining/recertification.

(3) Procedures for periodic safety and health training for supervisors and employees.

(4) Requirements for emergency response training.

g. Safety and Health Inspections.

(1) Specific assignment of responsibilities for a minimum daily jobsite SOH inspection during periods of work activity: Who will conduct (e.g., SSHO, PM, QC, supervisors, employees – depends on level of technical proficiency needed to perform said inspections), proof of inspector's training/qualifications, when inspections will be conducted, procedures for documentation, deficiency tracking system, and follow-up procedures;

(2) Any external inspections/certifications that may be required (e.g. USCG).

h. Mishap Reporting and Investigation. The Contractor shall identify means to provide the following:

(1) Exposure data (man-hours worked);

(2) Mishap reports, investigations, and documentation. Report all accidents per the requirements covered in Section 01.D. Mishaps shall be reported as soon as possible but not more than 24 hours afterwards to the KO/COR. The contractor shall report, thoroughly investigate, and analyze all mishaps occurring incidentally to an operation, project or facility for which this manual is applicable. Implement corrective actions as soon as reasonably possible and provide notice to the KO/COR when corrective actions are completed;

i. Plans, Programs and Procedures, required by this manual. Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable SOH risks and associated compliance plans.

(1) Include a project-specific compliance plan, as applicable to the work being performed, and as identified below. The plans shall incorporate project-wide procedures to control hazards to which the employees of all project employers may be exposed.

(2) These procedures shall be coordinated with all project employers and shall include project-specific, project-wide emergency response and evacuation procedures, PPE requirements, recordkeeping and reporting requirements, and training requirements.

(3) The plans shall be prepared prior to the start of any work activities on the job site (as much as the information can be known at that point in time). The plans shall be updated throughout the life of the project to include changes in personnel, equipment, conditions, etc. Additional revisions shall be incorporated as necessary to reflect changing site conditions, construction methods, personnel roles and responsibilities and construction schedules.

(4) No activity (DFOW) shall be started on site until the APP is revised and submitted to the GDA for acceptance, with the site-specific plans, programs and procedures required to complete the project. Using the EM 385-1-1 as a guide, plans, programs, procedures (assessments and evaluations) may include but not be limited to:

- Fatigue Management Plan (01.A.20);
- Emergency Plans (01.E);
- Site Sanitation/Housekeeping Plan (02.B);

- Medical Support Agreement (03.A.01; 03.A.03);
- Blood-Borne Pathogen Program (03.A.05);
- Exposure Control Plan (03.A.05);
- Automatic External Defibrillator (AED) Program (03.B.04);
- Site Layout Plan (04.A);
- Access/Haul Road Plan (04.B);
- Hearing Conservation Program (05.C);
- Respiratory Protection Plan (05.G);
- Health Hazard Control Program (06.A);
- Hazard Communication Program (06.B.01);
- Process Safety Management Program (06.B.04);
- Lead Compliance Plan (06.C.02 & specifications);
- Asbestos Abatement Plan (06.C.03 & specifications);
- Radiation Safety Program (06.F);
- Abrasive Blasting Procedures (06.I.01);
- Heat Stress Monitoring Plan (HSMP) (06.J.02);
- Cold Stress Monitoring Plan (CSMP) (06.J.04)
- Indoor Air Quality Management (06.L);
- Mold Remediation Plan (06.L.04);
- Chromium (VI) Exposure Evaluation (06.M);
- Crystalline Silica Evaluation (06.N.02);
- Lighting Plan for Night Operations (07.A.06);
- Traffic Control Plan (08.C.05);

- Fire Prevention Plan (09.A.01);
- Wild Land Fire Management Plan (09.L);
- Arc Flash Hazard Analysis (11.B);
- Assured Equipment Grounding Control Program (AEGCP) (11.D.05, Appendix E);
- Hazardous Energy Control Program & Procedures (12.A.01);
- Standard Pre-Lift Plan – Load Handling Equipment (16.A.03);
- Critical Lift Plan – Load Handling Equipment (16.H);
- Naval Architectural Analysis – Load Handling Equipment (Floating) (16.L);
- Floating Plant Inspection and Certification (19.A.01);
- Severe Weather Plan for Marine Activities (19.A.03);
- Emergency Plan for Marine Activities (19.A.04);
- Man Overboard/Abandon Ship Procedures (19.A.04);
- Float Plan for Launches, Motorboats, and Skiffs (19.F.04);
- Fall Protection and Prevention Plan (21.D);
- Demolition/Renovation Plan (to include engineering survey) (23.A);
- Rope Access Work Plan (24.H);
- Excavation/Trenching Plan (25.A.01);
- Fire Prevention and Protection Plan for Underground Construction (26.D.01);
- Compressed Air Work Plan for Underground Construction (26.I.01);
- Erection and Removal Plan for Formwork and Shoring (27.C);
- Precast Concrete Plan (27.D.01);
- Lift-Slab Plans (27.E);
- Masonry Bracing Plan (27.F.01);

- Steel Erection Plan (28.B);
- Explosives Safety Site Plan (ESSP) (29.A);
- Blasting Plan (29.A; 26.J);
- Dive Operations Plan (30.A.14, 30.A.16);
- Safe Practices Manual for Diving Activities (30.A.15)
- Emergency Management Plan for Diving (30.A.18)
- Tree Felling and Maintenance Program (31.A.01);
- Aircraft/Airfield Construction Safety & Phasing Plan (CSPP) (32.A.02);
- Aircraft/Airfield Safety Plan Compliance Document (SPCD) (32.A.02);
- Site Safety and Health Plan for HTRW (33.B);
- Confined Space Entry Procedures (34.A.05);
- Confined Space Program (34.A.06).

j. Risk Management Process (AHAs). Detailed project-specific hazards and controls shall be provided by AHAs for each activity (DFOW). No work will begin on an activity (DFOW) until the initial AHA has been accepted by the GDA addressing the project-specific hazards. > See Section 01.A.14 and 01.A.15.

➢ Note: USACE uses the Activity Hazard Analysis (AHA) as part of a total risk management process. Contractors and other individual employer's may use the AHAs or their own version [Job Safety Analyses (JSAs), Job Hazard Analyses (JHAs), or similar Risk Management assessment tools]. These documents are considered equivalent to, and acceptable substitutes for, the USACE's AHA provided the data collected is the same as that required by the AHA.

(1) The AHA defines the work sequence, anticipated hazards, conditions, equipment, materials, personnel and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk, and the Risk Assessment Code for each step.

(2) Once this process has occurred, an overall RAC shall be assigned to the activity, based on the highest RAC assigned to an individual step.

(3) Acceptance of risk. The residual risk is that which remains after controls have been applied. This residual risk must be communicated to the proper authority for acceptance in order to proceed with the activity.

(4) Before beginning each work activity/DFOW, the Contractor performing that work activity shall prepare the initial AHA, which will include a RAC for that activity.

(5) No work will begin on the activity until the initial AHA has been accepted by the GDA addressing the activity-specific hazards.

(6) AHA's are intended to be created by the contractor field crews/workers performing the work, with the assistance of others (SSHO, QC, Superintendent, etc) as needed. They are living documents and are intended to be created in the field and updated (by the workers) as needed.

(7) The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of CP(s)/QP(s).

(a) If a new CP/QP (not on the original list) is added, the list shall be updated (an administrative action not requiring an updated AHA). The new person shall acknowledge in writing that he or she has reviewed the AHA and is familiar with current site safety issues.

(b) If the initial RAC increases due to a change made to the AHA by the workers, the AHA shall be resubmitted to GDA for acceptance prior to work proceeding.

(c) Changes to or updates of an AHA that do not increase the RAC are not required to be resubmitted for acceptance by the GDA.

(8) Workers/crews shall have in their possession the current AHA that reflects current site conditions, personnel, equipment, control measures, etc while the work is being performed.

(9) The AHA shall be used by the contractor and USACE personnel to assure work is being performed consistent with the AHA. In the event that the work is not being conducted in a safe manner, the contractor and/or the USACE shall stop the unsafe work being conducted until it is in compliance with this manual, APP and the AHA or the APP/ AHA is revised and accepted by the GDA, if necessary. > See Section 01.A.14.

(10) Once the activity has been completed, the AHA shall be available and kept on file on site for the length of the contract.

k. Abbreviated APP for Limited-Scope Service, Supply and R&D Contracts. If service, supply and R&D contracts with limited-scopes are awarded, the contractor may submit an abbreviated APP in lieu of a full APP. The abbreviated APP shall address the following areas at a minimum. If other areas of the EM 385-1-1 are pertinent to the contract, the contractor must assure these areas are addressed as well. The non-mandatory Abbreviated APP Form, Form A-01 (or similar) may be used to insure each area of required information has been provided.

(1) Title, signature, and phone number of the plan preparer.

(2) Background Information to include:

(a) Contractor;

(b) Contract number;

(c) Project name;

(d) Brief project description,

➢ Note: The project description shall provide a means to evaluate the work being done (see AHA requirements in 01.A.14), associated hazards involved and a RAC assigned to each. The overall RAC for the activity must be determined (based on highest task RAC) and accepted at the appropriate level in order for work to proceed.

(e) Description of work to be performed, and

(f) Location of work being performed, to include a map.

(3) Statement of Safety and Health Policy detailing their commitment to providing a safe and healthful workplace for all employees.

(4) Responsibilities and Lines of Authorities – to include a statement of the employer's ultimate responsibility for the implementation of his SOH program; Identification and accountability of personnel responsible for safety at all levels to include designated site safety and health officer (SSHO) and associated qualifications. The District SOHO will be asked to review the qualifications for acceptance.

(5) Training - new hire SOH orientation training at the time of initial hire of each new employee and any periodic retraining/recertification requirements.

(6) Procedures for job site inspections - assignment of responsibilities and frequency.

(7) Procedures for reporting man-hours worked and reporting and investigating any mishaps required by Section 01.D.

(8) Emergency Planning. Employees working alone shall be provided an effective means of emergency communication. This may be cellular phone, two-way radio or other acceptable means. The selected means of communication must be readily available and must be in working condition.

(9) Drinking Water provisions, toilet and washing facilities.

(10) First Aid and CPR training (at least two employees on each shift shall be qualified/certified to administer first aid and CPR) and provision of first aid kits (types/size).

(11) Personal Protective Equipment (PPE).

(a) Work Clothing - Minimum Requirements. Employees shall wear clothing suitable for the weather however minimum requirements for work shall be short-sleeve shirt, long pants (excessively long or baggy pants are prohibited) and leather work shoes. If analysis determines that safety-toed (or other protective) footwear is necessary (i.e., mowing, weedeating, chainsaw use, etc), they shall be worn.

(b) Eye and Face Protection. Eye and face protection shall be worn as determined by an analysis of the operations being performed, however, all involved in chainsaw use, chipping, stump grinding, pruning operations, grass mowing, weedeating and blowing operations shall be provided safety eyewear (Z87.1) as a minimum.

(c) Hearing Protection. Hearing protection must be worn by all those exposed to high noise activities (to include grass mowing and trimming, chainsaw operations, tree chipping, stump grinding and pruning).

(d) Head Protection. Hard hats shall comply with ANSI Z89.1 and shall be worn by all workers when a head hazard exists, per Section 05.D.

(e) High Visibility Apparel shall comply with ANSI/ISEA 107, Class 2 requirements at a minimum and shall be worn by all workers exposed to vehicular or equipment traffic.

(f) Protective Leg chaps shall be worn by all chainsaw operators.

(g) Gloves of the proper type shall be worn by persons involved in activities that expose the hands to cuts, abrasions, punctures, burns and chemical irritants.

(h) If work is being performed around water and drowning is a hazard, PFDs must be provided and worn as appropriate.

(12) Machine Guards and safety devices. Power tools/equipment must have appropriate guards and safety devices in place and operational.

(13) Hazardous Substances. When any hazardous substances are procured, used, stored or disposed, a Hazard Communication Program must be in place and MSDSs (SDSs) shall be available at the worksite. Employees shall have received training in hazardous substances being used. When the eyes or body of any person may be exposed to corrosives, irritants or toxic chemicals, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within 10 seconds of the worksite.

(14) Traffic control shall be accomplished in accordance with DOT's MUTCD.

(15) Control of Hazardous Energy (Lockout/Tagout). Before an employee performs any servicing or maintenance on any equipment where the unexpected energizing or startup of the equipment could occur, procedures must be in place to ensure adequate control of this energy. > See Section 12.

(16) High hazard activities should not be encountered on these types of jobs. If they are (i.e., driving/operating equipment on slopes, working from/in boats, etc), a determination shall be made by the KO and local SOH Office as to whether an abbreviated APP is applicable. If so, they shall be fully addressed in the APP. AHAs are required on work activities which include high hazard activities.

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U.S.Army Corps of Engineers
Safety Inspection Checklist
Abbreviated Accident Prevention Plan

Date of Inspection

Location (Plant or Facility)	Contract Number
Contractor Name	Project Name
Inspector Name (Print)	Inspector Signature

This checklist serves as a guide only. It does not replace or eliminate the need to comply with the requirements set forth in Engineering Manual 385-1-1, Safety and Health Requirements Manual, dated XX September 2014.The references Included In this checklist correspond to the applicablesections of EM 385-1-1.

If service, supply and R&D contracts with limited scopes are awarded, the contractor may submit an abbreviated Accident Prevention Plan. This APP shall address the following areas at a minimum. If other areas of the EM 385-1-1 are pertinent to the contract, the contractor must assure these areas are addressed as well.

Item Description	Yes	No	N/A	Remarks (Any NO or N/A Item)
1. Signature sheet				
a. Includes the name, signature, and title of the Plan Preparer *(Qualmed person,* i.e. *corporate safety staff person,* QC)	☐	☐	☐	
b. Includes the name, signature,and tiUe of the Plan Approver {e.g. *owner, company president, regional vice presiden*	☐	☐	☐	
c. Includes the name{s), signature(s), and title{s) for Plan Concurrence (provide concurrence of other applicable corporate and project personnel(contractor))	☐	☐	☐	
2.Background information				
a. Includes the Contractor Name.	☐	☐	☐	
b. Includes the Contract Number.	☐	☐	☐	
c. Includes the Project Name.	☐	☐	☐	
d. Includes the Brief Project Description.	☐	☐	☐	
e. Includes the Location of the Project {map).	☐	☐	☐	
f. Includes a means to evaluate the work being done (see AHA requirements in 01.A.13) and associated hazards involved.	☐	☐	☐	
g. Addresses the identified hazards involved and the control measures to be taken.	☐	☐	☐	
3. Statement of Safety and Health Policy detailing their commitment to providing a safe and healthfulworkplace for all employees.	☐	☐	☐	
4.Responsibilities and Lines of Authorities				
a.Includes the identification and job responsibilities of personnel responsible for safety - at both corporate and project level - including their resumes.	☐	☐	☐	
b.Includes the lines of authority.	☐	☐	☐	
5. Training- new hire SOH orientation training at the time of initial hire of each new employee and any periodic retraining/recertification requirements	☐	☐	☐	
6.Procedures for job site inspections - assignment of responsibilities and frequency	☐	☐	☐	

U.S.Army Corps of Engineers
Safety Inspection Checklist
Abbreviated Accident Prevention Plan

Date of Inspection

Item Description	Yes	No	N/A	Remarks (Any NO or N/A item)
7.Procedures for reporting man-hours worked and reporting and investigating any accidents as soon as possible but not more than 24 hours afterwards to the Contracting Officer/Representative (CO/COR)	☐	☐	☐	
8.Emergency Planning. Employees working alone shall be provided an effective means of emergency communication. This may be cellular phone, two-way radio or other acceptable means. The selected means of communication must be readily available and must be in working condition.	☐	☐	☐	
9.Drinking Water provisions, toilet and washing facilities.	☐	☐	☐	
10.First Aid and CPR training (at least two employees on each shift shall be qualified/certified to administer first aid and CPR) and provision *of* first aid kit (types/size).	☐	☐	☐	
11.Personal Protective Equipment				
a. Work Clothing - Minimum Requirements. Employees to wear clothing suitable for the weather; minimum requirements for work shall be short-sleeve shirt, long pants (excessively long or baggy pants are prohibited) and leather work shoes. If AHA determines safety-toed (or other protective) footwear is necessary (i.e., mowing, weed eating, chain saw use, etc), they shall be wom.	☐	☐	☐	
b.Eye and Face Protection. Eye and face protection shall be worn as determined by an analysis of the operations being performed HOWEVER, all involved in chain saw use, chipping,stump grinding, pruning operations, grass mowing, weed eating and blowing operations shall be provided safety eyewear (Z87.1) as a minimum.	☐	☐	☐	
c. Hearing Protection. Hearing protection must be worn by all exposed to high noise activities {includes grass mowing/trimming, chainsaw operations, tree chipping, stump grinding and pruning)	☐	☐	☐	
d.Head Protection. Hard hats shall comply with ANSIZ89.1 and shall be wom by all workers when a head hazard exists. At a minimum, hard hats shall be worn when performing activities identified in {b) above	☐	☐	☐	
e.High Visibility Apparel shall comply with ANSI/ISEA 107, Class 2 requirements at a minimum and shall be worn by all workers exposed to vehicular or equipment traffic.	☐	☐	☐	
f.Protective Leg chaps shall be wom by all chainsaw operators.	☐	☐	☐	
g. Gloves of the proper type shall be worn by persons involved in activities that expose the hands to cuts,abrasions, punctures, bums and chemicalirritants.	☐	☐	☐	
h. If work is being performed around water and drowning is a hazard, PFD's must be provided and worn as appropriate.	☐	☐	☐	
12.Machine Guards and safety devices. Lawn maintenance equipment must have appropriate guards and safety devices in place and operational.	☐	☐	☐	

U.S.Army Corps of Engineers
Safety Inspection Checklist
Abbreviated Accident Prevention Plan

Date of Inspection

Item Description	Yes	No	N/A	Remarks (Any NO or N/A Item)
13. Hazardous Substances. When any hazardous substances are procured, used, stored or disposed, a hazard communication program must be in effect and MSDSs shall be available at the worksite. Employees shall have received training in hazardous substances being used. When the eyes or body of any person may be exposed to corrosives, irritants or toxic chemicals, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within 10 seconds of the worksite.	☐	☐	☐	
14. Traffic control shall be accomplished in accordance with DOrs MUTCD.	☐	☐	☐	
15. Control of Hazardous Energy (Lockout/Tagout). Before an employee perfonns any servicing or maintenance on any equipment where the unexpected unergizing or startup of the equipment could occur, procedures must be in place to ensure adequate control of	☐	☐	☐	
16. Driving, working on (i.e., working with equipmenUmowers) while on slopes, working from/in boats/skiffs, etc shall also be considered and dealt with accordingly.	☐	☐	☐	

Other Remarks

Form A-02
U.S. Army Corps of Engineers
Accident Prevention Plan Checklist

Date of Inspection

Location (Plant or Facility)	Contract Number
Contractor Name	Project Name
Inspector Name (Print)	Inspector Signature

This checklist serves as a guide only, it does not replace or eliminate the need to comply with the requirements set forth in Engineering Manual 385-1-1, Safety and Health Requirements Manual, dated XX Sept 2014. The references included in this checklist correspond to the applicable sections of EM 385-1-1.

Item Description	Yes	No	N/A	Remarks (Any NO or N/A item)
1. Signature sheet				
a. Includes the name, signature, and title of the Plan Preparer (*Qualified person, i.e. corporate safety staff person, QC*)	☐	☐	☐	
b. Includes the name, signature, and title of the Plan Approver (*e.g. owner, company president, regional vice president*) (HTRW activities require approval of a Certified Industrial Hygienist, a Certified Safety Professional may approve the plan for operations involving UST removal where contaminants are known to be petroleum, oils, or lubricants).	☐	☐	☐	
c. Includes the name(s), signature(s), and title(s) for Plan Concurrence (provide concurrence of other applicable corporate and project personnel (contractor)) (*e.g. Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional, project QC.*)	☐	☐	☐	
2. Background information				
a. Includes the Contractor Name.	☐	☐	☐	
b. Includes the Contract Number.	☐	☐	☐	
c. Includes the Project Name.	☐	☐	☐	
d. Includes the Brief Project Description.	☐	☐	☐	
e. Includes the Location of the Project (map).	☐	☐	☐	
f. Includes the Contractor Accident Experience (*Copy of OSHA 300*	☐	☐	☐	
g. Includes the Listing of Phases of Work and Hazardous Activities Requiring an Activity Hazard Analyses (AHA).	☐	☐	☐	
3. Statement of Safety and Health Policy. Includes a copy of the corporate safety policy. (*In addition to the corporate policy statement, a copy of the corporate safety program may provide a portion of the information required by the accident prevention*	☐	☐	☐	
4. Responsibilities and Lines of Authorities				
a. Includes the identification and job responsibilities of personnel responsible for safety - at both corporate and project level – including their resumes.	☐	☐	☐	
b. Includes the lines of authority.	☐	☐	☐	

Form A-02
U.S. Army Corps of Engineers
Accident Prevention Plan Checklist (cont'd)

Date of Inspection

Item Description	Yes	No	N/A	Remarks (Any NO or N/A item)
5. Training				
a. Includes the list of subjects to be discussed with employees at safety indoctrination.	☐	☐	☐	
b. Includes the list of mandatory training and certifications applicable to this project (*e.g., explosive actuated tools, confined space entry, crane operator, diver, vehicle operator, HAZWOPER training and certification, PPE*) and any requirements for periodic retraining / recertification.	☐	☐	☐	
c. Includes the identity requirements for emergency response training.	☐	☐	☐	
d. Includes the outline requirements (*who attends, when given, who will conduct, etc.*) for supervisory and employee safety	☐	☐	☐	
6. Safety and Health Inspections				
a. Includes the name(s) of individual(s) responsible for conducting safety inspections. (*e.g., PM, safety professional, QC, supervisors, employees*)	☐	☐	☐	
b. Includes proof of inspector's training / qualifications.	☐	☐	☐	
c. Indicates when inspections will be conducted.	☐	☐	☐	
d. Furnished sample forms upon which inspections will be recorded.	☐	☐	☐	
e. Indicates deficiency tracking system and follow-up procedures.	☐	☐	☐	
f. Includes the names of competent and / or qualified person(s) and proof of competency / qualification to meet specific OSHA competent / qualified person(s) requirements.	☐	☐	☐	
g. Includes any external inspections / certifications which may be required. (*e.g., US Coast Guard*)	☐	☐	☐	
7. Safety and Health Expectations, Incentive Programs, and Compliance				
a. Includes the company's written safety program goals, objectives, and accident experience goals.	☐	☐	☐	
b. Includes a brief description of the company's safety incentive programs (*if any*).	☐	☐	☐	
c. Includes the policies and procedures regarding noncompliance with safety requirements (to include disciplinary actions for violation of safety requirements).	☐	☐	☐	
d. Includes the written company procedures for holding managers and supervisors accountable for safety.	☐	☐	☐	
8. Mishap Reporting				
a. The plan identifies how, when, and who shall complete the Exposure data (man-hours worked).	☐	☐	☐	
b. The plan identifies how, when, and who shall complete mishap investigations, reports, and logs.	☐	☐	☐	
c. The plan identifies how, when, and who shall make immediate notification of major mishaps.	☐	☐	☐	

Form A-02
U.S. Army Corps of Engineers
Accident Prevention Plan Checklist (cont'd)

Date of Inspection

Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable occupational risks and compliance plans. Using the EM 385-1-1 as a guide, plans may include but not be limited to:

Item Description	Yes	No	N/A	Remarks (Any NO or N/A item)
9. Plans (Programs, Procedures) required by the Safety Manual				
a. Fatigue Management Plan (01.A.20)	☐	☐	☐	
b. Emergency response plans:	☐	☐	☐	
(1) Procedures & Test (01.E.01)	☐	☐	☐	
(2) Spill Plans (01.E.01, 06.A.02)	☐	☐	☐	
(3) Fire Fighting Plan (01.E.01; 19.A)	☐	☐	☐	
(4) Posting of Emergency Telephone Numbers (01.E.05)	☐	☐	☐	
(5) Man overboard/abandon ship (19.A.04)	☐	☐	☐	
(6) Medical Support. Outline on-site medical support and off-site medical arrangements including rescue and medical duties for those employees who are to perform them, and the name(s) of on-site Contractor personnel trained in first aid and CPR. A minimum of two employees shall be certified in CPR and first-aid per shift/site (Section 03.A; 03.D)	☐	☐	☐	
c. Plan for prevention of alcohol and drug abuse (01.C.02)	☐	☐	☐	
d. Site Sanitation Plan (Section 02.B)	☐	☐	☐	
e. Medical Support Plan, (03.A.01; 03.A.06; 03.D)	☐	☐	☐	
f. Bloodborne Pathogen Plan (03.A.05)	☐	☐	☐	
g. Exposure Control Plan (03.A.05)	☐	☐	☐	
h. Site Layout Plan (04.A)	☐	☐	☐	
i. Access/Haul road Plan (04.B)	☐	☐	☐	
j. Hearing Conservation Program (05.C)	☐	☐	☐	
k. Respiratory Protection Plan (05.G)	☐	☐	☐	
l. Health Hazard Control Program (06.A)	☐	☐	☐	
m. Process Safety Management Plan (06.B.04)	☐	☐	☐	
n. Lead Abatement Plan (06.C & Specs)	☐	☐	☐	
o. Asbestos Abatement Plan (06.C & Specs)	☐	☐	☐	
p. Radiation Safety Program (06.F)	☐	☐	☐	
q. Abrasive Blasting Plan (06.I)	☐	☐	☐	
r. Heat/Cold Stress Monitoring Plan (06.J)	☐	☐	☐	
s. Indoor Air Quality Management Plan (06.L)	☐	☐	☐	
t. Mole Remediation Plan (06.L.04)	☐	☐	☐	
u. Chromium (VI) Exposure Evaluation (06.M)	☐	☐	☐	
v. Crystalline Silica Assessment (06.N)	☐	☐	☐	
w. Lighting Evaluation (07.A)	☐	☐	☐	
x. Lighting Plan for Night Operations (07.A.09)	☐	☐	☐	

Form A-02
U.S. Army Corps of Engineers
Accident Prevention Plan Checklist (cont'd)

Date of Inspection

Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable occupational risks and compliance plans. Using the EM 385-1-1 as a guide, plans may include but not be limited to:

Item Description	Yes	No	N/A	Remarks (Any NO or N/A item)
9. Plans (Programs, Procedures) continued.				
y. Traffic Control Plan (08.C.05)	☐	☐	☐	
z. Fire Prevention Plan (09.A.01)	☐	☐	☐	
aa. Wild Land Fire Management Plan (09.L)	☐	☐	☐	
bb. Arc Flash Hazard Analysis (11.B)	☐	☐	☐	
cc. Assured Equipment Grounding Control Program (AEGCP), (11.D.05, App D)	☐	☐	☐	
dd. Hazardous Energy Control Plan, (12.A.01)	☐	☐	☐	
ee. Standard Pre-Lift Plan (LHE) (16.A.03, 16.L.15)	☐	☐	☐	
ff. Critical Lift Plan – LHE (16.H)	☐	☐	☐	
gg. Naval Architectural Analysis (16.L)	☐	☐	☐	
hh. Contingency Plan for Severe Weather (19.A.03)	☐	☐	☐	
ii. Man Overboard/Abandon Ship (19.A.04)	☐	☐	☐	
jj. Float Plan (19.F.04)	☐	☐	☐	
kk. Fall Protection Program, (21.D);	☐	☐	☐	
ll. Demolition/Renovation Plan (to include engineering survey), (23.A.02)	☐	☐	☐	
mm. Rope Access Program, (24.H.02)	☐	☐	☐	
nn. Excavation/Trenching Plan, (25.A.01)	☐	☐	☐	
oo. Underground construction fire prevention and protection Plan, (26.D.01)	☐	☐	☐	
pp. Compressed Air Plan, (26.I.01)	☐	☐	☐	
qq. Formwork and Shoring Erection and Removal plan, (27.C)	☐	☐	☐	
rr. PreCast Concrete Plan, (27.D)	☐	☐	☐	
ss Lift. slab plans, (27.E)	☐	☐	☐	
tt. Masonry Bracing Plan, (27.F.01)	☐	☐	☐	
uu. Steel Erection Plan, (28.B)	☐	☐	☐	
vv. Explosives Safety Site Plan (ESSP) (29.A)	☐	☐	☐	
ww. Blasting Plan, (29.A; 26.J)	☐	☐	☐	
xx. Underwater Dive Operations Plan, (30.A.14, 16,)	☐	☐	☐	
yy. Tree Felling/Maintenance Program, (31.A)	☐	☐	☐	
zz. Aircraft/Airfield Construction Safety & Phasing Plan, (32.A.02)	☐	☐	☐	
aaa. Site Safety and Health Plan (HTRW), (33.B)	☐	☐	☐	
bbb. Confined Space Entry Program, (34.A.06, 07)	☐	☐	☐	
10. Risk Management Processes. Detailed project-specific hazards shall be identified and controls provided via Activity Hazard	☐	☐	☐	

Other Remarks:

APPENDIX B

Emergency Operations

1. Safety and Health Requirements. During emergency operations, it is extremely important that safety and occupational health (SOH) requirements are implemented. Personnel often perform unusual, difficult, hazardous tasks while in a challenging environment, and these conditions may increase risk and the potential for accidents. Additionally, resources are in short supply, and the loss of any resource to a mishap reduces the USACE ability to respond.

a. The SOH of USACE employees, Contractors, and members of the public exposed to USACE activities will be a primary concern during all USACE emergency operations. SOH Offices (SOHO) shall provide the necessary input to their Emergency Management counterparts to ensure that planning for SOH concerns (including hazard and risk analysis) is addressed prior to and during emergency operations.

b. Contract Requirements. SOH program requirements shall be included in all Government and contract operations. FAR Clause 52.236-13 shall be included in contracts and memoranda of agreement/understanding (MOAs/MOUs) for emergency operations and recovery assistance.

c. Accident Prevention Plan (APP) and Activity Hazard Analyses (AHAs). In addition to the APP already submitted by the Controlling Contractor, activity-specific AHAs shall be developed and submitted to the on-site USACE SOH professional for review and acceptance prior to beginning any operation (debris removal, tree removal, blue-roof activities, leaners and hangers, etc.). Once accepted, the AHA is considered a living/field document that is intended to be updated in the field by the field crews so that it constantly reflects current equipment, personnel, conditions, PPE, etc. GDA acceptance of changes made to an AHA is not necessary as long as changes do not increase original risk assessment code (RAC) level for the activity, as long as requirements are being met and a copy is made available upon request.

d. Structural Demolition. For structural demolition activities, consideration shall be given to combine like-structures under a common engineering survey and demolition plan, see Section 23.A.01.a. For example, single-story residential structures that would pose no hazards to neighboring structures or personnel could be demolished using a common engineering survey and demolition plan, whereas multiple-story structures or others that would pose risks to personnel or other structures would have individual surveys and plans per Section 23.A.01.

2. Initial Response. A qualified SOH professional shall be immediately alerted of the disaster and shall be included in the planning and execution of response and recovery efforts. This individual shall assess SOH issues and shall assure precautions are taken prior to deployment of personnel. Issues to consider include: sanitation, drinking water, power supply, living quarters, driving conditions, environmental conditions, and health issues.

3. Staffing. SOHO in the Geographic District experiencing the disaster will be temporarily staffed with additional safety, industrial hygiene, and medical personnel as necessary to ensure a comprehensive SOH program is administered for all emergency operations. If a Recovery Field Office (RFO) is established, SOH staffing is usually accomplished by use of SOH functional planning and response teams (PRT). If a RFO is not established, the Geographic District shall establish an emergency operations safety office (minimum staffing to include a safety manager and administrative support person) dedicated totally to emergency operations. Also, each Emergency Field Office established shall have a minimum of one SOH professional.

a. Medical personnel shall provide medical assistance, assessments, and advice to USACE management and employees.

b. SOH personnel shall: manage safety and health aspects of emergency operations; provide advice on SOH issues; provide SOH technical oversight for USACE employees, other Federal employees engaged in fulfilling the Corps' mission, and quality assurance for Contractor employees.

c. Prime Contractors for emergency operations are required to have as a minimum a full-time, qualified SOH professional on-site. Qualifications of the SOH professional shall be provided to the GDA for review and acceptance. Additional Contractor personnel may be required as determined by the GDA.

4. Qualifications of Government Employees.

a. All Government employees reporting for emergency recovery operations shall <u>meet the medical requirements in the current All Hazards OPORD (currently 2012-11) and shall have a current medical clearance in ENGLink</u>. <u>This requirement shall be confirmed upon arrival during the check-in process</u>.

<u>b</u>. Employees with known pre-existing non-work-related medical conditions such as uncontrolled diabetes, cardiovascular or pulmonary problems, back conditions, pregnancy or hypertension shall not deploy to emergency operations sites unless specific medical clearance is provided by the USACE medical provider in conjunction with their personal physician(s) indicating their current medical condition will not jeopardize their health or their ability to fully perform their duty assignments at deployment sites.

c. Employees may be returned to their duty station if during the course of duty they experience health problems that may endanger their well-being.

d. Employees shall be notified that pharmacies and medical services may be limited at the emergency operations site.

5. Mobilization of USACE Personnel. USACE personnel will be provided the following prior to departing their home duty station for emergency operations:

a. PPE consisting of, at a minimum, head, eye and foot protection appropriate for the hazards of the field activities that they will perform (additional PPE that may be necessary will be provided at the emergency operations site), and

b. Immunizations appropriate for their field exposure (follow-up immunizations will be the responsibility of each employee's home duty station). Deploying USACE personnel shall obtain the immunizations as required by the current All Hazards OPORD. The USACE personnel will update their immunization data in ENGLink before departing their home station, provide a copy to a USACE nurse for verification, and carry with them their immunization record (USPHS Form 731) or immunization record which provides, type of immunization with lot and manufacture, date of immunization, and name and credential of provider.

6. Safety Orientation**.** SOH in-briefings and orientation shall be conducted as personnel arrive at the emergency area and prior to beginning work activities.

7. Communications.

a. Two-way radios, cellular phones, computers and facsimile machines shall be used as needed to establish and enhance communications. > See Section 18.C.01.

b. SOH programs, documents, signs, tags, instructions, etc., shall be communicated to employees and the public in a language they understand.

8. Duty Schedule.

a**.** During the first 2 weeks of an emergency response operation extended work hours are allowed. Supervisors shall monitor employees for signs of stress-related health problems and seek medical assistance as appropriate.

b. For operations lasting longer than 2 weeks, USACE and contractor employees shall not work in excess of 84 hours per week. The duty hours an employee would be required to work during emergency operations are 12 hours per day, 7 days a week. Work and travel time must allow for 8 hours continuous rest between each work shift.

c. Employees who are working 12 hours per day, 7 days a week shall be provided the opportunity for 24 hours of rest after working 14 days and 48 hours of rest after working 21 days. Employees shall be required to take at least 24 hours off for rest after a continuous 30-day period of work during normal non-duty days (Saturday or Sunday) and shall be required to take at least 24 hours every 2 weeks thereafter. Supervisors shall monitor employees for signs of stress-related health problems and seek medical assistance as appropriate.

9. Machinery and Mechanized Equipment. > See Sections 16 and 18.

a. Inspection of equipment is critical as mobilization can be extremely short and equipment may not be up to USACE safety standards. Whenever feasible, contract specifications shall provide adequate mobilization time to allow equipment to be inspected and brought up to USACE standards. Equipment not meeting the requirements of this manual will not be used.

b. Trucks hauling debris on public highways shall have physical barriers (covers and either tail gates or chain link fencing) to preclude debris from falling from the truck. Tail gates or chain link fencing shall cover the full area at the rear of the dump body.

(1) Back-up alarms shall be provided.

(2) The need for rollover warning devices shall be considered for long-bed end dump trucks.

(3) Sideboards shall not be added to trucks to increase their capacity unless specific design specifications are provided to Contractors as part of the scope of work. Single or double boards added to trailers designed for normal operation with the additional boards are permitted. Where sideboards are permitted, the tail gate or chain link fencing shall extend to cover the full area of the rear of the vehicle.

(4) Trees, to include leaners and hangers, shall be cut into manageable size to place in the bed of a truck. All loads shall be secured so that any debris, dust-like emission, aggregate (gravel), soil, or stump cannot be ejected during transport to the final reduction site. After final reduction, tarping systems that prevent workers from being exposed to fall hazards greater than 6 ft (1.8 m) shall be required. All loads leaving the reduction site shall be secured and tarped.

c. Prior to operation, Contractors shall develop written safe operating procedures (SOPs) for each brush chipper, shredder, and/or grinder.

(1) SOPs shall incorporate the manufacturer's recommendations for safe operation of this equipment as well as the use of an exclusion zone (EZ) and fire prevention efforts.

(2) Operations and maintenance manuals for chippers, grinders, and shredders shall be kept on-site.

(3) A minimum 200 ft (61.0 m) EZ is required for authorized persons during operation of chippers, shredders, and grinders unless documentation or actual practice indicates otherwise. Signs shall be placed at 200 ft (61.0 m) identifying the EZ.

(4) The public shall be kept a minimum of 300 ft (91.4 m) from all chipper operations.

(5) Unauthorized personnel shall not enter the EZ while the chipper is in operation.

(6) Front-end loaders, skid steers, knuckle booms, and other equipment working in debris reduction areas or feeding grinders, shredders or chippers shall provide protection to the operator as required in Section 18.

(7) Whenever chipper operations are shut down for any significant length of time (e.g., overnight or when the chipper will be left unattended), equipment walls, crevice drums, cutter heads and hammers, and drive mechanisms shall be cleared of all combustible materials by blowing, washing, and wetting down.

(8) Any material contaminated by leakage of hydraulic fluids, oils, or fuel shall be immediately removed. Leakage shall be minimized through preventive maintenance.

(9) Because piles of chipped wood are susceptible to spontaneous combustion, fire controls such as segregation, separation, and adequate water supply shall be used.

d. The number of workers in proximity to loaders, trucks, and other equipment shall be the minimum necessary to accomplish the job.

(1) In restricted areas or areas with reduced access or visibility, special precautions will be taken to ensure the safety of workers on the ground.

(2) Sequencing of work shall minimize equipment movement when personnel are in the work area.

(3) Workers in the area of operating machinery or vehicular traffic shall wear high-visibility apparel, in accordance with Section 5.F. These workers include, but are not limited to flag persons, signalpersons, spotters, survey crews and inspectors.

e. Loaders, trackhoes, and other construction equipment in debris reduction areas shall have functional lights in the front and back in order to work at night or during periods of reduced visibility.

f. Aerial Lifts/Platforms/Bucket trucks shall conform to requirements identified in Section 22.M.

g. Unless provided by the manufacturer, seat belts are not required at the operator's station on articulating grapple trucks (knuckle boom trucks). If provided by the manufacturer, seat belts are required to be worn. Access ladders shall be a minimum of 12 in (30.5 cm) width with 16 in (40.6 cm) recommended.

10. Traffic Control.

a. Traffic control is extremely important on highways, in residential areas, and at construction sites. When traffic may pose a hazard to operations, public roads will be closed. Road closings shall be coordinated in writing with appropriate local agencies. Traffic controls and signage should comply with the DOT Federal Highway Administration's "Manual on Uniform Traffic Control Devices (MUTCD)".

b. When a road cannot be closed, the following precautions shall be taken:

(1) "FLAGGER" (MUTCD W-20-7) or "WORKERS AHEAD" (W21-1) or similar appropriate signs shall be placed along the roadway, 1,000 ft (304.8m) and 500 ft (30.5 m) before the work zone, on both sides of the work zone;

(2) Sufficient number of flag persons shall be used to control traffic within the work area;

(3) Flag persons shall be used and shall receive instruction in flagging operations before being placed in traffic. Flagger training shall be consistent with the requirements of the MUTCD and State DOT unless the State requirements have been waived for the emergency at which point training and certification, such as provided by the National Safety Council, is recommended;

(4) All flag persons shall wear high-visibility apparel in accordance with Section 05.F, safety-toed footwear and hard hats;

(5) "STOP/SLOW" paddles, preferably mounted on a 6 ft (1.8 m) staff, will be used for traffic control;

(6) Flag persons shall be able to communicate with each other and with the foreman, and effectively signal/direct the affected public;

(7) Two-way radios shall be used whenever visual contact between flaggers is not maintained.

c. When construction vehicles and all vehicles exceeding 1-1/2 tons (1360.8kg) are required to back-up, an AHA shall be developed per Section 01.A.14 that considers all potential hazards and controls to include consideration for use of a spotter.

d. Fugitive dust emissions shall be kept to a minimum within the work boundaries especially when adjacent to debris towers.

11. Debris Reduction.

a. General information.

(1) The Contractor shall notify the local fire department and arrange for fire suppression support in case of fire beyond the Contractor's firefighting capability.

(2) Adequate supplies of water or fire extinguishers shall be readily available and fire watches shall be used. A fire watch shall be present continuously at debris collection/reduction sites anytime there is reduction taking place or visible flame and when the site is not being actively worked and the potential exists for spontaneous combustion or other fire hazard. The fire watch shall have at least one 20 lb ABC fire extinguisher available and the means to expediently communicate with the site supervisor and designated fire response agencies.

(3) No hazardous or containerized ignitable material shall be co-mingled with debris.

(4) Pits may not extend within 1 ft (30.5 cm) of the ground water table. Pits shall have a compacted clay layer (or similar) on the bottom to minimize migration of ash to the aquifer.

(5) Particulate emissions must meet State and EPA standards for burning operations. The site manager must be continuously aware of wind conditions and adjust accordingly to control smoke encroachment into residential areas. Wind meters must be available on site to track wind conditions. Personnel shall work out of direct smoke streams.

(6) Eye wash facilities shall be provided at all burning and grinding operations. > See Section 06.

(7) For night operations, adequate lighting of 55 lx (5 fc) shall be provided in all outdoor work areas.

(8) Signs shall be posted at entrances to debris collection/reduction areas indicating "NOTICE: AUTHORIZED PERSONNEL ONLY" (USACE SNO-07 or ANSI equivalent).

(9) A “Danger/Keep Back” sign shall be posted at the edge of the 100 ft (31 m) setback from air curtain incinerators and open burn areas as a warning to personnel (USACE UNS-01 or ANSI-equivalent).

(10) All personnel working in debris collection/reduction areas shall wear safety shoes, hard hat, safety glasses, Class II (minimum) high-visibility vest, and have hearing protection available.

(11) A minimum 30 ft (9 m) wide fire lane shall be cleared around the full perimeter of the site with a silt fence along the perimeter. The fire lane shall be kept clear of all combustible materials.

(12) All burning operations, including air-curtain incinerators, shall be conducted at a distance of no less than 1000 ft (305 m) from an occupied dwelling or business or a dwelling or business in such condition that it can be occupied.

(13) For outbuildings such as barns, sheds, structures destroyed by the storms, tree lines and similar, the minimum separation distance is 300 ft (92 m) subject to local authority approval.

(14) Burning may not occur within 100 ft (31 m) of overhead utility lines.

b. Debris/mulch piles.

(1) At least 100 ft (31 m) is required between the debris/mulch piles and the burn area or incinerator.

(2) At least 1000 ft (305 m) is required between the debris/mulch piles and the nearest occupied dwelling or business or a dwelling or business in such condition that it can be occupied.

(3) Debris/mulch piles shall not be placed directly under transmission lines nor located within 100 ft (31 m) of transmission towers.

(4) A minimum 30 ft (9 m) wide fire lane shall be cleared around each debris/mulch pile. The fire lane shall be kept clear of all combustible materials.

(5) Mulch piles shall not be stacked greater than 20 ft (6 m) high for more than 7 days due to the increased risk of spontaneous combustion.

c. Air-curtain incinerator operations.

(1) Prior to operating an air-curtain incinerator, the contractor shall develop a written AHA and SOP. Employees will be briefed on the AHA/SOP, which will be readily available for their review. In addition, the contractor shall have all incinerator placements inspected by a USACE SOH professional prior to the start of burning and ensure that the design is maintained throughout the life of the activity.

(2) The design of air-curtain operations shall provide for efficient burning of materials.

(3) Equipment, such as trackhoes, that feed burn pits/debris piles shall have a fully enclosed cab equipped with an air filtration and pressurization system. Workers requiring respirators shall be enrolled in the respiratory protection program and all applicable requirements met in accordance with Section 5.

(4) There shall be a 1 ft (0.3 m) high warning barrier the length of the charging side of the pit to warn equipment operators. It shall be constructed of non-combustible material.

(5) Pits must be constructed out of highly compactable material that will hold its shape.

- If a manufactured fire box is not provided, the incineration pits shall be made of Type B soil (cohesive soil), and be reinforced with earth anchors, wire mesh, or other items in order to support the weight of loaders.

- The edges of the pit shall be checked for integrity on a regular basis to prevent unexpected cave-ins or collapse.

- There shall be an impervious layer of clay on the bottom of the pit to attempt to seal the ash from the aquifer. This shall be replaced if scraped by dozers.

- The length of the air-curtain pit shall not be more than 6 in (15.2 cm) longer than the blower system at each end.

- The ends of the pit shall be near vertical and extend to the top of the pit.

(6) If a pick-and-drop debris pile is located within the 100 ft (30.5 m) minimum separation zone of the air curtain incinerator, the total volume of the pick-and-drop debris pile(s) supporting an incinerator shall not be more than four times the volume of the incinerator pit.

(7) A 12 in (30.5 cm) soil seal shall be placed on the lip of the air curtain incineration pit to seal the blower nozzle. The nozzle should be 3 in (7.6 cm) to 6 in (15.2 cm) from the edge of the pit.

d. Open burning operations.

(1) Open burning may involve one of the following:

- Ignition of brush piles in rows on top of the ground;

- Digging a fire pit in the ground or constructing the pit above ground using berms;

- Constructing a 3-sided bermed pit open at one end to allow equipment tending the fire to push the brush pile to one end and continue feeding, with all brush contained below the top of the bermed area.

(2) When open burning:

- AND sustained wind speeds reach 15 mph, additional material may not be added to the burn pile;

- Full burning may resume when sustained wind speeds drop below 15 mph;

- When sustained wind speeds reach 20 mph, fires shall be wetted or knocked down to control spread of fires.

(3) Each open burning area may not exceed 200 ft by 200 ft (61 m x 61 m) in the horizontal plane.

- If space permits the use of multiple open burning areas, there will be a 30 ft (91.4 m) fire lane between the open burning areas.

- The load approach area of the pits shall be sufficiently compacted to provide a surface capable of supporting the loading equipment without damaging the integrity of the pit walls.

- A stop of non-combustible material shall be constructed no closer than 10 ft (3 m) of the edge of the pit to prevent equipment from falling into the pit.

(4) When burning in pits:

- AND the top of the brush pile remains below the top of the pit AND sustained winds reach 25 mph, additional material may not be added to the pile:

- AND sustained wind speeds reach 30 mph, fires shall be wetted or knocked down to control spread of fires.

- AND the brush pile extends above the top of the pit AND sustained wind speeds reach 15 mph, additional material may not be added to the burn pile.

- AND the brush pile extends above the top of the pit AND sustained wind speeds reach 20 mph, all fires must be wetted or knocked down.

- Debris may not be stacked in the burning area higher than 10 ft (3 m) above the original ground level.

e. Ash management.

(1) The burn shall be extinguished approximately 2 hours before anticipated removal of the ash mound. The ash mound shall be removed before it reaches 2 ft (0.6 m) below the lip of the incineration pit.

(2) The contractor shall exercise dust control measures while handling ash especially during transport. Ash shall not be transported until it is proven fully extinguished (soaked with water, producing no steam, and having no visible evidence of residual hot embers).

12. Temporary Roofing.

a. During emergency operations that involve residential temporary roofing, RFO Commanders may permit:

(1) The use of athletic footwear by workers performing temporary roofing operations only;

(2) The removal of hard hats by workers on roof tops;

b. Fall Protection shall be per Section 21 and fall protection during temporary roofing activities shall be in accordance with Figure B-1.

c. While workers are on the roof, weather shall be monitored as required in Section 01.E.01.

13. Tower Safety Requirements.

a. All towers shall be designed by a registered professional engineer (RPE) and clearly marked with weight capacities. The weight capacities shall not be exceeded under any circumstance.

b. All towers shall be GFCI (Ground Fault Circuit Interruption) protected, receptacles shall have gasket weather-proof coverings, and both electrical boxes and conduit shall be rated for outdoor use.

c. No modifications shall be made to the tower that will affect the structural stability of the structure without obtaining a sign-off by the design engineer.

d. Personnel shall not lean out of tower windows nor use stools or other steps to decrease fall protection provided by the window height. If visibility of load is obstructed, use of a mirror or other tool shall be utilized.

e. All portable generators shall be tagged green for having been inspected and deemed in compliance with the manufacturer's recommendations especially in regards to proper grounding.

f. Scissor lifts may be approved by the GDA during the initial 72 hours of the emergency operation during tower construction.

(1) Scissor lifts may not be occupied by more than two individuals at any given time unless the manufacturer allows additional occupancy.

(2) All personnel shall be provided with and required to wear proper fall protection with restraint lines while in the scissor lift, as required in Section 21.

(3) Scissor lifts shall be protected from impact by suitable impact protection equal to that required by a tower in the same location.

g. All towers shall be provided sufficient traffic barrier protection such as would be provided by concrete jersey barriers.

14. Tree Maintenance. > See Section 31.

15. Defensive Driving Training. Personnel involved in emergency operations are at increased risk of motor vehicle accidents due to damaged roadways, debris/hazards in roadways, road closings, malfunctioning or missing traffic control devices, extended duty hours, and driving under challenging environmental conditions.

a. Safe driving programs shall be instituted and those deploying will have current Defensive Driver Training.

b. In addition, Government-owned vehicles operated by Contractor personnel (GOCO) shall also have current Defensive driver training. > See Section 18.

c. Personnel operating off-road vehicles shall be trained, prior to operation, in the use of such equipment. > See Sections 18.C.02 and 18.D.

16. Public Safety. Requirements for work area delineation, traffic control devices, and the use of flag persons shall be considered and as per ANSI A10.34. Public service announcements shall be used as needed to promote safety of the public exposed to USACE activities. Barriers and fencing shall be considered in restricting the public from operation sites. It is also necessary for all contact with the public to be handled in a courteous manner. > See ANSI A10.34.

17. Health Hazard Recognition.

a. Health hazards (e.g., asbestos, lead paint, radiation, hazardous chemicals, etc.) shall be identified and controlled through the recommendations of a qualified industrial hygienist(s). Instrumentation, as required, shall be provided for the detection and measurement of health hazards. After hazards have been identified, and measured, this information shall be posted at the work site and copies of this posting shall be kept by both the contractor and the relevant local USACE field office's Quality Assurance Team. Controls shall be instituted where required and a description of the controls shall be written as part of the APP.

b. Asbestos Recognition and Control. Before work begins where the potential exists for an exposure to asbestos containing material, an asbestos control plan shall be developed using age of the buildings, type of typical building supplies for the period and location, and any observations of debris or demolition areas.

(1) The plan shall be written by an industrial hygienist with asbestos training or an AHERA trained supervisor or manager.

(2) If possible, the potential work areas should be inspected by asbestos trained inspectors or an industrial hygienist to identify and quantify asbestos hazards.

(3) The plan shall address control mechanisms, such as wetting with water or surfactant, posting, worker and community protection, air sampling, and safe transport and disposal.

(4) As the asbestos volume and type may change, the pre-inspections of the debris and demolition areas shall continue for each new sector. > See also Section 06.B.05.

18. Mishap Reporting.

a. All mishaps (near-miss, incident or accident) shall be reported in accordance with AR 385-10 and applicable supplements.

b. Contractor motor vehicle mishaps occurring on public highways shall be reported for trend analysis only and shall not be considered recordable.

c. The RFO SOH Manager will report mishap experience during emergency operations by maintaining an onsite accident log and by creation of a Preliminary Accident Notification (PAN) in ENGLink under the event name for all recordable accidents. This information, as well as information regarding unsatisfactory SOH performance and/or unresolved SOH problems, will be periodically reported to the USACE National Program Manager for SOH Emergency Planning and Response.

19. Variances to Safety and Health Requirements. The on-site RFO SOH Manager may recommend variances to the requirements contained within this manual to the Geographic District SOHO.

a. The Geographic District SOHO must review the request, concur or non-concur. Geographic District SOHOs will exercise prudent judgment in their recommendations for granting variances with due consideration of existing disaster conditions.

b. The recommended variance is then coordinated with the KO/COR for concurrence and then given to the RFO Commander for approval.

c. The RFO Commander shall have the authority to approve or disapprove requests for variances.

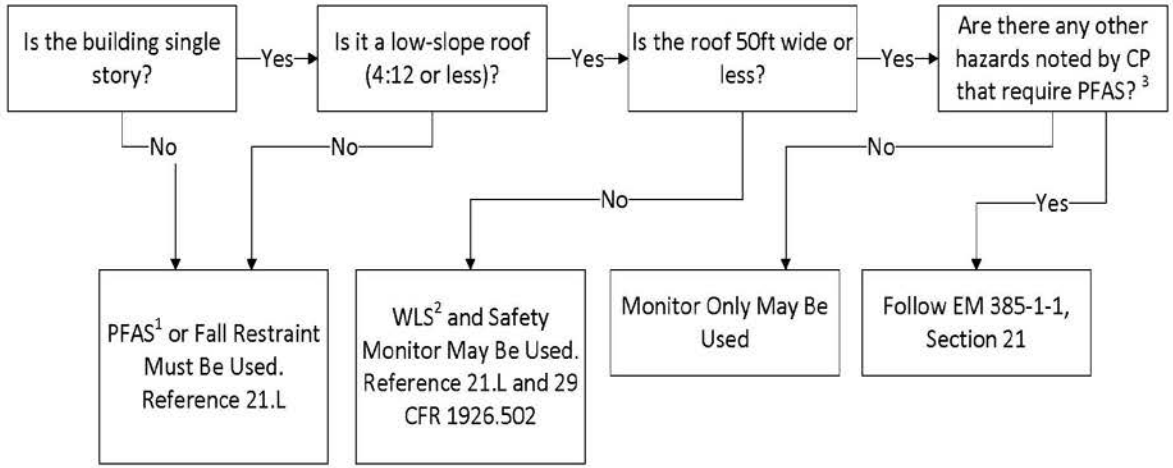
d. All variances granted must be copied to Division and HQ SOHO immediately for information only. The variances approved by the RFO Commander will expire at the end of the emergency operation mission.

Figure B-1

Blue-Roof Mission – Fall Protection Chart

Blue-Roof Mission

Fall Protection Chart



[1] Personal Fall Arrest System

[2] Warning Line System

[3] Other hazards, e.g. downed power lines or trees or obstructions from other sources, snow or ice, heavy rain or wind, roof load bearing risks, and insect/vermin hazards

Regulatory Requirements. Contractor shall submit a Fall Protection Plan specific to the mission which complies with the requirements in EM 385-1-1 Sections 21 and 24, and 29 CFR 1926.500. In addition, an Activity Hazard Analysis shall be developed for each roof prior to start of work.

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APPENDIX C

Process for Requesting Interpretations

The following process will be used for requesting an official interpretation of a requirement contained in this manual. Other DOD Components must submit their requests for interpretations through their chain of command.

1. Official requests for interpretation and all responses shall be in writing.

2. The requester must:

a. Specifically identify the requirement for which he/she seeks an interpretation;

b. Provide the exact citation and quote the requirement in question. A separate request must be made for each requirement;

c. State his/her source of confusion regarding the requirement;

d. Provide all the information necessary to understand the context in which the requirement is being applied;

e. Provide his/her interpretation of the requirement and his/her rationale.

3. Every effort shall be made to clarify the requirement at the lowest possible level.

a. The requester shall work the request for interpretation with the local USACE Safety and Occupational Health Office (SOHO). A Contractor must request interpretation of a requirement from the field office under which they work who will then coordinate with the local SOHO to provide a response. The local SOHO must then render a written interpretation of the requirement within 5 working days of receipt.

b. If either the field office or the requester is not satisfied with this response, either may appeal their position in writing to the Division SOHO. The entire package containing the requester's, and the local SOHO's interpretation, rationale, and supporting information shall be sent to the Division SOHO who shall render a written response to the local SOHO within 5 working days of receipt.

c. If the requester, the field office, or local SOHO is not satisfied with the Division SOHOs response, they may appeal it to the USACE-SO for final resolution. All of the information sent to the Division, the interpretation, rationale, and supporting information shall be provided. Within 5 working days of receipt, USACE-SO will provide a written interpretation to the Division SOHO for dissemination and it shall be final.

4. Interpretations apply ONLY to the specific time and the context in which the requirement is being applied. They may not be used as precedents to determine future applications of the requirement. USACE-SO will make the proper notifications if an interpretation may be applied globally.

5. Unofficial requests for interpretations/clarifications of requirements from local SOHOs may be made via email or telephone. However, the answers provided via this mode will be considered general guidance, not official interpretations.

6. USACE-SO will NOT accept requests for official interpretations from parties outside the USACE structure.

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APPENDIX D

Process for Requesting Waivers/Variances

The following process shall be used when requesting a waiver or a variance from a requirement contained in this manual. Other DOD Components must submit their requests through their chain of command.

1. Official requests for waivers or variances and all responses shall be in writing.

2. Waiver/variance request package shall be complete and shall include the following:

a. Specific identity of the requirement for which relief is being sought, providing exact citation and quoting the requirement;

b. Statement as to whether a waiver (total elimination of the requirement) or a variance (retaining the basic requirement, but doing it differently) is being sought;

c. Details as to why it is not possible or practical to comply with the requirement;

d. All the information (maps, drawings, references, calculations, change analysis or impact, etc.) necessary to make an informed decision. The burden of proof rests with the requester. Failure to provide the necessary information may be justification for denial of the request. It is up to the requester to make the case as to why the requirement should be waived or varied;

e. Identification of specific time period and operation for which the request is being made. A waiver/variance will be granted for specific time periods and operations and may not be used as a defense for failure to comply with a requirement at another time or on another project;

f. Explanation of method they plan to use in lieu of the requirement and how it provides protection equal to or greater than the requirement being challenged;

g. A detailed AHA addressing the alternate procedure. Risk assessment should be a part of the AHA process;

h. Provision of any other requirements or standards addressing the requirement in question. It is incumbent upon the requester to research the literature to determine if any other requirement or standard exists addressing the requirement from which relief is being sought. If there is another standard(s), the requester must identify it and provide a copy. Requests for waivers/variances will not be processed until this requirement has been met; and

i. A cover letter.

3. Requester shall work the action with the local USACE Safety and Occupational Health Office (SOHO) who shall cover package with their official signed memorandum requesting consideration and including their concurrence or non-concurrence with the request. Package is then sent via mail in hard copy or via e-mail with attached PDF file to HQ USACE-SO with a copy furnished to Division SOH Manager for concurrence or non-concurrence.

4. HQ USACE-SO will then coordinate with Division SOH Manager to evaluate the request. USACE-SO shall have at least 10 working days from date of receipt to consider the request and to render a written decision.

5. A waiver or variance will not be carried over to other operations unless the evaluator extends the scope to include other times and operations. If warranted, HQ USACE-SO may issue a global variance based on an individual request, however a global variance/waiver normally indicates a flawed requirement and hence, the actual requirement may be in need of correction/change.

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APPENDIX E

Assured Equipment Grounding Conductor Program

1. Program Overview**.** If an Assured Equipment Grounding Conductor Program (AEGCP) is used in place of ground-fault circuit interrupters (GFCIs) for ground-fault protection, the AEGCP shall consist of: written procedures for equipment inspections, tests, test schedule and results to assure equipment grounding conductors for all cord sets, receptacles that are not a part of the permanent wiring of the building or structure, and equipment connected by cord and plug are installed and maintained to protect employees on construction sites. AEGCP must be in compliance with OSHA, NESC and NEC requirements.

a. These procedures shall be made available when requested to GDA and affected persons. An AEGCP shall be continuously implemented and enforced at the site by one or more designated persons.

b. One or more competent persons shall be designated to implement and enforce the AEGCP.

2. Visual Inspections. Visually inspect all cord sets, attachment caps, plugs and receptacles, and any equipment connected by cord and plug before each day's use for external damage (i.e., deformed or missing pins, damaged insulation) and for indication of possible internal damage. Ensure flexible cords are being inspected and those arriving onsite between tests are identified and tested.

3. Removing Equipment. Equipment found to be damaged or defective or which fails any of the prescribed inspections or tests shall not be used until repaired or replaced.

4. Testing. Perform two required tests on all electrical equipment: a continuity test and a terminal connection test. Tests are required:

a**.** Before first use;

b**.** Before placing back in service following any repairs;

c**.** Before equipment is used after any incident that can be reasonably suspected to have caused damage (e.g., when a cord set is run over); AND

d. At intervals not to exceed 3 months, except that cord sets and receptacles that are fixed and not exposed to damage shall be tested at intervals not to exceed 6 months.

5. Recordkeeping. All inspections and tests shall be documented to identify all equipment that passed the inspection or test, the date of inspection or test, and the individual responsible for the inspection or test.

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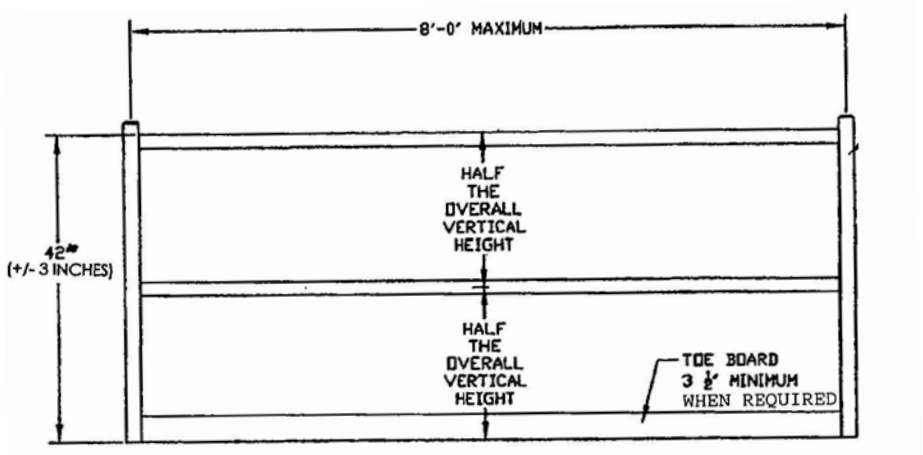
APPENDIX F

Floating Plant and Marine Activities Diagrams

FIGURE F-1

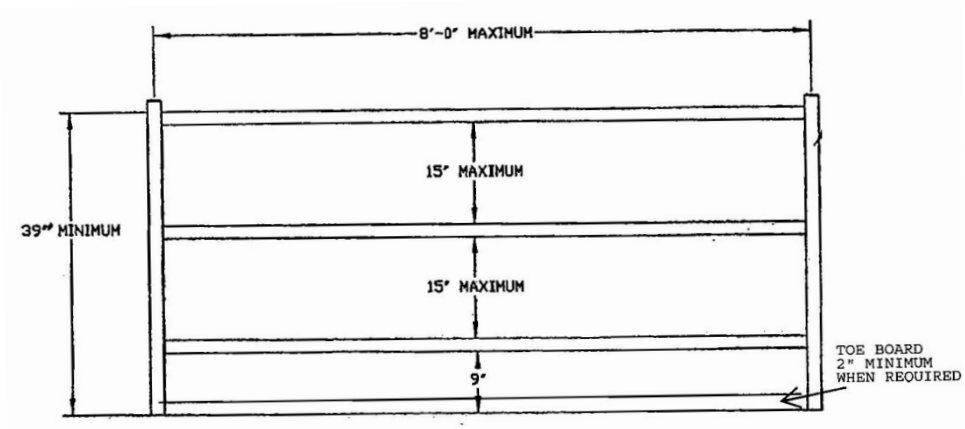
Type A Railing



MARINE RAILING TYPE A, TWO TIER RIGID FALL PROTECTION RAILING

Figure F-2

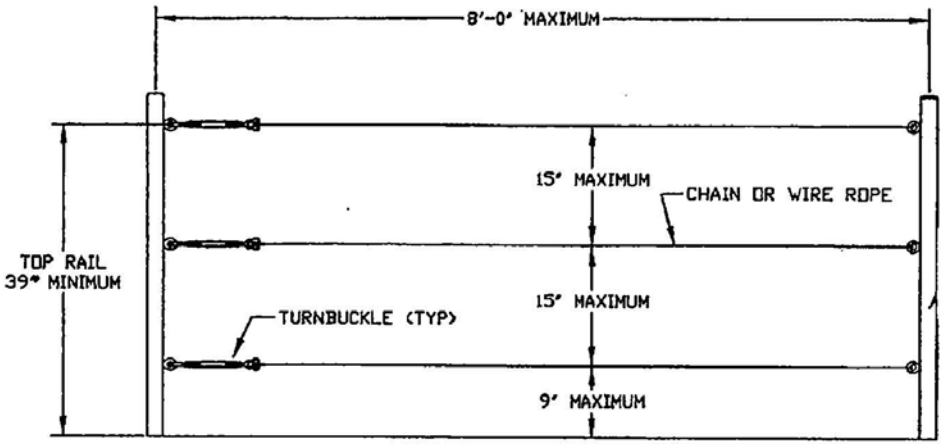
Type B Railings



MARINE TYPE B THREE TIER RIGID RAILING

Figure F-2 (Continued)

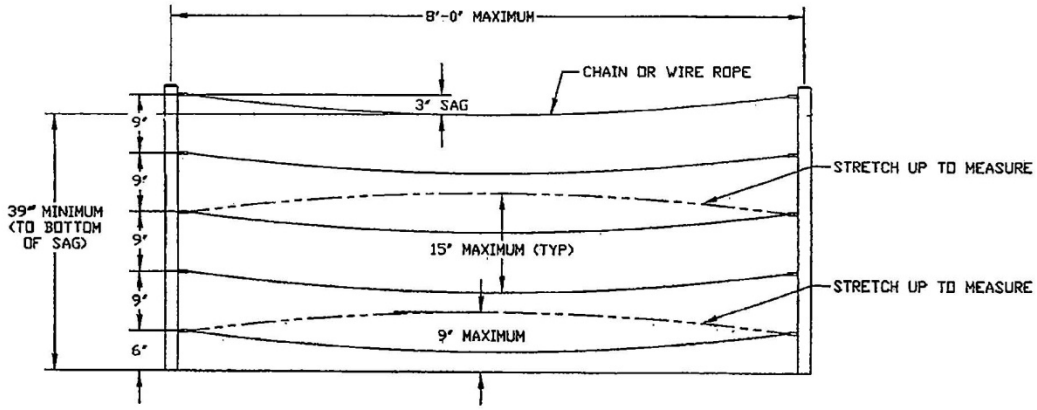
Type B Railings



MARINE TYPE B THREE TIER TENSIONED RAILING

Figure F-3

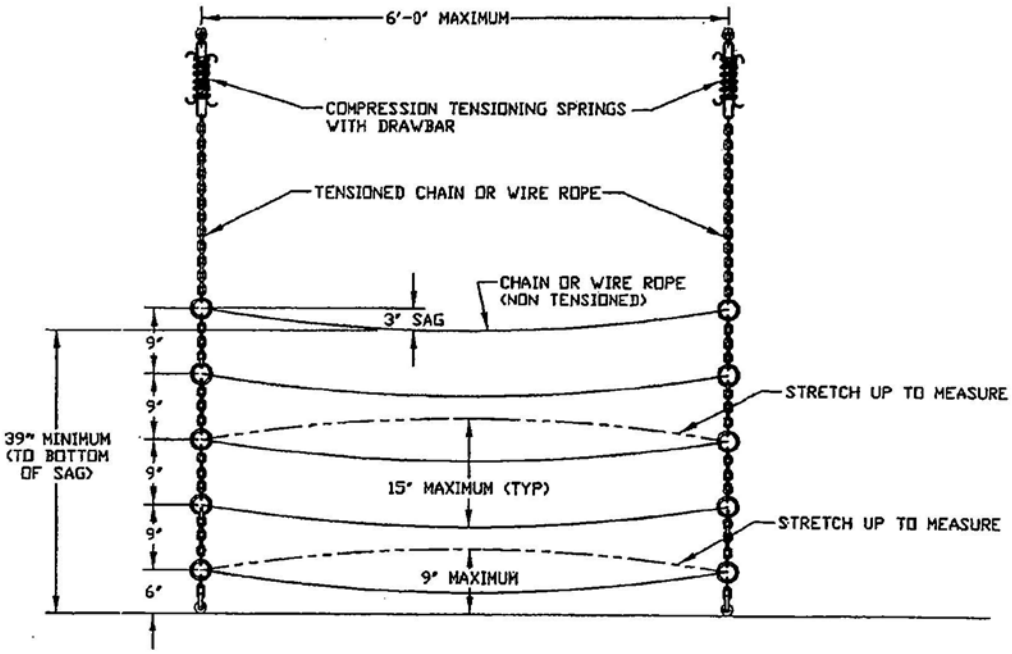
Type C Railings



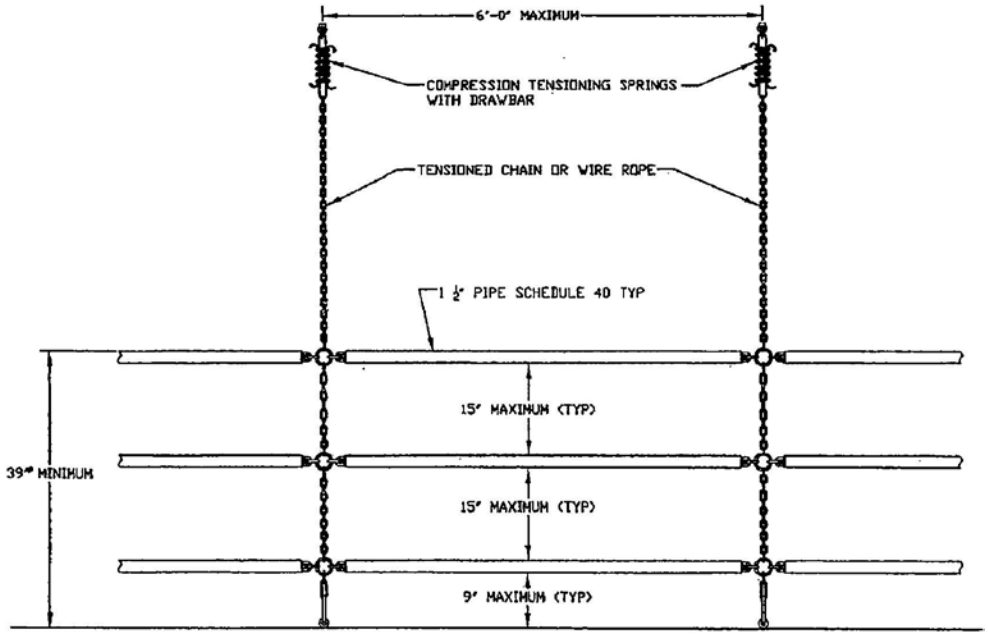
MARINE TYPE C NON-TENSIONED RAILING (3" SAG SHOWN)

Figure F-3 (Continued)

Type C Railings



MARINE TYPE C FLEXIBLE/ SWING-AWAY RAILING
WITH FLEXIBLE TIERS (3" SAG SHOWN)



MARINE TYPE C FLEXIBLE/ SWING-AWAY RAILING WITH RIGID TIERS

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APPENDIX G

Manning Levels for Dive Teams

1. General. Manning level tables shown are a minimum. Actual manning levels may increase, as determined by the DDC, after considering the diving support systems, the task at hand, weather conditions, dive platform and location, and other factors. Team members may rotate through the dive team positions as long as the minimum manning levels are maintained and team members are qualified and accepted for the position.

2. SCUBA: Untethered, 0 to 100 ft (0 to 30.5 m).

a. Untethered SCUBA divers shall always be accompanied by another diver in continuous visual contact.

b. When depth of dive is 0-100 ft (0-30.5 m), the minimum dive team will be composed as shown in Table G-1:

TABLE G-1

Dive Team Composition,
SCUBA - Untethered, 0 to 100 ft (0 to 30.5 m)

Personnel	Number
Diving Supervisor	1
Divers (in visual contact)	2
Standby Diver*	1
TOTAL TEAM	4

3. SCUBA: Tethered with communications, 0 to 100 ft (0 to 30.5 m). When depth of the dive is 0-100 ft (0-30.5 m), the minimum dive team will be composed as shown in Table G-2:

TABLE G-2 Dive Team Composition, SCUBA – Tethered with communications, 0 to 100 ft (0 to 30.5 m)	
Personnel	Number
Diving Supervisor ***	1
Diver in water	1
Standby Diver* (tethered with communications)	1
Tender	1
TOTAL TEAM	4

4. Surface Supplied Air: 0 to 100 ft (0 to 30.5 m).

a. When surface supplied air is being used as the diving mode, the minimum dive team will be composed as shown in Table G-3:

TABLE G-3 Dive Team Composition, Surface Supplied Air (SSA), 0 to 100 ft (0 to 30.5 m) Within No Decompression Limits		
Personnel	Number	Penetration Dive
Diving Supervisor ***	1	1
Diver	1	2
Standby Diver*	1	1
Tender	1	2
TOTAL TEAM	4	6

b. Deploying the Standby Diver as a Worker Diver. The Standby diver may be deployed as a working diver provided all of the following conditions are met:

(1) Surface-supplied no-decompression dive of 60 fsw or less;

(2) Divers are in close proximity, (based on site specific requirements), with unimpeded access to each other;

(3) Divers have communications with each other at all times;

(4) No entanglement hazards exist;

(5) Prior to deploying the standby diver, the work area shall be determined to be free of hazards (i.e., suctions, discharges) by the first diver on the job site;

(6) The dive is NOT a penetration or confined space dive;

(7) Each diver has a full-time tender (which brings the minimum number of team members to 5).

5. Surface Supplied Air: 101 to 190 ft (30.8 to 57.9 m).

When surface supplied air is being used as the diving mode, the minimum dive team will be composed as shown in Table G-4:

TABLE G-4

Dive Team Composition,
Surface Supplied Air (SSA), 0 to 100 ft Requiring Decompression and
All Surface Supplied Air, 101 to 190 ft (30.8 to 57.9 m)

Personnel	Dives within no decompression limits	Dives requiring decompression	Penetration Dive
Diving Supervisor	1	1	1
Chamber Operator**	**/1	****/1	1
Diver	1	1	2
Standby Diver*	1	1	1
Tender	1	1	2
Standby Diver Tender	1	1	1
TOTAL TEAM	5/6	5/6	8

6. Surface Supplied Mixed Gas Diving. For surface supplied mixed gas diving, to include OEA (Nitrox, etc.), the minimum dive team will be composed as shown in Table G-5:

TABLE G-5

Dive Team Composition,
Surface Supplied Mixed Gas Diving

Personnel	Dives within no decompression limits	Dives requiring decompression	Penetration Dives
Diving Supervisor	1	1	1
Chamber Operator**	**/1	****/1	1
Diver	1	1	2
Standby Diver*	1	1	1
Tender	1	1	2
Standby Diver Tender	1	1	1
TOTAL TEAM	5/6	5/6	8

Notes:
* The standby diver will be rested and capable of performing emergency rescue assistance. When work is limited to no decompression limits, the standby diver shall be sufficiently free of residual nitrogen to allow for 25 minutes of bottom time at the working depth without exceeding "No Decompression Limits."
** The Competent Person/chamber operator may be any non-diving member of the dive team when the chamber is only for emergency use when diving within the no-decompression limits. Saturation diving requires that a life support technician will serve as the chamber operator.
*** The supervisor may be the standby tender for dives under 100 ft (30.5 m).
**** The Competent Person/chamber operator may be any non-diving member of the dive team if all diving ceases during chamber decompression.

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APPENDIX Q

Definitions

This appendix defines the following terms for the purposes of this manual.

Abrasive blasting: the forcible application of an abrasive to a surface by pneumatic pressure, hydraulic pressure, or centrifugal force.

Absorbed dose: energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest in that material. The units of absorbed dose are the rad or the Gray (1 Gray equals 1 Joule/Kilogram equals 100 rad).

Accepted/Acceptable: a term denoting when a written procedure, practice, method, program, engineering design, or employee qualification criteria submittal, which, after a cursory review by a GDA, is determined to generally conform to safety and health or contractual requirements. Acceptance or acceptability of such submittals in no way relieves the submitting entity from ensuring employees a safe and healthful work environment or complying with all contractual requirements and good engineering practices.

Accident, recordable: One of 3 types of mishaps; meets the definition of an Army accident that involves a Government employee, Contractor, or member of the public that rises to the severity level that they are used to calculate accident experience modification rates.

Accident Prevention Plan (APP): a document that outlines occupational safety and health policy, responsibilities, and program requirements.

Accredited testing laboratory: a laboratory that an accrediting organization has determined has demonstrated the ability to conduct air quality testing according to their standard.

Activity Hazard Analysis (AHA): a documented risk management process by which the steps (procedures) required to accomplish a work activity/task are outlined and the actual/potential hazards of each step are identified. This is identification of “inherent risk”. Safety measures, precautions and controls are then identified and put into place to reduce the level of hazard for each step. The risk level then identified, is called the residual risk for that step/activity. A risk acceptance code (RAC) is then assigned to the entire activity. The AHA is an analysis tool that the USACE uses, however, other similar analysis tools are acceptable (e.g., Job Hazard Analysis, JHAs; Job Safety Analysis, JSA;, etc) provided the information required on the AHA is included, steps are identified, hazards associated with each step are listed. > See also “Inherent Risk”, “Risk Assessment Code” and “Residual Risk”.

Aerial lift/device: any vehicle mounted device, telescoping or articulating, or both, which is used to position/elevate personnel to job sites/activities above the ground. May be made of metal, wood, fiberglass reinforced plastic (FRP) or other; may be powered or manually operated; Includes:

- Aerial ladder: an aerial device consisting of a single- or multiple-section extensible ladder;
- Articulating boom platform: an aerial device with two or more hinged boom sections;
- Insulated aerial device: an aerial device designed for work on energized lines and apparatus.

Related definitions:

- Mobile unit: a combination of an aerial device, its vehicle and related equipment;
- Platform: any personnel-carrying device, basket or bucket, which is a component of an aerial device.

Affected employee: a person whose position requires him/her to operate or use a system that is under lockout or tagout or whose position requires him/her to work in an area where a system that is under lockout or tagout is being serviced or maintained.

Air curtain incinerator: Means an incinerator that operates by forcefully projecting a curtain of air across an open chamber or pit in which burning occurs. If operating optimally, there should be minimal to no visible smoke plume above the pit.

Air-purifying respirator: a respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

Air receiver: a tank used for the storage of air discharged from the compressor; used to help eliminate pressure pulsations in the discharge line.

All-Terrain Vehicles (ATVs): ATVs are motorized vehicles intended for off-road use that travel on four low-pressure tires with a seat designed to be straddled by the operator and handlebar for steering control.

Altered: any change to the original manufacturer's design configuration. These are:

- Replacement of weight-handling equipment parts and components with parts or components not identical with the original (i.e., change in material, dimensions, or design configuration);
- The addition of parts or components not previously a part of the equipment;
- The removal of components that were previously a part of the load handling equipment; and
- Rearrangement of original parts or components.

Anchor handling barge: a floating work platform consisting of a pontoon or barge, hoisting equipment, and a fixed A-frame that cannot slew or change radius. An anchor barge is used to extract anchors or buoy weights only. The load is often unknown and is often not under the tip of the A-frame.

Anchorage (fall protection): a secured point of attachment that can safely withstand the forces exerted by activation of fall protection and rescue equipment. The anchorage is the rigid part of the structure that can be in the form of a beam, girder, column or floor.

Anchorage connector: a component or subsystem by which fall protection or rescue equipment is secured to the anchorage.

Anchorage system: a combination of anchorage and anchorage connector.

Anchored bridging: the steel joist bridging is connected to a bridging terminus point.

Anti-runaway: a safety device to stop a declining conveyor in case of mechanical or electrical failure.

Anti-two blocking (A2B) device: a device that is activated by two-blocking and disengages the particular function whose movement is caused by the two-blocking.

Approach-departure clearance surface: an extension of the primary surface and the clear zone at each end of the runway, first along an inclined plane (glide angle) and then along a horizontal plane, both flaring symmetrically about the runway centerline extended.

Arborist: Is a professional in the practice of arboriculture, which is the cultivation, management, and study of individual trees, shrubs, vines, and other perennial plants. Arborists generally focus on the health and safety of individual plants and trees. Arborists typically climb trees through rope ascending and have special training in this type of climbing.

Arc: a controlled electrical discharge between the electrode and the work piece that is formed and sustained by a gas that has been heated to such a temperature that it can conduct electric current.

Arc flash: An explosive release of energy caused by an electrical arc. An arc flash results from either a phase to ground or a phase to phase fault caused by such occurrences as accidental contact with electrical systems, build up of conductive dust, corrosion, dropped tools, and improper work procedures.

Arc Rating: A value of the energy necessary to pass through any given fabric to cause with 50% probability a second or third degree burn. This value is measured in calories/cm². The necessary Arc Rating for an article of clothing is determined by a Hazard/Risk Assessment and the resulting HRC. Usually measured in terms of ATPV or EBT

Arc welding: a welding process that joins work pieces by heating them with an arc.

Articulating boom crane: a crane with a boom that has sections that are articulated by hydraulic cylinders. The boom may have a telescoping section. The crane can be stationary or mounted on a vehicle, track, locomotive, etc., and is used to lift, swing, and lower loads.

Associate Safety Professional (ASP): an individual who has achieved an interim designation denoting progress towards the Certified Safety Professional Certification offered by BCSP.

Atmosphere-supplying respirator: a respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere, and includes SARs and SCBA units.

Attendant (confined space): an individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program.

Authorized Entrant: anyone entering the site that is assigned to the site but is not a site worker (e.g., security forces, other military forces, etc.).

Authorized Entrant (confined space): an employee who is authorized by the employer to enter a permit space.

Authorized Individual (Hazardous Energy Control): a qualified person who is designated, in writing by the designated authority, to request, receive, implement, and remove hazardous energy control procedures

Authorized Person, Fall Protection: a worker working at heights, exposed to fall hazards and using FP equipment; shall have a working understanding of and follow the employer's policy and procedures and the instructions of the Competent Person for FP regarding the use of fall protection and rescue systems.

Authorized Rescuer: A person assigned to perform rescue from fall protection.

Back cut: the final cut in a felling operation, made horizontally on the opposite side from the undercut. > See definition of notch.

Barricade: a physical obstruction, such as tape, screens, or cones, intended to warn of and limit access to a hazardous area.

Barrier: a physical obstruction that is intended to prevent contact with energized lines or equipment.

Beam platform: a work platform made up of wood beams (oriented vertically).

Bearer: a horizontal member of a scaffold upon which the platform rests and that may be supported by runners.

Benching: a method of protecting employees from cave-ins by cutting the sides of the excavation in the arrangement of one or more horizontal levels, usually with vertical or near-vertical walls between steps.

Blast area: the area in which explosive loading and blasting activities are being conducted and the area immediately adjacent that is within the influence of fly-rock and concussion.

Blast site: the area in which explosive materials are being loaded, or have been loaded, including all holes to be loaded for the same blast for a distance of 50 ft (15.2 m) on all sides.

Blaster: the person(s) authorized to use explosives for blasting purposes.

Blasting agent: any material or mixture, consisting of a fuel and oxidizer, intended for blasting, not otherwise classified as an explosive, and in which none of the ingredients is classified as an explosive, provided that the finished product, as mixed and packaged for use or shipment, cannot be detonated by means of a No. 8 blasting cap when unconfined.

Boatswain’s chair: a suspended seat designed to accommodate one worker.

Body belt: a body support comprised of a strap with means for securing about the waist and attaching it to a lanyard, lifeline, or deceleration device (prohibited).

Body harness, full: straps connected together and secured about a body in a manner that distributes the arresting forces over at least the thighs, waist, chest, shoulders, and pelvis, with provision for attaching a lanyard, lifeline, or deceleration device.

Bolted diagonal bridging: diagonal bridging that is bolted to a steel joist or joists.

Bond: an electrical connection from one conductive element to another to minimize potential differences or providing suitable conductivity for fault current or for mitigation of leakage current and electrolytic action.

Bonding: the permanent joining of metallic parts to form an electrically conductive path that will ensure electrical continuity and capacity to conduct safely any current likely to be imposed.

Bonding jumper: a reliable conductor to ensure the required electrical conductivity between metal parts required to be electrically connected.

Boom: a member hinged to the superstructure or a crane/derrick and used for supporting hoisting tackle.

Boom angle: the angle above or below the horizontal of the longitudinal axis of the base of the boom section.

Boom angle indicator: a device that measures the angle of the boom to the horizontal.

Boom hoist mechanism: means for supporting the boom and controlling boom angle.

Boom, live: a boom in which lowering (free-fall) is controlled by a brake without aid from other lowering retarding devices.

Boom stop (crane): a device used to limit the angle of the boom at the highest position.

Bottom time: the total elapsed time, measured in minutes, from the time when the diver leaves the surface in descent to the time that the diver begins ascent.

Braided sling: a sling made from braided rope.

Branch circuit: the circuit conductors between the final over current device protecting the circuit and the outlet(s).

Brazing: a welding process that joins materials by heating them to a temperature that will not melt them but will melt a filler material which adheres to them and forms a joint.

Bricklayers' square scaffold: a scaffold made up of a work platform (planking) supported on bricklayers' squares.

Bridge: that part of a gantry or overhead crane that carries the trolley(s).

Bridging clip: a device that is attached to the steel joist to allow the bolting of the bridging to the steel joist.

Bridging terminus point: a wall, a beam, tandem joists (with all bridging installed and a horizontal truss in the plane of the top chord) or other element at an end or intermediate point(s) of a line of bridging that provides an anchor point for the steel joist bridging.

Bridle sling: multiple-leg-sling; the legs of the sling are spread to distribute the load.

Bucket conveyor: any type of conveyor in which the material is carried in a series of buckets.

Bucking: the act of sawing a felled tree or limbs into smaller sections.

Bus wire: an expendable wire used in parallel or series-in-parallel circuits to which are connected the leg wires of electric blasting caps.

Cable: a conductor with insulation, or a stranded conductor with or without insulation and other coverings (single-conductor cable), or a combination of conductors insulated from one another (multiple-conductor cable).

Cable laid endless sling: a wire rope sling made from one continuous length of cable laid rope with the ends joined by one or more metallic fittings.

Cable laid grommet, hand tucked: an endless wire rope sling made from one continuous length of rope formed to make a body composed of six ropes around a rope core. The rope ends are tucked into the body, forming the core. No sleeves are used.

Cable laid rope: a rope composed of several wire ropes laid as strands around a wire rope core.

Cable laid rope sling, mechanical joint: a wire rope sling made from a cable laid wire rope with eyes fabricated by pressing or swaging metal sleeves over the rope junction.

Caisson: a watertight chamber (of wood or steel sheeting or a concrete or steel cylinder) used in construction work underwater or as a foundation. When the bottom of the structure extends below the surface of free water, excavation is performed by workers in a working chamber at an air pressure greater than atmospheric pressure.

Canister or cartridge: a container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.

Capable of being locked: an energy isolating device is considered “capable of being locked out” if it meets the following:

- Is designed with a hasp or other part to which a lock can be attached (i.e., a lockable electric disconnect switch);
- Has a locking mechanism built into it; or
- Can be locked without dismantling, rebuilding, or replacing the energy isolating device or permanently altering its energy control capability (i.e.,using a lock/chain assembly on a pipeline valve, a lockable valve cover, circuit breaker lockout or fuse block-out devices).

Equipment that accepts bolted blank flanges and bolted slip blinds are considered to be capable of being locked out.

Carabiner: a connector component generally consisting of an oval or trapezoidal shaped body with a closed gate or similar arrangement

Carpenter's bracket scaffold: a scaffold made up of a work platform supported on wood or metal brackets.

Catch platform: a temporary structure erected around, attached to and abutting the building being demolished for the purpose of safeguarding and protecting the employees and the public by catching and retaining falling objects or debris.

Cathead: a spool shaped attachment on a winch around which rope is wound for hoisting and pulling.

Certificate Of Compliance (COC): A certificate provided by the contractor for each piece of Load Handling Equipment prior to the LHE being brought on site. The COC states that the LHE and rigging gear meet applicable regulations and requirements, is submitted to the GDA for acceptance and shall be posted on the LHE. See Certificate Of Compliance, Form 16-1.

Certified Anchorage: An anchorage for fall arrest, positioning, restraint, or rescue systems that a qualified person certifies to be capable of supporting the potential fall forces that could be encountered during a fall or that meet the criteria for a certified anchorage.

Certified Construction Heath and Safety Technician (CHST): an individual who is currently certified by the Council on Certification of Health, Environmental and Safety Technologists (CCHST).

Certified Health Physicist (CHP): an individual who is currently certified by the American Board of Health Physics.

Certified Industrial Hygienist (CIH): an individual who is currently certified by the American Board of Industrial Hygiene.

Certified Safety Professional (CSP): an individual who is currently certified by the BCSP.

Certified Safety Trained Supervisor (CSTS): an individual who is currently certified by the Council on Certification of Health, Environmental and Safety Technologists (CCHST).

Chain conveyor: any type of conveyor in which one or more chains act as the conveying medium.

Chemical Agent (CA). A chemical compound (to include experimental compounds) that, through its chemical properties, produces lethal or other damaging effects on human beings, and is intended for use in military operations to kill, seriously injure, or incapacitate persons through its physiological effects. Excluded are research, development, test and evaluation solutions; riot control agents; chemical defoliants and herbicides; smoke and other obscuration materials; flame and incendiary materials; and industrial chemicals.

Chicken Ladder: See “Crawling Board”

Choker: a sling used to form a slip noose around an object.

Christmas tree lifting – See Multiple Lift Rigging

Class A fire: a fire involving ordinary combustible materials such as wood, paper, clothing, and some rubber and plastic materials.

Class B fire: a fire involving flammable or combustible liquids, flammable gases, greases and similar materials, and some rubber and plastic materials.

Class C fire: a fire involving energized electrical equipment where safety to the employee requires the use of electrically nonconductive extinguishing media.

Class D fire: a fire involving combustible metals such as magnesium, zirconium, sodium, and potassium.

Cleat: a mooring fitting having two horizontal arms to which mooring lines are secured.

Coarse laid rope: 6 x 7 wire rope (6 strands, 7 wires per strand).

Cofferdam: a temporary structure used to keep water (and earth) out of an excavation during construction of the permanent structure.

Collateral Duty Safety Officer (CDSO): An employee who is trained to assist with the SOH program as a minor duty (20% or less of the time) and upon appointment as CDSO, is designated in writing and provided SOH training commensurate with the scope of their assigned responsibilities, per 29 CFR 1960.58.

Column: a load-carrying vertical member that is part of the primary skeletal framing system. Columns do not include posts.

Command: the USACE Major Subordinate Command, District, Laboratory, or Field Operating Activity with responsibility for a particular activity.

Committed dose equivalent: The dose equivalent to organs or tissues of reference that will be received from an intake of radioactive material by a person during the 50-year period following the intake.

Committed effective dose equivalent: the sum of the products of the weighting factors applicable to each of the body organs or tissues irradiated and the committed dose equivalent to these organs or tissues.

Competent Person: one who can identify existing and predictable hazards in the working environment or working conditions that are dangerous to personnel and who has authorization to take prompt corrective measures to eliminate them.

Competent Person, Confined Space: A person with thorough knowledge of OSHA's Confined Space Standard, 29 CFR 1910.146, designated in writing by the employer to be responsible for the immediate supervision, implementation and monitoring of the confined space program, who through training, knowledge and experience in confined space entry is capable of identifying, evaluating and addressing existing and potential confined space hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

Competent Person, Confined Spaces in ships and vessels (CPCSSV): a person who has the knowledge of the designation of spaces where the work is done; ability to understand and follow through on the air sampling, personal protective equipment and instructions of a Marine Chemist, Coast Guard authorized person, or Certified Industrial Hygienist.

Competent Person, Cranes and Rigging: A person meeting the competent person requirements as defined in the definitions of EM 385-1-1 and 29 CFR Part 1926 who has been designated in writing by the employer to be responsible for the immediate supervision, implementation and monitoring of the Crane and Rigging Program, who through training, knowledge and experience in crane and rigging is capable of identifying, evaluating and addressing existing and potential hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

Competent Person, Excavation/Trenching: A person meeting the competent person requirements as defined in the definitions of EM 385-1-1 and 29 CFR Part 1926 who has been designated in writing by the employer to be responsible for the immediate supervision, implementation and monitoring of the excavation/trenching program, who through training, knowledge and experience in excavation/trenching is capable of identifying, evaluating and addressing existing and potential hazards and, who has the authority to take prompt corrective measures with regard to such hazards

Competent Person, Fall Protection: a person designated in writing by the employer to be responsible for immediate supervising, implementing and monitoring of the fall protection program, who through training, knowledge and experience in fall protection and rescue systems and equipment, is capable of identifying, evaluating and addressing existing and potential fall hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

Competent Person, Scaffolding: a person, designated in writing by the employer to be responsible for immediate supervising, implementing and monitoring of the scaffolding program. The CP for Scaffolding has enough training, knowledge AND experience in scaffolding to correctly identify, evaluate and address existing and potential hazards and also has the authority to take prompt corrective measures with regard to these hazards. CP qualifications must be documented and shall include training - a minimum of 8-hours of scaffold training, to include training on the specific type of scaffold being used (e.g., mast-climbing, adjustable, tubular frame, etc.) and experience on specific scaffolding systems/types, assessment of the base material the scaffold will be erected upon, load calculations for materials and personnel, erection and dismantling.

Competent Person Trainer: An individual who by training, knowledge and experience is capable of conducting competent person training.

Competent Rescuer: An individual designated by the employer who by training, knowledge, and experience is capable of the implementation, supervision, and monitoring of the employer's fall protection rescue program.

Competent Rescuer Trainer: An individual who by training, knowledge and experience specific to fall protection rescue is capable of conducting rescue training.

Confined space: a space that

- Is large enough and so configured that a person can bodily enter and perform assigned work; and
- Has limited or restricted means for entry or exit [such that the entrant's ability to escape in an emergency would be hindered (e.g., tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry; doorways are not considered a limited means of entry or egress)]; and
- Is not designed for continuous worker occupancy.

Confined space on a ship or vessel: a compartment of small size and limited access such as a double bottom tank, cofferdam, or other space which by its small size and confined nature can readily create or aggravate a hazardous exposure.

Connector: an employee who, working with hoisting equipment, is placing and connecting structural members and/or components.

Constructability: the ability to erect structural steel members in accordance with 29 CFR 1926, Subpart R, without having to alter the over-all structural design.

Construction load: (for joist erection) means any load other than the weight of the employee(s), the joists and the bridging bundle.

Container: any vessel of 60 gal (0.23 m^3) or less capacity used for transporting or storing liquids.

Contaminant: any material, that, by nature of its composition or reaction with other materials, is potentially capable of causing injury, death, illness, damage, loss, or pain.

Contaminated water: related to underwater diving; water which contains any chemical, biological, or radioactive substance which poses a chronic or acute health risk to exposed personnel. Supervisory personnel are encouraged to contact local agencies to obtain information on local water contaminants and hazards.

Contractor: any individual or firm under contractual agreement with the government or its subunits for the performance of services and products, such as construction, maintenance, and hazardous waste activities, including subcontractors of a prime contractor.

Controlled Access Zone: a zone to restrict access to unprotected side or edge of a roof or floor.

Controlled decking zone (CDZ): an area in which certain work (e.g., initial installation and placement of metal decking) may take place without the use of guardrail systems, personal fall arrest systems, fall restraint systems, or safety net systems and where access to the zone is controlled.

Controlled load-lowering: lowering a load by means of a mechanical hoist drum device that allows a hoisted load to be lowered with maximum control using the gear train or

hydraulic components of the hoist mechanism. Controlled load lowering requires the use of the hoist drive motor, rather than the load hoist brake, to lower the load.

Controlling Contractor: a prime contractor, general contractor, construction manager or any other legal entity which has the overall responsibility for the construction of the project – its planning, quality and completion.

Conveyor: a horizontal, inclined, or vertical device for transporting material in a path predetermined by the design of the device and having points of loading and discharge.

Conveyor, portable: a transportable conveyor that is not self-propelled, usually having supports that provide mobility.

Corrosive: is a substance that can cause destruction of living tissue or damage by chemical action, including acids with a pH of 2.5 or below or caustics with a pH of 11.0 or above.

Crane: a machine for lifting or lowering a load and moving it horizontally, with the hoisting mechanism being an integral part of the machine.

Crane, truck-mounted: a crane consisting of a rotating superstructure (center post or turn table), boom, operating machinery, and one or more operator's stations mounted on a frame attached to a commercial truck chassis, usually retaining a payload hauling capability whose power source usually powers the crane.

Crane, crawler: a crane consisting of rotating superstructure with a power plant, operating machinery, and a boom, mounted on a base and equipped with crawler treads for travel.

Crane, floating: a rotating superstructure, power plant, operating machinery, and boom, mounted on a barge or pontoon. The power plant may be installed below decks. The crane's function is to handle loads at various radii.

Crane, floor-operated: a crane that is pendant or nonconductive rope controlled by an operator on the floor or an independent platform.

Crane, gantry: a crane similar to an overhead crane except that the bridge is rigidly supported on two or more legs running on fixed rails or other runway.

Crane, hammerhead: a lifting machine arranged with a tower (mast), an upper structure that rotates, a horizontally-extended load jib (boom) with trolley, and a counterweight jib extending in the direction opposite of the load jib: neither jib are arranged for luffing. The trolley on the load jib traverses the length of the jib and contains the sheaves and accessory parts which make up the upper load block; the lower load block is suspended from the trolley.

Crane, locomotive: a crane mounted on a base or car equipped for travel on a railroad track.

Crane, luffing jib: a type of jib on a tower crane that is pivoted at the jib foot and supported by luffing cables. The hoist rope usually passes over a sheave at the jib point and the hook radius is changed by luffing, or changing the angle of inclination, of the jib. Rear pivoted luffing jibs are similar but the pivot is towards the rear of the top of the tower rather than at the jib foot.

Crane, mobile: a crane mounted on a truck or crawler.

Crane, overhead: a crane with a single- or multiple-girder movable bridge or fixed hoisting mechanism and traveling on an overhead fixed runway structure.

Crane, pillar: a fixed crane consisting of a vertical member, held in position at its base to resist overturning moment, and normally with a constant-radius revolving boom supported at the outer end by a tension member.

Crane, portal: a crane consisting of a rotating superstructure with operating machinery and boom, all of which is mounted on gantry structure, usually with a portal opening between the gantry columns or legs for traffic to pass through; may be fixed or traveling.

Crane, standby: a crane that is not in regular service but which is used occasionally or intermittently as required.

Crane, tower: similar to a portal crane but with a tower intervening between the upper structure and the gantry or other base structure; typically without a portal. To resist overturning moments, the assembly may be ballasted, fixed to a foundation, or a combination of both. The crane may be either fixed or on a traveling base.

Crane (hoist), under-hung: a crane that is suspended from the bottom flange of a runway track or a single-track monorail system.

Crane, wall: a crane having a jib with or without trolley and supported from a side wall or line of columns of a building. It is a traveling type and operates on a runway attached to the sidewall or columns.

Crane, wheel-mounted (multi-control stations): a crane consisting of a rotating superstructure, operating machinery, and operator's station and boom, mounted on a crane carrier equipped with axles and rubber-tired wheels for travel, a power source(s), and having separate stations for driving and operating.

Crane, wheel-mounted (single control station): a crane consisting of a rotating superstructure, operating machinery, and boom, mounted on a crane carrier equipped with axles and rubber-tired wheels for travel, a power source, and having a single control station.

Crane operator aids: devices that are used to assist a crane operator in the safe operation of the crane, including: two-block warning devices, two-block prevention devices, load and load moment indicator devices, boom angle and radius indicators, boom and jib stops, boom hoist disengaging devices, limit switches, drum rotation indicators, etc.

Crawling board (chicken ladder): a supported scaffold consisting of a plank with cleats spaced and secured to provide footing, for use on sloped surfaces such as roofs.

Cribbing: a system of timbers, arranged in a rectangular pattern, used to support and distribute the weight of equipment.

Critical Item Weld: A structural feature or structural piece which requires welding and is in place to provide life saving support for people, e.g., personal fall arrest anchorages, scaffolding, shoring, forms, ladders, or piling. A critical item weld may also be on piping or ventilation systems containing hazardous materials, pressurized piping, bulkheads, tainter gates, catwalks, lifting or pad eyes for rigging, and cranes. This definition is not written to be complete in nature, but to provide guidance in determining critical item welds. This determination shall be made by a Qualified Person.

Critical lift: a non-routine crane lift requiring detailed planning and additional or unusual safety precautions.

Crossbraces: two diagonal scaffold members joined at their center to form an “X”, used between frames or uprights or both.

Crotch: to pass a rope through the crotch of a limb, or false crotch, in such a way that the load will be supported by the main leader.

Cumulative trauma disorders: disorders of muscles, tendons, peripheral nerves, or vascular system. These can be caused, precipitated, or aggravated by intense, repeated, or sustained exertions, motions of the body, insufficient recovery, vibration, or cold.

Cylinder manifold: a multiple header for interconnection of gas sources with distribution points.

DANGEROUS Placard: A freight container, unit load device, transport vehicle, or railcar that contains non-bulk packages with two or more categories of hazardous materials that require different placards, may be placarded with a DANGEROUS placard instead of the separate placards specified for each of the materials.

Deadman control: a constant-pressure, hand or foot-operated control designed so that when released, it automatically returns to a neutral or deactivated position.

Debris net: a net designed to catch only debris. It must be used in conjunction with a personnel net if there is any possibility for personnel to fall.

Decelerating device: any mechanism that serves to dissipate energy during a fall.

Decibel (dB): a measure of sound pressure.

dB(A): A-weighted measure of sound pressure used with sound level meters; the weighting causes the sensitivity of the sound level meter to vary with the frequency and intensity of sound and in doing so duplicates the response of the human ear.

Decompression sickness: a condition with a variety of symptoms which may result from gas or bubbles in the tissues of divers after pressure reduction.

Decompression table: a profile or set of profiles of depth-time relationships for ascent rate and breathing mixtures to be followed after a specific depth-time exposure or exposures.

Derrick: an apparatus consisting of a mast or equivalent member held at the end by guys or braces, with or without a boom, for use with a hoisting mechanism and operating ropes.

Derrick, A-frame: a derrick in which the boom is hinged from a cross member or pedestal between the bottom ends of two upright members spread apart at the lower ends and joined at the top, the boom point secured to the junction of the side members, and the side members are braced or guyed from this junction point.

Derrick, floating: a mast or equivalent member held at the head by guys or braces, with or without a boom, for use with a hoisting mechanism and operating ropes, mounted on a barge or a pontoon. The power plant may be installed below decks.

Derrick, floor: an elevated floor of a building or structure that has been designated to receive hoisted pieces of steel prior to final placement.

Derrick, guy: a fixed derrick consisting of a vertical mast capable of being rotated 360° (but not continuous rotation) supported by guys, and a boom that is pivoted at the bottom and capable of moving in a vertical plane; a reeved rope between the head (top) of the mast and the boom harness (at the boom point) allows lifting and lowering of the boom and a reeved rope from the boom point allows lifting and lowering of the load.

Derrick, stiff leg: a derrick similar to a guy derrick except that the mast is supported or held in place by 2 or more stiff members (stiff legs) which are capable of resisting either tensile or compressive forces. Sills are generally provided to connect the lower ends of the stiff legs to the foot of the mast.

Design load: the maximum intended load: that is, the total of all loads including the worker(s), material, and the equipment placed on the unit.

Designated Dive Coordinator (DDC): a USACE employee assigned the responsibility for organizing, integrating, and monitoring the total dive program within a USACE Command. This individual and an alternate are appointed, in writing, by the USACE Commander/ Director; shall successfully complete Diving Safety/ Diving Supervisor Training Course; shall maintain certification (attending the diving refresher course every 4 years); are not required to perform 12 working/training dives unless they are also a USACE diver or USACE Diving Supervisor.

Designated person: An employee who has been trained or is qualified and assigned the responsibility to perform a specific task.

Designated Representative (DR): an individual that can substitute for an SSHO under certain conditions; See Section 01.A.17.

- DR supports and supplements the SSHO efforts in managing, implementing and enforcing the Contractor's safety and health program. DRs shall be individuals(s) with work oversight responsibilities, such as crew leader, masters, mates, seniors and/or foreman. DRs should not be in positions requiring continuous mechanical or equipment operations, such as equipment operators.

Dive location: a surface or vessel from which a diving operation is conducted.

Dive operation: the complete scope of work addressed in a single diving plan.

Dive team: divers and support employees involved in a diving operation, including the diving supervisor.

Dive tender: that individual on the dive team assigned to assist the diver with dressing in and out, entering and exiting the water, and continuously tend the tether or umbilical of the diver while in the water. The dive tender shall have experience and training that encompasses all aspects of tending in order to provide safe and efficient support to the diver.

Diving, Direct Source Compressor: Air compressor system used on-site as a direct source to supply air to SSA divers via the receiver tank, manifold, and air line – not compressors used onsite solely to fill SCUBA or other air cylinders.

Diving, Heavy Gear: Surface-supplied deep-sea diving gear including helmet (with or without breastplate), dry suit, and weighted shoes, with the helmet directly connected to the dry suit, forming a self-contained pressure envelope for the diver.

Diving Inspector: a USACE employee or other designated qualified person who inspects a Contractor diving operation while work is in progress (not an employee of the dive contractor); USACE Diving inspectors are designated in writing by local Commander; must successfully complete a USACE diving safety/ diving supervisor, Diving Inspector, or Dive Safety Administrator course and shall maintain certification via refresher every 4 years. Non-USACE Diving monitors/inspectors with other credentials will be considered on a case-by-case basis and may be approved in writing by the DDC with Command notification and concurrence.

Diving Safety Representative (DSR): the Safety and Occupational Health Office representative assigned the responsibility of dive safety; provides dive safety advice; actively participates in the review and comment process for diving plans and hazard analyses; on-site monitoring of diving operations; has successfully completed USACE diving safety/ diving supervisor, diving inspector, or Dive Safety Administrator course and maintain certification every 4 years.

Diving supervisor: the employer, or an employee designated by the employer, at the dive location in charge of all aspects of the diving operation that affect the safety and health of dive team members. The diving supervisor shall have experience and training in the conduct of the assigned diving operation.

Dose equivalent: the product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem or Sievert (Sv) (1 Sievert equals 100 rem).

Dosimetry: the measure of radiological exposure.

Double-cleated ladder: a ladder, similar to a single cleat ladder but with a center rail, which allows simultaneous two-way traffic for employees ascending or descending.

Dragline: a bucket attachment for a crane that excavates by the crane drawing, with a cable, the bucket towards itself.

Dredge: any vessel fitted with machinery for the purpose of removing or relocating material from or in a body of water.

Drilled Shaft: a shaft constructed by excavating a cylindrical hole, placing reinforcing steel (if required) and filling the hole with concrete (also called drilled piers or caissons).

Drilling fluid (mud): fluid that is pumped into a drilled hole and used to wash cuttings from the hole: drilling mud is a type of drilling fluid made of a slurry of clay and water and that is used to coat and support the sides of the drill hole and seal off permeable strata.

Dry chemical: an extinguishing agent composed of very small particles of chemicals such as sodium bicarbonate, potassium bicarbonate, or potassium chloride supplemented by special treatment to provide resistance to packing and moisture absorption and to provide proper flow capabilities. Does not include dry powders.

Dry location: a location not normally subject to dampness or wetness; a location classified as dry may be temporarily subject to dampness or wetness, as in the case of a building under construction

Dry powder: a compound used to extinguish or control Class D fires.

Duck Pond: Openings between stationary vessels or vessels and other structures that create fully enclosed water areas (duck ponds) into which personnel could fall.

Dust: solid particles generated by handling, crushing, grinding, or detonation of organic or inorganic materials.

Duty cycle: operations involving repetitive pick and swing, such as with a dragline, grapple, or clamshell: such operations are conducted primarily for production as opposed to placement.

Duty time: time during which an individual is being compensated for his/her services.

Effective dose equivalent: the sum of the products of the dose equivalent to the organ or tissue and the weighting factors applicable to each of the body organs or tissues irradiated.

Effectively grounded: intentionally connected to earth through a ground connection or connections of sufficiently low impedance and having sufficient current-carrying capacity to prevent the buildup of voltages which may result in undue hazard to connected equipment or to persons.

Elevating aerial work platform: a vertically-adjustable, integral chassis, power operated work platforms, which may be horizontally extended or rotated relative to the elevating mechanism; an integral frame boom supported power operated elevating work platforms which either telescope, articulate, rotate, or extend beyond their base dimensions.

Emergency (marine): an unforeseen development that imposes an immediate hazard to the safety of the vessel, the passengers, the crew, the cargo, property, or the marine environment, requiring urgent action to remove or mitigate the hazard.

Employee: a Government or Contractor person engaged in work on a USACE project.

Employer: a Government or Contractor organization that has control over employees engaged in work on a USACE project.

Enclosed space: any space, other than a confined space, that is enclosed by bulkheads and overhead. This includes cargo holds, tanks, and quarters, as well as machinery and boiler spaces.

Endless rope: a rope with the ends spliced together.

End-of-service-life indicator (ESLI): a system that warns the respirator user of the approach of the end of adequate respiratory protection (e.g., that the sorbent is approaching saturation or is no longer effective).

End user: a person who has been trained and authorized by the employer on the use of assigned fall protection equipment in a typical fall hazard situation.

Energy (shock) absorber: a component whose primary function is to dissipate energy and limit the deceleration forces imposed on the body during fall arrest.

Energy control procedure: a written procedure (including responsibilities, procedural steps for lockout and tagout, and requirements for testing the effectiveness of energy control measures) to be used for the control of hazardous energy.

Energy isolation device: a physical device that prevents the transmission or release of energy. Includes, but is not limited to, manually operated circuit breakers, disconnect switches, slide gates, slip blinds, line valves, blocks, or similar devices, capable of blocking or isolating energy, with a position indicator. The term does not include push buttons, selector switches, and other control circuit type devices.

Energy ratio: a measure of the seismic energy impact of an explosive blast.

Energy source: includes electrical, mechanical, hydraulic, pneumatic, chemical, thermal, nuclear, stored, or other energy.

Engulfment: the surrounding and effective capture by a liquid or finely divided (flow able) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Enter with restrictions: refers to entry into a confined space when engineering controls, personal protective equipment, and time limitations are imposed by the competent person.

Entry permit (permit): the written/printed document provided to allow and control entry into a permit space and that contains the information specified in ENG Form 5044-R.

Entry supervisor (confined space): the person responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this manual.

Erection bridging: the bolted diagonal bridging that is required to be installed prior to releasing the hoisting cables from the steel joists.

Escape-only respirator: a respirator intended to be used only for emergency exit.

Exceptional-exposure dive: dives in which the risk of decompression sickness, oxygen toxicity, and or exposure to the elements is substantially greater than normal working dives.

Explosion Proof: this term is usually seen when describing Class I Division 1 equipment. The device must be able to withstand an internal explosion if it should occur and it must work to prevent the spread of the internal explosion to the surrounding saturated atmosphere. Equipment is designed so as not to allow the explosion or other possible sources of ignition to reach the hazardous atmosphere.

Explosive: A substance or a mixture of substances that is capable by chemical reaction of producing gas at such temperature, pressure, and speed as to cause damage to the surroundings; includes all substances known as high explosives and propellants, together with igniters, primers, initiators, and pyrotechnics (e.g., illuminant, smoke, delay, decoy, flare, and incendiary compositions).

Explosive-actuated tool: a tool that uses the expanding gases from a power load to drive a fastener.

Exposure: a measure of the ionizing radiation produced in air by X or gamma radiation, equal to the sum of the electrical charges on all ions of one sign produced per unit mass of air. The special unit of exposure is the Roentgen equal to 2.58×10^{-4} Coulombs per Kilogram of air at standard temperature and pressure.

Exposure hours: the number of paid duty hours. Unpaid hours count as exposure when employees are quartered on-site. Exposures hours are used to calculate accident experience rates.

Exposure (respiratory hazard): exposure to a concentration of an airborne contaminant that would occur if the employee were not using respiratory protection.

Extension trestle ladder: <u>A self-supporting portable ladder, adjustable in length, consisting of a trestle ladder base and a vertically adjustable extension section, with a suitable means for locking the ladders together</u>.

Extinguisher classification: the letter classification given an extinguisher to designate the classes of fire on which it will be effective.

Extinguisher rating: the numerical rating given to an extinguisher that indicates the extinguishing potential of the unit.

Facility: may be classified as permanent or temporary and may include any of the following: building, structure, shed, tower, utility support system or utility conveyance system, swimming pool or other open concrete structure, whether above or below grade or any other item that is designated a facility by Government Designated Authority (GDA).

Fall arrest system: assembly of equipment, components and subsystems used to arrest a fall.

Fall arrestor (rope grab): a device that travels on a lifeline and will automatically engage or lock onto the lifeline in the event of a fall.

Fall Protection Program Administrator: a person responsible for the development, implementation, monitoring and evaluation of the managed FP Program; shall have a working knowledge of current FP regulations, standards, FP equipment and systems; May also function as a QP for FP or CP for FP, CP Trainer, QP Trainer or Competent rescue Trainer.

Fall Protection Program Manager: A person responsible for managing the fall protection program.

Fall Restraint System: A fall protection system that prevents the user from falling any distance. The system is comprised of body harness, along with an anchorage, connectors and other necessary equipment. The other components typically include a lanyard, and may also include a lifeline and other devices.

False crotch: a pulley, block, sling, lashing, or metal ring, affixed to a tree's leader of limb, through which a load line is passed, to raise or lower limbs or equipment.

Feeder: all circuit conductors between the service equipment, the source of a separately derived system, or other power supply source and the final branch-circuit over-current device.

Figure-four form scaffold: a scaffold consisting of a work platform supported by brackets designed in the shape of a "4."

Filter or air purifying element: a component used in respirators to remove solid or liquid aerosols from the inspired air.

Filtering facepiece (dust mask): a negative-pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

Fire cut-offs: Building features (fire walls, automatic fire doors, etc.) designed to retard or restrict the spread of a fire within the building.

Fit factor: a quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

Fit test: the use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual. > See Qualitative fit test (QLFT) and Quantitative fit test (QNFT).

Fixed extinguishing system: a permanently installed system that either extinguishes or controls a fire.

Fixed ladder: a ladder that cannot be readily moved or carried because it is an integral part of a building or structure.

Fixed lead: pile driving leads which are rigidly attached to a boom by horizontal struts extending from the leads to extended boom foot pins, thus providing a fixed triangular frame of boom, struts, and leads.

Flammable liquid: any liquid having a flashpoint at or below 199.4°F (93°C). Flammable liquids are divided into four categories as follows:

- Category 1 shall include liquids having flashpoints below 73.4°F (23°C) and having a boiling point at or below 95°F (35°C).
- Category 2 shall include liquids having flashpoints below 73.4°F (23°C) and having a boiling point above 95°F (35°C).
- Category 3 shall include liquids having flashpoints at or above 73.4°F (23°C) and at or below 140°F (60°C).
- Category 4 shall include liquids having flashpoints above 140°F (60°C) and at or below 199.4°F (93°C).

Flashback: a recession of the flame into or back of the mixing chamber of the oxy-fuel gas torch.

Floating plant/vessel: used to transport personnel, work boats, floating cranes and derricks, barges, patrol boats, etc.

Float/ship scaffold: a scaffold hung from overhead supports by means of ropes and consisting of a unit having diagonal bracing underneath: the scaffold rests upon and is securely fastened to two parallel planks bearers at right angles to the span.

Floor arch: the masonry arch shaped filling between steel floor beams or girders, whatever the type of flooring system.

Floor (roof) hole/opening: floor or roof holes/openings are any that measure over 2 in (51 mm) in any direction of a walking/working surface which persons may trip or fall into or where objects may fall to the level below.

Floor-operated crane: a crane which is pendant or nonconductive rope controlled by an operator on the floor or an independent platform.

Foam: a stable aggregation of small bubbles that flow freely over a burning liquid surface and form a coherent blanket that seals combustible vapors, thereby extinguishing the fire.

Foot-candle: the English and American traditional measurement unit of light (illuminance) as perceived by the human eye, and is roughly equal to 10.7 Lux.

Forklift: See Powered industrial truck (PIT).

Form scaffold: a scaffolding system integrated to formwork.

Free Fall Distance: The vertical distance traveled during a fall, measured from the onset of a fall from a walking working surface to the point at which the fall protection system begins to arrest the fall; excludes deceleration distance and the elongation of a lifeline or lanyard; includes any distance that a deceleration device slides before engaging or the distance that a self retracting lifeline or lanyard extends before fall arrest forces are applied; distance is measured using a common reference point, typically the fall arrest attachment.

Freestanding scaffold: a scaffold that is independent of and not rigidly attached to a structure.

Fuel gas: a gas (e.g., acetylene, hydrogen, natural gas, propane) used with oxygen in the oxy-fuel process and for heating.

Full body harness: See “Body Harness, Full”.

Full personnel protection: when tagout is used in place of lockout, full personnel protection is provided when:

- The tagout device is attached at the same location as the lockout device would have been attached;
- All tagout-related requirements of this manual have been complied with; and
- Additional means have been taken to provide a level of safety commensurate with that of a lockout device. Such additional means include the removal of an isolating circuit element, blocking of a control switch, opening and tagging an extra (separated by distance)

disconnecting device, or the removal of a valve handle to reduce the likelihood of being energized.

Fume: very small suspended solid particles created by condensation from the gaseous state.

Fusible plug: a device designed to relieve pressure and to indicate certain conditions that contribute to low water.

Gaffs: Spurs used to assist in climbing utility poles or trees.

Gangway: any ramp, stairway, or ladder provided for personnel to board/leave a vessel.

Gaseous agent: a fire-extinguishing agent that is in the gaseous state at normal room temperature and pressure and diffuses readily to diffuse itself uniformly throughout an enclosure.

Gas metal arc welding: an arc welding process that uses an arc between a continuous filler metal electrode and the weld pool. Shielding (from the atmosphere) is provided by an externally supplied gas.

Gate: a device or structure by means of which the flow of material may be stopped or regulated.

Generator, mobile: mobile describes equipment, such as vehicle-mounted generators, that is capable of being moved on wheels or rollers.

Generator, portable: portable describes equipment that is easily carried by personnel from one location to another.

Government Designated Authority (GDA): the senior person in charge or his/her appointed representative for the operation or activity being conducted/considered.

Grommet: an endless 7-strand wire rope.

Ground: (reference) - that conductive body, usually earth, to which an electric potential is referenced; (as a noun) - a conductive connection whether incidental or accidental, by which an electric circuit or equipment is connected to reference ground; (as a verb) - the connecting or establishing of a connection, whether by intention or accident, of an electric circuit or equipment to reference ground.

Grounded: connected to earth or to some conducting body that serves in place of the earth.

Grounded conductor: a system or circuit conductor that is intentionally grounded.

Grounded system: a system of conductors in which at least one conductor or point (usually the middle wire or neutral point of a transformer or generator windings) is intentionally grounded, either solidly or through a current limiting device (not a current-interrupting device).

Ground fault circuit interrupter: a device used to interrupt the electric circuit to the load when a fault current to ground exceeds some predetermined value that is less than that required to operate the over current protection device of the supply circuit.

Grounding conductor: a conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode or electrodes.

Grounding electrode (ground electrode): a conductor embedded in the earth, used for maintaining ground potential on conductors connected to it, and for dissipating into the earth current connected to it.

Guarded by location: describes moving parts so protected by their remoteness from the floor, platform, walkway, or other working level, or by their location with reference to frame, foundation, or structure as to reduce the foreseeable risk of accidental contact by persons or objects. Remoteness from foreseeable, regular, or frequent presence of public or employed personnel may in reasonable circumstances constitute guarding by location.

Guardrail system: A rail system erected along open-sided floors, openings, and ends of platforms. The rail system consists of a toprail, midrail and their supports.

Halon: a colorless, electrically nonconductive gas that extinguishes fire by inhibiting the chemical chain reaction of fuel and oxygen. Halon 1211 is a liquefied gas, also known as bromochlorodifluromethane. Halon 1301 is also known as bromotrifluoromethane.

Hardware: rigid components or elements such as buckles, D-rings, snap-hooks, and associated devices used to attach the components of a personal fall protection system together.

Hazard: a dangerous condition, potential or inherent, that can bring about an interruption or interfere with the expected orderly progress of an activity. A source of potential injury to person or to property.

Hazardous (physical) agent: noise, non-ionizing and ionizing radiation, and temperature exposure of durations and quantities capable of causing adverse health effects.

Hazardous atmosphere: an atmosphere that may expose persons to the risk of death, incapacitation, impairment of ability to self rescue (i.e., escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

- Flammable gas, vapor, or mist in excess of 10% of its lower flammable limit (LFL);
- Airborne combustible dust at a concentration that meets or exceeds its LFL;
- Atmospheric oxygen concentration below 19.5% or above 23.5%;
- Atmospheric concentration of any substance for which a dose or PEL is published and which could result in team member exposure in excess of its dose or PEL;
- Any other atmospheric condition that is IDLH.

Hazardous energy control plan (HECP): the written plan that clearly and specifically identifies the hazardous energy sources and outlines the scope, purpose, responsibilities, and procedural steps for lockout and tagout and the requirements for testing the effectiveness of energy control measures to be used for the control of hazardous energy from stated sources.

Hazardous environment: an environment with an atmosphere that poses a risk of death, incapacitation, injury, or illness due to flammable or explosive hazards; hazardous substances or agents; oxygen concentrations below 19.5% or above 22%; or any other atmospheric condition recognized as IDLH.

Hazardous substance: any substance defined as a hazardous substance under 29 CFR 1910.120, 29 CFR 1926.65, or 40 CFR 302; any chemical determined to be a hazard as specified in 29 CFR 1910.1200 or 29 CFR 1926.59 to include a chemical (as a gas, liquid, vapor, mist, dust, or fume) which has been identified as causing adverse health effects in exposed employees.

Hazardous, toxic, radioactive waste (HTRW) activity: refers to overall project or worksite involving the investigation, assessment, or clean-up of HTRW or the emergency response to releases of hazardous substances, hazardous waste, or hazardous material at an HTRW site. Includes: activities undertaken for the EPA's Superfund Program, the Defense Environmental Restoration Program (which also includes FUDS and Installation Restoration Program activities), HTRW actions associated with Civil Works projects, and HTRW projects of other Government agencies. Includes, but are not limited to: preliminary assessments/site inspections; remedial investigations; feasibility studies; engineering evaluations/cost analyses; RCRA facility investigations/corrective measures studies/corrective measures implementations/closure plans/Part B permits; or any other pre-design investigations, remedial design, or remedial construction, operation or maintenance at known, suspected, or potential HTRW sites, activities conducted at containerized HTRW sites (leaking PCB transformers and leaking or suspected leaking USTs that contain hazardous substances).

Hazardous, toxic, radioactive waste (HTRW) operation: a specific function on an HTRW site, such as sampling, monitoring, excavation, drum removal, etc.

Hazardous, toxic, radioactive waste (HTRW) site: any facility or location that:

- Requires the planned or emergency clean-up of hazardous, toxic, radioactive waste; and
- Is designated as an uncontrolled hazardous waste site or covered by the RCRA.

Headache Ball: A weighted hook that is used to attach loads to the hoist load line of the crane.

Heating torch: a device for directing the heating flame produced by the controlled combustion of fuel gases.

Heavy gear: diver-worn deep-sea dress, including helmet, in-water stage: a suspended underwater platform that supports a diver in the water. Breastplate, dry suit, and weighted shoes, (e.g., U.S. Navy Mark V gear).

High efficiency particulate air (HEPA) filter: a filter that is at least 99.97% efficient in removing mono-disperse particles of 0.3 µm in diameter. The equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters.

High radiation area: any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any 1 hour a dose in excess of 100 mrem.

High voltage: is a voltage of 600 volts or greater.

Hoist: a machinery unit that is used for lifting or lowering a freely suspended (unguided) load.

Hoisting Equipment: equipment, including excavators or forklifts, used WITH RIGGING to hoist and move a load, which causes this to become “load handling equipment” (see Section 16).

Hole: a gap or void more than 2 in (5.1 cm) in its least dimension and less than 12 in (30.5 cm) in its greatest dimension in a floor, roof, or other walking/working surface. Pre-engineered holes in cellular decking (for wires, cables, etc.) are not included in this definition.

Horizontal lifeline system: A fall arrest sub-system consisting of an assembly of components (flexible wire, rope or synthetic cable) spanned horizontally between two end anchorages.

Horse scaffold: a scaffold composed of work platforms supported by construction horses.

Hotline tools and ropes: those tools and ropes that are especially designed for work on energized high voltage lines and equipment. Insulated aerial equipment especially designed for work on energized high voltage lines and equipment shall be considered hot line.

Hot tapping: a procedure of attaching connections to equipment in service by welding and drilling.

Hot work: hot riveting, welding, burning, abrasive blasting, or other fire- or spark-producing operations.

Hot work, confined space: hot work in confined space: any activity involving riveting, welding, burning, powder-actuated tools, or similar fire-producing operations. Grinding, drilling, abrasive blasting, or similar spark-producing operations are also considered hot work except when such operations are isolated physically from any atmosphere containing more than 10% of the lower explosive limit of a flammable or combustible substance.

Hot work permit: written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

Humboldt Notch: A notch cut used to fell a tree. A directional felling cut into the side of a tree, facing the intended direction of fall and consisting of a horizontal face cut and an angled cut below it, creating a notch of approximately 45 degrees. A Humboldt notch is usually reserved for larger trees on steep slopes.

Hydrostatic Testing: Test of strength and leak-resistance of a vessel, pipe, or other hollow equipment by internal pressurization with a test liquid, usually water.

Immediately dangerous to life or health (IDLH–respiratory hazard): an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Impulse noise: noise is considered impulse when the variations in sound-pressure level involve peaks at intervals greater than 1 second.

Incident: a mishap that adversely affects a mission and results in property damage and personal injury below the recordable threshold identified in Section 01.D.03 (e.g., a worker falls off a scaffold and incurs minor cut to his hand (no lost time, no property damage); a crane swings around to move a load and the load scrapes a parked vehicle, incurring minor damage to the vehicle, <$5K). > See also "Mishap".

Incidental employee: an employee who, under normal circumstances, would not be in an area where a system is under lockout and tagout but is required to enter or pass through such an area.

Incipient stage fire: a fire that is in the initial or beginning stage and that can be controlled or extinguished by portable fire extinguisher, Class II standpipe, or small hose systems without the need for protective clothing or breathing apparatus.

Independent wire rope core: a small 6 x 7 wire rope with a wire strand core; used to provide greater resistance to crushing and distortion of the wire rope.

Induced current: the generation of a current in a conductor caused by its proximity to a second alternating current source, a moving direct current source (such as a motor), or an extraneous voltage source (such as lightning).

Inherent Risk: the initial level of risk or danger associated with a work activity or task in the absence of any action to control or modify the circumstances. The inherent risk is identified by identifying the anticipated frequency of loss versus the severity of loss PRIOR to identifying and applying any safety measures, precautions and controls to reduce the level of hazard for each step; Identified by using an Activity Hazard Analysis AHA). > See also "Activity Hazard Analysis", "Risk Assessment Code" and "Residual Risk".

Inside post: the post nearest to the structure against which the scaffold is erected.

Intrinsically safe equipment: Equipment and associated wiring incapable of releasing sufficient electrical energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture; equipment incapable of igniting the atmosphere surrounding it.

In-water stage: a suspended underwater platform that supports a diver in the water.

Ionizing radiation: electromagnetic and particulate radiation that causes molecular ionization; includes alpha particles, beta particles, gamma rays, x-rays, neutrons, high speed electrons and protons, and other atomic matter.

Isolation: an activity that physically prevents the transmission or release of energy.

Jib: on hammerhead cranes, the horizontal structural member attached to the rotating superstructure of a crane and upon which the load trolley travels; on mobile cranes, an extension attached to the boom to provide added boom length for lifting specified loads.

Job-made ladder: a ladder fabricated by employees, typically at the construction site, and is not commercially manufactured.

Labeled: equipment or materials that has an attached label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with the product evaluation that maintains periodic inspection of production of

labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Laboratory waste pack: a drum containing individual containers of laboratory materials normally surrounded by cushioning absorbent material.

Ladder: a device incorporating or employing steps, rungs, or cleats on which a person may step to ascend or descend.

Ladder climbing safety device: device that is connected to a harness or belt to prevent falls from ladders.

Ladder, combination: a portable ladder capable of being used either as a stepladder or as a single or extension ladder. It may also be capable of being used as a trestle ladder or a stairwell ladder. Its components may be used as single ladders.

Ladder, extension: a non-self-supporting portable ladder adjustable in length. It consists of two or more sections, traveling guides, or brackets or the equivalent and so arranged as to permit length adjustment.

Ladder, individual-rung/step: a ladder without a side rail or center rail support, made by mounting individual steps or rungs directly to the side or wall of the structure.

Ladder jack scaffold: a supported scaffold consisting of a platform resting on brackets attached to ladders. (prohibited)

Ladder, portable: a ladder that can readily be moved or carried, usually consisting of side rails joined at intervals by steps, rungs, cleats, or rear braces.

Ladder, sectional: a non-self-supporting portable ladder, nonadjustable in length, consisting of two or more sections, and so constructed that the sections may be combined to function as a single ladder.

Ladder, side-step, fixed: a fixed ladder that requires a person getting off at the top to step to the side of the ladder side rails to reach the landing.

Ladder, single cleat: a ladder consisting of a pair of side rails connected together by cleats, rungs, or steps.

Ladder, single rail: a portable ladder with rungs, cleats, or steps mounted on a single rail instead of the typical two rails.

Ladder, through-step, fixed: a fixed ladder that requires a person getting off at the top to step between the side rails of the ladder to reach the landing.

Ladder, trestle: a self-supporting ladder consisting of two single ladders hinged or joined at the top to form equal angles with the base.

Ladder type: the designation that identifies the working load.

Ladder-type platform: a platform that resembles a ladder covered by planking.

Lagging: timber planks, steel plates, or other structural members used for transferring loads and supporting soil or rock.

Lanyard: a component consisting of flexible rope, wire rope or strap , which typically has a connector at each end for connecting body support to a fall arrestor, energy absorber, anchorage connector, or anchorage.

Large area scaffold: a scaffold erected over substantially the entire work area. For example: a scaffold erected over the entire floor area of a room.

Laser: a device that produces an intense, coherent, directional beam of light.

Lead: the device on a pile driver that maintains the hammer in position during the driving. A lead typically is made up of two vertical rails or guides, held together by a frame, in which the hammer moves vertically.

Lead (leading) wire: an insulated expendable wire used between the electric power source and the electric blasting cap circuit.

Leader: the upper portion of the primary axis of a tree.

Leading edge: the unprotected side or edge of a floor, roof, or formwork for a floor or other walking/working surface (such as deck) that changes location as additional floor, roof, decking, or formwork sections are placed, formed, or constructed.

Ledger: is a horizontal scaffold member upon which bearers rest; the longitudinal member that joins scaffold uprights, posts, poles, and similar members.

Lifeline: a line (horizontal or vertical) for direct attachment between a worker's personal fall protection equipment and a point of anchorage.

Lift supervisor: the person designated to direct the load handling activity; who must have a thorough knowledge of safety procedures as they relate to the crane, rigging and employee conduct and who has satisfactory level of experience of working with LHE, especially the type being used. The lift supervisor may be the crane operator or another individual.

Limbing: to cut limbs from a tree.

Limited Approach Boundary: An approach limit at a distance from an exposed energized electrical conductor or circuit part within which a shock hazard exists.

Liquefied petroleum gas (LP-Gas): any material that is composed predominantly of any of the following hydrocarbons (or mixtures of them): propane, propylene, butanes, and butylenes.

List: the angle of inclination about the longitudinal axis of a vessel.

Listed: equipment, materials, or services included in a list published by an organization acceptable to the authority having jurisdiction (AHJ) and concerned with the evaluation of products or services that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services and whose listing states either that the equipment, material, or service meets identified standards or has been tested and found suitable for a specified purpose.

Live-boating: The practice of supporting a SSA or mixed gas diver from a vessel that is underway.

Live-line bare-hand technique: a highly specialized technique (usually used on medium- and high-voltage transmission lines) where a qualified employee working from an insulated aerial platform is electrically bonded to an energized line, effectively canceling any electrical potential difference across the worker's body and protecting the employee from electric shock.

Live-line bare-hand work: work that is performed barehanded from an insulated aerial platform, with the linemen in the basket at the same potential as the live conductor on which they are working.

Live-line tools: tools used by qualified employees to handle energized conductors. The tool insulates the employee from the energized line, allowing the employee to perform the task safely. Also known as "hot sticks."

Load block: an assembly of hook or shackle, swivel, pins, and frame.

Load Handling Equipment (LHE): a term used to describe cranes, hoists and all other hoisting equipment (hoisting equipment means equipment, including excavators or forklifts, used WITH RIGGING to hoist and move a load).

Load indicator: a device that measures the weight of the load.

Load moment indicator (rated capacity indicator): a device that indicates the bending moment on a crane by measuring both the load on a boom and the horizontal distance from

the load (boom point) to the crane's axis of rotation. Load moment indicators are often equipped with warning devices or disengaging devices that are actuated before a crane is overloaded.

Load performance test: a test of a crane's performance, structural competence, and stability while lifting at a percentage of its rated load capacity.

Load-rated: the maximum allowable working load.

Load-working: the external load applied to the crane or derrick, including the weight of load-attaching equipment such as load blocks, shackles, and slings.

Local application system: a fixed fire suppression system that has a supply of extinguishing agent with nozzles arranged to automatically discharge extinguishing agent directly on the burning material to extinguish or control the fire.

Lockout: a form of hazardous energy control using the placement of a lockout device, in accordance with established procedures, on an energy-isolating device to ensure that the energy-isolating device and the system being controlled cannot be operated until the lockout device is removed.

Lockout device: a device that uses a positive means, such as a key or combination lock, to hold an energy-isolating device in the safe position and prevent the energizing of a system.

Long-bed end-dump trailer: a trailer with a length of 30 ft (9.1 m) or more, a length-to-width ratio of or exceeding 4:1, and which is used to transport and dump material.

Loose-fitting facepiece: a respiratory inlet covering that is designed to form a partial seal with the face.

Low-slope roof: a roof having a slope less than or equal to 4:12 (vertical to horizontal).

Low voltage: voltage less than 600 volts.

Lux: the International System of Units measurement of light (illuminance) as perceived by the human eye.

Machinery and Mechanized equipment: equipment intended for use on construction sites or industrial sites and not intended for operations on public highways.

Manned vessels: vessels that operate with crews, or quartered personnel, or that have work areas that are occupied by assigned personnel during normal work activities.

Marine activities: operations and work involving proximity to or on water.

Mast (derrick): the upright member of the derrick used for support of the boom.

Mast climbing work platform: a hoist having a working platform used for temporary purposes to raise personnel and materials to the working position by means of a drive system mounted on an extendable mast which may be tied to a building.

Material Safety Data Sheet (MSDS): a sheet that provides information on substance identification; ingredients and hazards; physical data; fire and explosion data; reactivity data; health hazard information; spill, leak, and disposal procedures; and special precautions and comments.

Maximum arresting force: the peak force exerted on the boy when a fall protection system arrests or stops a fall.

Mechanical Demolition: removal of a structure involving the use of one or more pieces of heavy machinery to include: hydraulic excavators with various attachments; front end loaders (tracked or rubber-tired); cranes; bulldozers; etc.

Metal-clad cable (MC): a factory assembly of one or more conductors, each individually insulated and enclosed in a metallic sheath of interlocking tape or a smooth or corrugated tube.

Metal decking: a commercially manufactured, structural grade, cold-rolled metal panel formed into a series of parallel ribs; this includes metal floor and roof decks, standing seam metal roofs, other metal roof systems, bar gratings, checker plate, expanded metal panels, and similar products.

Miscellaneous-Type Hooks: Hooks that do not support a load in a direct-pull configuration, such as grab hooks, foundry hooks, sorting hooks and choker hooks.

Misfire: an explosive charge that failed to detonate.

Mishap: an unplanned, undesired event that occurs during the course of activity being performed. The term “mishap” includes accidents, incidents and near-misses.

Mixed-gas diving: a diving mode in which the diver breathes mixture other than air, e.g., helium-oxygen, (OEA).

Mobile conveyor: a conveyor supported on a structure that is movable under its own power.

Monorail: a single run of overhead track.

Motor vehicle: a sedan, van, SUV, truck, motorcycle, or other mode of conveyance intended for use on public roadways, and includes construction equipment that is driven on public highways. It is not intended to apply to equipment designed exclusively for use off the highway.

Mud capping (bulldozing, adobe blasting, or dobying): blasting by placing a quantity of explosives against a rock or other object without confining the explosives in a drill hole.

Mudsill: a 2-in x 10-in x 8-in (5.1-cm x 25.4-cm x 20.3-cm) (minimum) wood plate that is used to distribute the scaffolding load over a suitable ground area. The size of the mudsill is determined by the load carried over a particular ground area and by the nature of the soil supporting the sills.

Multi-employer work site: a work site where more than one employer occupies the same work site. The Government considers the Prime Contractor to be the "controlling authority" for all subcontractors.

Multiple-Lift Rigging (Christmas Tree Lifting"): procedure allowed ONLY during steel erection activities and ONLY if specific criteria are met – found in 29 CFR 1926.753(e) and EM 385-1-1, Sections 15 and 16.

Multiple-lift Rigging Assembly (Christmas tree lifting): a rigging assembly manufactured by wire rope rigging suppliers that facilitates the attachment of up to five independent loads to the hoist rigging of a crane.

Multipurpose dry chemical: a dry chemical that is approved for use on Class A, Class B, and Class C fires.

Near miss: a mishap resulting in no personal injury and zero property damage, but given a shift in time or position, damage or injury may have occurred (e.g., a worker falls off a scaffold and is not injured; a crane swings around to move his load and narrowly misses a parked vehicle). > See also "Mishap".

Negative pressure respirator (tight fitting): a respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.

No-decompression limits: the depth-time limits of the "no-decompression limits and repetitive dive group designation table for no-decompression air dives" as specified in the U.S. Navy Diving Manual or equivalent.

Nominal dimension: the dimension of material before it is surfaced and finished.

Non-Certified Fall Arrest Anchorage: An anchorage that a competent person can judge to be capable of supporting the predetermined anchorage forces.

Non-guided personnel hoist system: a hoist system used to transport personnel in a device that is not attached to fixed tracks or guide ropes (a boatswain's chair is an example of a non-guided personnel hoist).

Non-ionizing radiation: those electromagnetic radiations that do not cause ionization (but may be absorbed) in biological systems; includes low frequency ultraviolet light, infrared light, heat, laser, microwaves, and radio waves.

Nonmetallic-sheathed cable: a factory assembly of two or more insulated conductors having an outer sheath of moisture-resistant, flame-retardant, nonmetallic material.

Non-Permit Required Confined Space: a confined space that does not contain, or have the potential to contain an atmospheric hazard capable of causing death or physical harm. The atmosphere should be proven by air monitoring to be free of hazard.

Normally unoccupied remote facility: a facility operated, maintained, or serviced by employees who visit the facility only periodically to check its operation and to perform necessary operating or maintenance tasks. No employees are permanently stationed at the facility. Facilities meeting this definition are not contiguous with, and must be geographically remote from, all other buildings, processes, or persons.

Nosing: that portion of a tread projecting beyond the top of the tread immediately below.

Notch: when cutting a tree to be felled, a notch is cut into the tree on the same side to which the tree is to fall; the notch consists of a horizontal cut (of depth approximately one-third the tree's diameter); the top of the notch is cut at a 45° angle from a height of 2.5 in (6.4 cm) per 1 ft (0.3 m) of diameter above the base of the notch.

OEA: > See Nitrox Gas

OE Safety Specialist: A USACE employee who is qualified through experience and completion of the U.S. Army Bomb Disposal School, Aberdeen Proving Ground, Maryland, or U.S. Naval EOD School, Indian Head, Maryland ,or Eglin AFB, Florida, and is classified in the GS-0018 job series (CP-12 career series). Performs safety and occupational health support and oversight of projects involving MEC/RCWM.

Open conductors: wires that are run as separate conductors, in contrast to wires run through conduit, cables, or raceways.

Opening: a gap or void 12 in (30.5 cm) or more in its least dimension in a floor, roof, or other walking/working surface. Skylights and smoke domes that do not meet the strength requirements of 29 CFR 1926.754(e)(3) shall be regarded as openings.

Operational performance test: a test, conducted without a test load, to determine the proper operation of a crane or other load handling equipment (LHE).

Outrigger: extendable or fixed structural members with one end attached to the base of a piece of equipment and the other end resting on floats on the ground: used to distribute loads in supporting equipment.

Outrigger float: the pedestal (or bearing pad) on which an outrigger beam is supported.

Outside post: the post away from the structure against which the scaffold is erected.

Overexposure: an exposure to a safety or health hazard above the PEL or, if there is no PEL, above the published exposure levels for the hazard.

Overriding operational necessity: circumstances in which essential work cannot be delayed for safety or environmental reasons, or could not reasonably have been anticipated.

Oxyfuel gas cutting: an oxygen cutting process that uses heat from an oxyfuel gas flame.

Oxyfuel gas welding: a welding process that joins work pieces by heating them with an oxyfuel gas flame

Oxygen deficient atmosphere: an atmosphere with oxygen content below 19.5% by volume.

Oxygen enriched atmosphere: an atmosphere containing more than 23.5% oxygen by volume.

Peak particle velocity: a measure of how fast the ground moves during an explosive blast.

Pendant: a rope or strand of specified length with fixed end connections.

Performance test: a test to determine the proper operation of a crane and the ability of the crane to safely lift loads within its performance rating. A performance test includes operational performance tests and load performance tests.

Perimeter protection: measures taken to prevent personnel, vehicles, and materials from falling into an excavation:

- Class I perimeter protection guarding against personnel falling into an excavation it shall meet the following:

- Have the strength, height, and maximum deflection requirements for guardrails;
- Provide fall protection equivalent to that provided by a toprail, midrail, and toeboard; and
- Have post spacing equivalent to a standard guardrail.

- Class I perimeter protection guarding against traffic (vehicles and/or equipment) falling into an excavation ishall be designed, by a qualified person, to withstand the potential forces and bending moments due to impact by traffic.
- Class II perimeter protection: consists of warning barricades or flagging placed at a distance not closer than 6 ft (1.8 m) from the edge of the excavation: warning barricades or flagging do not have to meet the requirements for Class I perimeter protection but do need to display an adequate warning at an elevation of 3 ft (0.9 m) to 4 ft (1.2 m) above ground level.
- Class III perimeter protection: warning barricades or flagging placed a distance not closer than 6 in (15.2 cm) nor more than 6 ft (1.8 m) from the edge of the excavation: warning barricades or flagging do not have to meet the requirements for Class I perimeter protection but do need to display an adequate warning at an elevation of 3 ft (0.9 m) to 4 ft (1.2 m) above ground level.

Permanent floor: a structurally completed floor at any level or elevation (including slab on grade).

Permit-required confined space (permit space): a confined space that has one or more of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere,
- Contains a material that has the potential for engulfing an entrant,
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section, or
- Contains any other recognized serious safety or health hazard.

Personal Eyewash Units: Personal eyewash units are portable, supplementary units that support plumbed units or self-contained units, or both, by delivering immediate flushing for approximately 15 minutes. May not be used by itself as eyewash protection.

Personal fall arrest system: an engineered system used to arrest an employee in a fall; consists of an anchorage, connectors, body harness, and may include a lanyard, deceleration device, lifeline, or suitable combination of these.

Personal fall protection system: an engineered system that protects employees from falls.

Physician: A licensed Doctor of Medicine (M.D) or Osteopathy (D.O.) in good standing who, by virtue of education, specialized training, and experience, has acquired a minimum of five (5) years experience and is knowledgeable of regulations and resources relating to occupational medicine such as OSHA, and Occupational Medicine Practice Guidelines (ACOEM).

- For the purposes of this manual, physicals can be accomplished through other licensed health care providers, such as a Physician's Assistant, but shall be reviewed and signed by a licensed Doctor of Medicine or Osteopathy.
- This term is intended to mean a Medical Doctor (M.D.) or Doctor of Osteopathy (D.O.).

Plank platform: a work platform made up of wood boards (oriented horizontally).

Planking: a wood board or fabricated component that is used as a flooring member.

Platform Ladder: a self-supporting portable ladder of fixed size with a platform provided at the intended highest standing level.

Point of anchorage: a secure point of attachment for lifelines, lanyards, or deceleration devices.

Portable electric tools: electric equipment intended to be moved from one place to another.
Portable ladder: a ladder that can be readily moved or carried.

Portable tank: any closed vessel having a liquid capacity over 60 gal (0.23 m^3) and not intended for fixed installation.

Portal: the entrance to a tunnel.

Position hazard analysis (PHA): a documented process by which the duties (or tasks) of an employee's job position are outlined, the actual or potential hazards of each duty are identified, and measures for the elimination or control of those hazards are developed.

Positioning Device System: a body harness system rigged to allow a worker to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning (e.g., working on rebar assembly, towers, poles or ladders).

Positive-pressure respirator: a respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

Potable Water: water which meets the quality standards prescribed in the U.S. Public Health Service Drinking Water Standards, published in 42 CFR Part 72, or water which is approved for drinking purposes by the State or local authority having jurisdiction.

Powered Air-Purifying Respirator (PAPR): an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

Powered industrial truck (PIT): a mobile power propelled truck used to carry, push, pull, lift, stack, or tier materials; Includes forklifts, pallet trucks, rider trucks, forktrucks, lifttrucks, telehandlers. Excluded are vehicles used for earth moving and over-the-road hauling.

Pre-discharge employee alarm: an alarm that will sound at a set time before actual discharge of an extinguishing system so that employees may evacuate the discharge area before system discharge.

Pre-entry briefings: an information briefing given by the site safety and health supervisor to employees before their entry to an HTRW site and instructing employees in the contents of the site-SSHP.

Premises wiring: the interior and exterior wiring, including power, lighting, control, and signal circuit wiring with all of the associated hardware, fittings, and wiring devices, both permanently and temporarily installed, which extend from the load-end of the service lateral conductors to the outlets.

Prescribed fire: any fire ignited to meet specific management objectives.

Pressure systems: all pipe, tubing, valves, controls, and other devices that operate or are maintained above atmospheric pressure. > See definition of Vacuum systems.

Primer: a cartridge or container of explosives into which a detonator or detonating cord is inserted or attached.

Prohibited condition: any condition in a permit space that is not allowed by the permit during the period in which entry is authorized.

Project Structural Engineer of Record: The registered, licensed professional responsible for the design of structural steel framing and whose seal appears on the structural documents.

Protective system: a method of protecting employees from cave-ins, from material falling into an excavation, or from the collapse of adjacent structures; includes benching, sloping, shoring, trench shields, underpinning, rock bolting, etc.

Qualified Evaluator of Signal Persons (not a third party): a person employed by the signal person's employer who has demonstrated that he/she is competent in accurately assessing whether individuals meet the Qualification Requirements in Section 16.B.06 for a signal person.

Qualified Evaluator of Signal Persons (third party): an entity that, due to its independence and expertise, has demonstrated that it is competent in accurately assessing whether individuals meet the Qualification Requirements in Section 16.B.06 for a signal person.

Qualified line-clearance tree trimmer: a tree worker who, through related training and on-the-job experience, is familiar with the hazards in line clearance and has demonstrated his/her ability in the performance of the special techniques involved.

Qualified line-clearance tree trimmer trainee: any worker undergoing line-clearance tree trimming training who, in the course of such training, is familiar with the hazards in line clearance and has demonstrated his/her ability in the performance of the special techniques involved.

Qualified Mast-Climber Work Platform (MCWP) Operator: an employee designated in writing by the employer that has been trained by a CP for Scaffolding; shall be able to recognize hazards associated with mast-climbing scaffolds; have specific equipment familiarization prior to operation to include distributed loading and point loading characteristics; demonstrate a comprehensive working understanding of the controls and safety systems; read and understand all cautions and danger warnings on the machine and in the operator's manual, including the maximum uniformly distributed load allowable for the specific configuration, the maximum point load allowed for the configuration, information relating to the placement of these loads on the platform, and any load reductions or restrictions (e.g., planking and cantilevers); and successfully demonstrate a comprehensive knowledge of pre-use inspection criteria, specific for the make and model.

Qualified person: one who, by possession of a recognized degree, certificate, or professional standing, or extensive knowledge, training, and experience, has successfully demonstrated his/her ability to solve or resolve problems related to the subject matter, the work, or the project.

Qualified Person, Electrical: One who, due to their knowledge, ability, experience, specialized training, and/or licensing can competently and safely perform required/assigned electrical duties or functions (construction, operations and/or maintenance); includes skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment, to determine the nominal voltage of exposed live parts, the clearance distances and corresponding voltages to which the qualified person will be exposed.

- Note 1: Whether an employee is considered to be a “qualified person” will depend upon various circumstances in the workplace, e.g., an individual may be considered “qualified” with regard to certain equipment in the workplace, but “unqualified” as to other equipment.
- Note 2: An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his level of training and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.

Qualified Person, Fall Protection (QP for FP): a person with a recognized degree or professional certificate and with extensive knowledge, training and experience in the fall protection and rescue field who is capable of designing, analyzing, evaluating and specifying fall protection and rescue systems; shall have an advanced understanding of the regulatory requirements, physical sciences and engineering principles that affect equipment and systems for FP and rescue; be able to calculate forces generated by an arrested fall, the total loading and the deflection of the fall arrest anchorage, the impact on the structural members to which the fall arrest system is attached and shall be able to determine safe locations of anchorages; shall supervise the design, selection, installation and inspection of certified anchorages and horizontal lifelines.

Qualified Person Trainer: A qualified person who meets the requirements of these standards and who is also qualified to provide fall protection training.

Qualified Rigger (Qualified Rigging Supervisor, Qualified Lift Supervisor): an employee that will rig loads or oversee the rigging of loads for hoisting. Employee must be at least 18 years of age; Be able to communicate effectively with the crane operator, the lift supervisor, flagman and affected employees on site; Have basic knowledge and understanding of equipment-operating characteristics, capabilities, and limitations; AND shall be able to demonstrate adequate knowledge and proficiency in the following: Personnel roles and responsibilities; Site preparation (terrain, environment); Rigging equipment and materials; Safe Operating procedures as related to rigging; Principles of safe rigging; Environmental hazards (overhead interferences); Rigging the load, handling the load, common causes of crane-related accidents.

Qualified tree worker: an individual who, through related training and on-the-job experience, is familiar with equipment, techniques, and hazards of tree maintenance and removal and with the equipment used in such operations and has demonstrated his/her ability in the performance of the special techniques involved.

Qualitative fit test (QLFT): a pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

Quantitative fit test (QNFT): an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Rad: a measure of the dose of ionizing radiation to the body tissue in terms of the energy absorbed per unit of mass of the tissue.

Radiant energy: the energy of electromagnetic waves produced by movement of molecules excited by the heat of an electric arc, gas flame, or the passage of electric current. Includes ultraviolet, visible light, and infrared energy.

Radiation area: any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any 1 hour a dose in excess of 5 mrem, or in any 5 consecutive 8-hour days a dose in excess of 100 mrem.

Radioactive material: any material that emits, by spontaneous nuclear disintegration, electromagnetic or particulate emanations.

Radiological device: machinery or equipment that produces or contains ionizing radiation, such as nuclear density meters and radiographic testing machines.

Rails: the side structural members of a ladder to which rungs, cleats, or steps are attached.

Rated Load (rated capacity): the maximum allowable working load established by the rigging hardware manufacturer. The terms “rated capacity” and “working load limit” are commonly used to describe rated load.

Recompression chamber: a pressure vessel for human occupancy such as a surface decompression chamber, closed bell, or deep diving system used to decompress divers to treat decompression sickness.

Reconfiguration: the addition or subtraction of boom, jib, counterweight or, for a fixed crane, a change in foundation.

Red Flag Barge/vessel: a barge/vessel carrying in bulk, hazardous cargoes regulated by SubChapter D (petroleum) and O (chemical) of Chapter I, Title 46 CFR of Certain Dangerous Cargoes (flammable or other hazardous materials) OR Vessels whose primary purpose is the transporting of flammable or other hazardous cargos e.g. oil tankers, chemical parcel tankers, liquid chemical barges, liquefied gas tankers, etc.).

Reeving: a rope system in which the rope travels around drums and sheaves.

REM (roentgen equivalent in man): a measure of the dose of ionizing radiation to body tissue in terms of its biological effect; the dose required to produce the same biological effect as one roentgen of high-penetration of x-rays.

Renovation: the process of remodeling or upgrading an existing structure. This process includes the selective interior demolition and possibly some exterior demolition of a structure as the first step before renovation begins.

Rescue system: an assembly of components and subsystems used for self-rescue or assisted-rescue

Residential Type Construction. Regardless of structure size, projects where the materials, methods and procedures are essentially the same as those used in building a typical single-family home or townhouse. Wood framing (not steel or concrete), wooden floor joists and roof structures are characteristic of the materials used, and traditional wood frame construction techniques are used in construction. Structures that use metal studs are considered residential construction if they meet the other criteria for residential construction.

Residual Risk: the level of risk or danger of an activity or event that exists after an activity has been analyzed and safety measures have been applied. > See Activity Hazard Analysis.

Rest: a period of time during which the person concerned is off duty; is not performing work, including administrative tasks; and is afforded the opportunity for uninterrupted sleep. This does not include time for breaks, meals, or travel time to/from work.

Restraint system: a combination of anchorage, anchorage connector, lanyard (or other mean of connection), and body support that limits travel in such as manner that the user is not exposed to a fall hazard.

Restricted area: when used in conjunction with ionizing radiation, any area to which access is controlled by the employer for purposes of protecting individuals from exposure to ionizing radiation.

Rigging Hardware: Detachable rigging hardware used for load-handling activities; includes shackles, links, rings, swivels, turn-buckles, eyebolts, hoist rings, wire rope clips, wedge sockets, rigging blocks and load-indicating devices.

Risk Assessment: the systematic identification of potential hazards in the work place as a first step to controlling the possible risk involved; a fundamental process that is required by legislation.

Risk Assessment Code (RAC): quantitative estimate of risk associated with an activity/task; a product of the estimated probability (frequency) of loss from an activity/task and the severity of that loss. The RAC is then used as a level of residual risk for that activity. This level must be approved by the appropriate level of authority prior to that work activity proceeding. > See also “Activity Hazard Analysis”, “Inherent Risk” and “Residual Risk”.

Roll out: A process by which a snaphook or carabiner unintentionally disengages from another connector or object to which it is coupled.

Rope Access: a variety of advanced access techniquies where roped and specialized equipment are used as the primary method for providing access and support to workers in their jobs at high or hard-to-reach places.

Rope Access Supervisor: A person with the training, skills, experience and qualifications necessary to assume responsibility for the entire rope access work site, including management and guidance of other Rope Access Technicians on the worksite; is capable of designing, analyzing, evaluating and specifying rope access systems and has the knowledge and experience to direct rescue operations from rope access systems, as well as the skills necessary to perform advanced rescue from rope access systems.

Rope Access Worker: A person with the appropriate training, skills, and qualifications for performing, under the direct supervision of a Rope Access Leader, Technician or Supervisor, standard rope access operations and, at a minimum, has the skills necessary to perform limited rescue from rope access systems.

Rope grab: see fall arrestor.

Rope-guided personnel hoist system: a hoist system, used to transport personnel in a cage, which is guided by wire ropes as differentiated from a hoist system using anchored rail arrangements.

Rotation resistant rope: a wire rope consisting of an inner layer of strand laid in one direction covered by a layer of strand laid in the opposite direction: this has the effect of counteracting torque by reducing the tendency of the finished rope to rotate.

Runner: a horizontal scaffold member that forms a tie between posts and may also support a bearer.

Runway: a personnel passageway elevated above the surrounding floor or ground level, such as a foot walk along shafting or a walkway between scaffolds.

Safe Clearance Procedure: Written procedure that identifies the steps to be taken for the implementation of proper controls of the known and potential hazards associated with a particular operation, piece of equipment, tool or system.

Safe for Workers: denotes a confined space on floating plant that meets the following criteria:

- The oxygen content of the atmosphere is at least 19.5 percent and below 22 percent by volume;
- The concentration of flammable vapors is below 10 percent of the lower explosive limit (LEL);
- Any toxic materials in the atmosphere associated with cargo, fuel, tank coatings, or inerting media are within permissible concentrations at the time of the inspection.

Safety belt: See “Body Belt”.

Safety can: an approved container, of not more than 5 gal (18.9 L) capacity, having a spring-closing lid and spout cover and designed to safety relieve internal pressures under fire exposure.

Safety deck attachment: an initial attachment that is used to secure an initially placed sheet of decking to keep proper alignment and bearing with structural support members.

Safety factor: the ratio of the ultimate braking strength of a member or piece of material or equipment to the actual working stress or safe working load when in use.

Safety harness: See “Full Body Harness”.

Safety Lashing: A rope, cord, chain, or other suitable material flexible lacing that is used to fasten two objects together securely and thus rendering the objects safe.

Safety Monitoring System: Safety System where Competent Person for Fall Protection is responsible for recognizing and warning employees of fall hazards.

Safety Point of Contact (POC): a worker that has knowledge of the work being performed and the associated hazards and controls associated with it.

Safety precaution area: those portions of approach-departure clearance zones and transitional zones where placement of objects incident to contract performance might result in vertical projections at or above the approach-departure clearance or the transitional surface.

Safety Professional: Because of the wide variety of safety, health and environmental responsibilities safety professionals undertake, a simple definition has not been widely accepted within the profession. Instead, industry looks to ANSI Z590.2, Criteria for Establishing the “Scope and Functions of the Professional Safety Position”.

Safety relief valves: valves that relieve excess pressure or vacuum (depending on their design) that would otherwise damage equipment or cause injury to personnel.

Safety sign: a visual alerting device in the form of a sign, label, decal, placard, or other marking that advises the observer of the nature and degree of the potential hazard(s) that can cause an accident. It may also provide other directions to eliminate or reduce the hazard and may advise of the probable consequences of not avoiding the hazard.

Safety sign alert symbol: a symbol that indicates a potential personal injury hazard. It is composed of an equilateral triangle surrounding an exclamation mark.

Safety sign message panel: area of the safety sign that contains those words related to: identification of the hazard, how to avoid the hazard, and probable consequences of not avoiding the hazard.

Safety sign panel: area of a safety sign having a distinctive background color different from adjacent areas of the sign or which is clearly delineated by a line or margin.
Safety sign signal word panel: area of the safety panel that contains the signal word.

Safety tag: a device usually made of card stock, paper, paperboard, plastic, or other material on which letters, markings, symbols, or combinations thereof, appear for the purpose of alerting persons to the presence of a temporary hazard or hazardous condition created by situations such as shipment, setup, service, or repair. The tag is removed when the hazard or hazardous condition no longer exists.

Scaffold: temporary elevated platform and its supporting structure used for supporting worker(s), materials, or both.

Scaffold, double pole: a scaffold supported from the base by a double row of posts. This scaffold is independent of support from walls and is constructed of posts, runners, horizontal platform bearers, and diagonal bracing (also known as independent pole scaffold).

Scaffold, float: a scaffold hung from overhead supports by means of ropes and consisting of a unit having diagonal bracing underneath. The scaffold rests upon and is securely fastened to two parallel plank bearers at right angles to the span (also known as ship scaffold).

Scaffold, Hanging: A scaffold consisting of a work platform supported by hooks or brackets that are part of the scaffold structure and are directly attached to or hanging on a wall, lock gate, or similar vertical structure, providing an elevated work area for those engaged in repairing or modifying the vertical structure.

Scaffold, horse: a scaffold for light or medium duty that is composed of horses supporting a platform.

Scaffold, interior-hung: a suspended scaffold consisting of a work platform suspended from the ceiling or roof structure by fixed length supports.

Scaffold, ladder jack (PROHIBITED): a light-duty supported scaffold consisting of a platform supported by brackets attached to ladders.

Scaffold, Large area: a scaffold erected over substantially the entire work area. For example: a scaffold erected over the entire floor area of a room.

Scaffold, Lean-to (prohibited): a supported scaffold which is kept erect by tilting it toward and resting it against a building or structure.

Scaffold, load ratings: maximum loadings for the following categories:

- Heavy duty: a scaffold designed and constructed to carry a working load of 75 lbs per square foot (366.2 kg/m^2), that is intended for stone masonry work, with storage material on the platform.
- Medium duty: a scaffold designed and constructed to carry a working load of 50 lbs per square foot (244.1 kg/m^2), that is intended for bricklayers or plasterers, with weight of material in addition to workers.
- Light duty: a scaffold designed and constructed to carry specific working load of 25 lbs per square foot (122.1 kg/m^2), that is intended for workers only, with no material storage other than weight for tools.
- Special duty: a scaffold designed and constructed to carry specific types of objects, such as palletized materials. The design of planks and other types of scaffold units, the scaffold, and accessories shall be based on categories of load ratings.

Scaffold, manually propelled: a scaffold assembly supported by casters and moved only manually.

Scaffold, mason's multiple-point adjustable suspension: a scaffold having a continuous platform supported by bearers suspended by wire rope hoists from overhead supports.

Scaffold, metal frame: a scaffold consisting of a work platform supported by prefabricated metal frames.

Scaffold, needle-beam: a platform resting on two bearers that is suspended by a line.

Scaffold, outrigger: a scaffold consisting of a work unit supported by outriggers projecting beyond the wall or face of the building or structure, the inboard ends of which are secured inside of such building or structure.

Scaffold, pump jack: a scaffold consisting of a work platform supported by movable support brackets mounted on vertical poles.

Scaffold, single-point suspension: a scaffold supported by a single wire rope from an overhead support so arranged and operated as to permit the raising or lowering of the platform to desired working position.

Scaffold, single pole: a unit resting on bearers or cross beams. The outside ends of this unit are supported on runners secured to a single row of posts or uprights, and the inner ends of this unit are supported on or in the wall.

Scaffold, stonesetters' multiple-point adjustable suspension: a swinging type scaffold having a unit supported by members that is suspended at four points.

Scaffold, system: a scaffold consisting of posts with fixed connection points that accept runners, bearers, and diagonals that can be interconnected at predetermined levels.

Scaffold, tube and coupler: a scaffold consisting of a work platform supported by individual pieces of tubing (uprights, bearers, runners, bracing) connected with couplers.

Scaffold, two-point suspension (swinging scaffold/swinging stage): a suspension scaffold consisting of a platform supported by hangers (stirrups) suspended by two ropes from overhead supports and equipped with means to raise and lower the platform.

Scaffold, window jack: a supported scaffold consisting of a platform supported by a bracket or jack that projects through a window opening.

Scaled distance: a scaled factor (ft/lb units) of the potential damage to a structure, based on the distance from the nearest structure to the blast site and the weight of explosives per delay.

Scaling: the removal of loose, overhanging, protruding, or otherwise precariously positioned material from above or along the sides of an excavation.

Scheduled work: Work that is regular and recurring, in that it forms a similar pattern for more than 50% of a working tour.

Scientific Diving: Diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks; Tasks are light to medium duty, such as environmental or ecological surveys, filming/ recording flora and fauna, biological sample collection, and placement of scientific monitoring equipment; does not include placing or removing heavy objects underwater, regardless of its purpose, or performing any tasks usually associated with commercial diving such as, but not limited to: inspection/ assessment of underwater pipelines, structures and similar objects for structural reasons; construction; demolition; cutting or welding; or the use of explosives.

Scissor lift: a raising/lowering device that is supported or stabilized by one or more pantograph leg sections.

SCUBA: an acronym for self-contained underwater breathing apparatus, in which the supply of breathing mixture carried by the diver is independent of any other source.

Sea-keeping: the aspects of a vessel's design and construction that determine its ability to operate efficiently in the body of water where it will operate (e.g., stability, strength, and speed).

Sea-worthy: a vessel that is fit in all aspects for the anticipated perils of the voyage and will carry the crew and cargo in a safe condition.

Self-contained breathing apparatus (SCBA): an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

Self-retracting lanyard: a deceleration device containing a drum wound line that automatically locks at the onset of a fall to arrest the user, but that automatically pays out from and retracts onto the drum during normal movement of the person to whom the line is attached, after onset of a fall, automatically locks the drum and arrests the fall.

Separately derived system: a premises wiring system whose power is derived from generator, transformer, or converter winding and has no direct electrical connection, including a solidly connected grounded circuit conductor, to supply conductors originating in another system.

Service: the conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

Service conductors: the conductors from the service point to the service disconnecting means.

Service drop: the overhead service conductors from the last pole or other aerial support to and including the splices, if any, connecting to the service-entrance conductors at the building or other structure.

Service life: the period of time that a respirator, filter or sorbent, or other respiratory equipment provides adequate protection to the wearer.

Service station (automotive): that portion of property where liquids used as motor fuels are stored and dispensed from fixed equipment into the fuel tanks of motor vehicles or approved containers and shall include any facilities for the sale and service of tires, batteries, and accessories.

Service station (marine): that portion of a property where liquids used as fuels are stored and dispensed from equipment on shore, piers, wharves, or floating docks into the fuel tanks of self-propelled craft.

Shackle: a U-shaped metal fitting with a pin through the ends.

Shaft: a passage made from the surface of the ground to a point underground; shafts cut through the ground at an angle greater than 20° to the horizontal. > See “Tunnel”.

Shallow dose equivalent: applies to the external exposure of the skin or an extremity. It is taken as the dose equivalent at a tissue depth of 0.007 cm averaged over an area of 1.6 in^2 (10 cm^2).

Shear connector: headed steel studs, steel bars, steel lugs, and similar devices that are attached to a structural member for the purpose of achieving composite action with concrete.
Sheave: the grooved wheel of a pulley or block over which rope or cable is passed.

Sheeting: > See “Upright”.

Shield: a structure that is designed to withstand the forces imposed on it by the walls of an excavation and prevents cave-ins.

Ship repair: includes any repair of a vessel including, but not restricted to, alterations, conversion, installation, cleaning, painting, and maintenance work. This includes work in confined and enclosed spaces and other dangerous atmospheres in vessels, vessel sections, and on land-side operations regardless of geographic location.

Shoring: a support member that resists compressive forces imposed by a load.

Site control procedures: procedures delineated in the site control program that will be used to minimize any potential contamination of workers, protect members of the public from the site’s hazards, and prevent vandalism.

Site Safety and Health Officer (SSHO): the superintendent or other qualified or competent person who is responsible for on-site safety and health.

Site Safety and Health Officer (HTRW): the person on-site with the responsibility for implementation of the APP and SSHP appendix at HTRW activities.

Site Safety and Health Manager (SHM): the CIH, CSP, or CHP responsible for development and enforcement of the APP and SSHP appendix for HTRW activities.

Site safety and health plan (SSHP): an appendix to the APP that describes the site-specific practices.

Site work zones: zones of differing work activities and hazards established to reduce the accidental spread of hazardous substances from a contaminated to an uncontaminated area and to control exposure of personnel to HTRW hazards. There are generally three categories of site work zones:

- Exclusion zones, where contamination does or could occur,
- Contamination-reduction zones, which are transition areas between contaminated areas and clean areas and where decontamination takes place, and
- Support zones, which are uncontaminated areas where administrative and support functions are located.

Sling: an assembly used for lifting when connected to a lifting mechanism at the sling's upper end and when supporting a load at the sling's lower end. > See Figure 15-4.

Sling - basket: loading with the sling passed under the load with both ends, end attachments, eyes, or handles on the hook or a single master link.

Sling - choker: loading with the sling passed through one end attachment, eye, or handle and suspended by the other.

Sloping: a method of protecting employees from cave-ins by cutting the sides of the excavation in the arrangement of slopes; The angle of the slope needed to prevent cave-in is a function of the soil type, environmental factors such as moisture and freezing weather, and the magnitude and location of any loads and vibration surcharged upon the slopes.

Sling - vertical: a load suspended on a single, vertical, part or leg.

Small hose system: a system of hose, ranging in diameter from 5/8 in (1.6 cm), that is for use by employees and provides a means for the control and extinguishment of incipient stage fire.

Snap hook: a connector comprised of a hook-shaped body with a normally closed gate, or similar arrangement that may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. The locking type has a self-closing, self-locking keeper that remains locked until unlocked and pressed open for connection or disconnection.

Snap-ties: a concrete wall-form tie, the end of which can be twisted or snapped off after the forms have been removed.

Snow Machine: any vehicle designed to travel over ice and snow using mechanical propulsion in conjunction with skis, belts, cleats or low-pressure tires.

Soft Demolition: removal of parts/systems of a structure which may include the following: removal of doors, windows, lay-in tile ceilings, fixtures, interior equipment, lighting, HVAC system components, floor covering, support systems, and other items deemed appropriate by the State in which the demolition permit is granted. Soft demolition does not include the facility enclosure, curtain walls, roof, slab, or the structural frame.

Sound-pressure: steady state: sound that does not significantly change in intensity or frequency with time.

Specialty Vehicles: all other vehicles not meeting definition of motor vehicle, ATVs, ORVs, Utility Vehicles, machinery or mechanized equipment, dump truck, etc. Examples are golfcarts, Segway HT, snow machines/mobiles, etc.

Splice - eye: a splice formed by bending a rope's end back onto itself and splicing it into the rope so that a loop is formed.

Splice - hand tucked: a loop formed in the end of a rope by tucking the end of the strands back into the main body of the rope.

Splice - long: a splice without an appreciable increase of circumference that is used when the rope must run over a sheave or through a hole.

Splice - mechanical: a loop formed in the end of a rope and connected by pressing (swaging) one or more metal sleeves over the junction of the rope.

Splice - short: a splice using less material than a long splice but increasing the circumference.

Sprinkler system: a system of piping designed in accordance with fire protection engineering standards and installed to control or extinguish fires. The system includes an adequate and reliable water supply, a network of specialty sized piping and sprinklers that are interconnected, and a control valve and device for actuating an alarm when the system is in operation.

SSHO: The SSHO for contract work shall meet the administrative, educational, experience and training requirements details in Section 01.A.17.a-d.

SSHO, Alternate: An employee that meets the definition of SSHO but is not the Primary SSHO.

Stable rock: natural solid mineral material that can be excavated with vertical sides and remain intact while exposed.

Standard Lift Plan: Written information and/or instruction used in support of planning a standard load handling activity; See also Form 16-2, Standard Lift Plan Checklist.

Standby diver: a diver at the dive location available to assist a diver in the water; standby divers will be dressed for immediate entry into the water.

Standpipe system:

- Class I standpipe system: a 2-1/2 in (6.4 cm) hose connection for use by fire departments and those trained in handling heavy fire streams.
- Class II standpipe system: a 1-1/2 in (3.8 cm) hose system that provides a means for the control or extinguishment of incipient stage fires.
- Class III standpipe system: a combined system of hose that is for use by employees trained in the use of hose operations and that is capable of furnishing effective water discharge during the more advanced stages of fire (beyond the incipient stage) in the interior of workplaces.

Station bill: a placard that designates vessel personnel duties and procedures to be followed in the event of an emergency or emergency drill. Placards are permanently placed in personnel quarters and work areas, and are strategically located throughout the vessel.

Steel erection: the construction, alteration, or repair of steel buildings, bridges, and other structures, including the installation of metal decking and all planking used during the process of erection.

Steel joist: an open web, secondary load-carrying member of 144 ft (43.9 m) or less, designed by the manufacturer, used for the support of floors and roofs. This does not include structural steel trusses or cold-formed joists.

Steel joist girder: an open web, primary load-carrying member, designed by the manufacturer, used for the support of floors and roofs. This does not include structural steel trusses.

Steel truss: an open web member designed of structural steel components by the project structural engineer of record. A steel truss is considered equivalent to a solid web structural member.

Steep-sloped roof: a roof having a slope greater than 4:1 (vertical to horizontal).

Step stool: a self-supporting, foldable, portable ladder, non-adjustable in length, 32 in (81.3 cm) or less in height, with flat steps and without a pail shelf, designed to be climbed on the ladder top cap as well as all steps.

Stilts: a pair of poles or similar supports with raised footrests, used for walking above the ground or working surface.

Storage tank: any vessel having a liquid capacity that exceeds 60 gal (227.1 L) is intended for fixed installation and is not used for processing.

Stored energy: energy (electrical, mechanical, or chemical) that might be found in a charge capacitor, a loaded spring, chemical solutions, or other similar hazardous form.

Structural Demolition: the complete removal of a structure that is not occupied. Structures may include: buildings, chimneys, towers, foundations, utilities, bridges or similar.

Structural steel: a steel member, or a member made of a substitute material (such as, but not limited to, fiberglass, aluminum or composite members). These members include, but are not limited to, steel joists, joist girders, purlins, columns, beams, trusses, splices, seats, metal decking, girts, and all bridging, and cold-formed metal framing which is integrated with the structural steel framing of a building.

Supplied-air respirator (SAR) or airline respirator: an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

Support system: a structural means of supporting the walls of an excavation to prevent cave-ins; includes shields, shoring, underpinning, rock bolts, etc.

Surface-supplied air (SSA): a diving mode in which the diver in the water is supplied from the dive location with compressed air for breathing.

Swage fittings: fittings in which wire rope is inserted and attached by cold flowing method.

Swinger mechanism: the device that rotates a derrick mast.

Swinging (hanging) lead: pile-driving leads that are suspended from an extended boom point sheave pin at the top of the boom. The bottom points of the leads are positioned astride the pile location, the hammer is vertically above the top of the pile. Often the bottoms of the leads are pointed and the weight of the pile leads and hammer force the bottom points into the ground, holding them in position.

Switch: a device for connecting two or more continuous package conveyor lines; an electrical control device; or a mechanism that transfers a trolley, carrier, or truck from one track to another at a converging or diverging section.

System: includes machinery, equipment, and electrical, hydraulic, and pneumatic lines and their subsystems.

Systems-engineered metal building: a metal, field-assembled building system consisting of framing, roof, and wall coverings. Typically, many of these components are cold-formed shapes. These individual parts are fabricated in one or more manufacturing facilities and shipped to the job site for assembly into the final structure. The engineering design of the system is normally the responsibility of the systems-engineered metal building manufacturer.

Tackle: an assembly of ropes and sheaves arranged for lifting, lowering and pulling.

Tagout: a form of hazardous energy control procedure using the placement of a tagout device, in accordance with established procedures, on an energy-isolating device to indicate that the energy-isolating device and the system being controlled may not be operated until the tagout device is removed.

Tagout device: a prominent warning device, such as a tag with a means of attachment, which can be securely attached to an energy-isolating device in accordance with established procedures to indicate that the energy-isolating device and system being controlled may not be operated until the tagout device is removed.

Tailing crane lift: a procedure sometimes used in erecting large pressure vessels or structural elements in which one crane (lead crane) lifts the top of the load and a second crane (tail crane), rigged to the bottom of the load, either secures the bottom of the load from movement or assists in the horizontal positioning of the load.

Take-up: the assembly of the necessary structural and mechanical parts that provides the means to adjust the length of belts, cables, chains, and similar transmission mechanisms to compensate for stretch, shrinkage, or wear, and to maintain proper tension.

Tandem crane lift: the use of two or more cranes to lift a load.

Taut-line hitch: a knot used for securing all workers aloft to their climbing rope, and consisting of either one or two wraps over two wraps.

Thermite Welding: a welding process that produces coalescence of metals by heating them with superheated liquid metal resulting from a chemical reaction between a metal oxide and aluminum, with or without the application of pressure.

Three-point-contact: usually required when ascending/descending ladders; means that either both hands and one foot, or both feet and one hand are in contact with the climbing device at all times.

Threshold limit values (TLV): airborne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects.

Third (3rd) party, Nationally Accredited (ANSI, NCCA) SOH-related certification: safety and health related certifications that can be obtained by a safety and occupational health professional. They are Nationally Accredited, meaning the awarding organization must follow recognized, established national criteria for administration of the certification process AND provided by a 3rd Party.

CFPS - Certified Fire Protection Specialist

CIH - Certified Industrial Hygienist
CHP - Certified Health Physicist
CHMM - Certified Hazardous Materials Manager
CHMP - Certified Hazardous Materials Practitioner
CHST - Construction Health and Safety Technologist
CMSP - Certified Mine Safety Professional
COHN - Certified Occupational Health Nurse
COHN-S - Certified Occupational Health Nurse - Specialist
CSP - Certified Safety Professional
OHST - Occupational Health and Safety Technologist
STS - Safety Trained Supervisor

Tied in: the term that describes a tree climber whose climbing line has been properly crotched and attached to the saddle and whose taut-line hitch is tied.

Tight-fitting facepiece: a respiratory inlet covering that forms a complete seal with the face.

Toeboard: a vertical barrier at floor level erected along exposed edges of a floor opening, wall opening, platform, runway, or ramp to prevent materials from falling.

Tool rest (work rest): a device that prevents the tool or work piece from jamming between the abrasive wheel and the wheel guard.

Top running bridge: a bridge that travels over top of a runway track.

Toprail: the uppermost horizontal rail of a guardrail system.

Total effective dose equivalent: the sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

Total Fall Distance. The total vertical distance a person falls, measured from the onset of a fall to the point where the person comes to rest after the fall is stopped. Total fall distance includes free fall distance and deceleration distance, but excludes dynamic elongation.

Total flooding systems: a fixed suppression system that is arranged to automatically discharge a predetermined concentration of agent into an enclosed space for fire extinguishment or control.

Toxic: pertaining to, or caused by, poison; poisonous; harmful.

Toxic chemical: is a chemical that produces serious injury or illness by absorption through any body surface.

Track-guided personnel hoist system: a hoist system used to transport personnel in a car that is attached to fixed tracks or guide members.

Travel restraint system: See “Restraint System”.

Travel time (marine): time spent transiting to and from the rest location when not immediately adjacent to or aboard the work site.

Trench: an excavation that is narrow in relation to its length; in general, the depth is greater than the width, and the width is not greater than 15 ft (4.6 m).

Trestle Ladder Scaffold: A work platform supported by a trestle ladder. A trestle ladder is a self-supporting portable ladder that can be adjustable in length, consisting of two sections, hinged at the top to form equal angles with the base.

Trim (floating crane barge): the angle of inclination about the transverse axis of the barge or pontoon.

Trolley: the unit that travels on bridge rails and supports the load block.

Trolley conveyor: a series of trolleys supported from or within an overhead truck and connected by endless propelling means, such as chain, cable, or other linkage, with loads usually suspended from the trolleys.

Trolley line: a horizontal line for direct attachment to a worker’s body belt, lanyard, or deceleration device.

Truck (crane): the unit consisting of a frame, wheels, bearings, and axles that supports the bridge girders or trolleys.

Tunnel: an excavation beneath the surface of the ground, the longer axis of which makes an angle not greater than 20° to the horizontal. > See “Shaft”.

Turbine Maintenance Platform: a temporary work platform designed to fit into a hydropower turbine to facilitate maintenance of the turbine -usually erected with the turbine remaining in place.

Two-block damage prevention device: a system that will stall when two-blocking occurs without causing damage to the hoist rope or crane machinery components.

Two-block warning device: a warning device to alert the operator of an impending two-blocking condition.

Two-blocking: the condition when the lower load block or hook assembly comes in contact with the upper load block, or when the load block comes in contact with the boom tip.

Unfired pressure vessels: vessels that can withstand internal pressure or vacuum but do not have the direct fire of burning fuel or electric heaters (heat may be generated in the vessel due to chemical reactions or the application of heat to vessel contents).

Unmanned vessels: vessels that carry cargo such as materials, supplies, equipment, or liquids, and do not have personnel on board during normal operations.

Unprotected sides and edges: any side or edge (except at entrances to points of access) of a walking/working surface (e.g., floor, roof, ramp or runway) where there is no wall or guardrail system.

Unsafe Condition: any physical state that is not acceptable, that presents risks to personal safety, or that has the potential to cause personal injury, illness, and/or damage to property, or that contributes to a reduction in the degree of safety normally present.

Upright: a vertical structural support member. In excavation support systems, uprights are placed in contact with the earth and are usually spaced so that individual uprights do not contact one another. Uprights that are spaced such that they are in contact with or interconnected to one another are referred to as sheeting.

USACE Diving Coordinator (UDC): a USACE employee assigned the responsibility for organizing, integrating, and monitoring the total dive program within a USACE Command; UDC and alternate are appointed, in writing, by the USACE Commander/Director; assures adherence to all applicable rules and regulations.

USACE motor vehicle: any vehicle (government-owned; POV or Rental Car if being used while on-duty in lieu of government-owned vehicle) provided for transportation of government and/or contractor personnel.

Utility Vehicles: Motorized off-highway vehicle capable of maneuvering over uneven terrain, having four or more low pressure tires, designed with side by side seats, seatbelts, steering wheel and optional cab/brush cage (not ROPS). Some offer ROPS as option. (e.g., Rangers, Rhino, M-Gators, Gators, and Mules).

Vehicle-mounted elevating and rotating work platforms: an elevating and rotating work platform mounted on the chassis of a commercial vehicle.

Vertical lifeline system: a vertically suspended flexible line with a connector at the upper end for tying it to a 5000 lbs (22.2 kN) single overhead anchorage along which a fall arrester (rope grab) travels.

Vessel: every type of watercraft or artificial contrivance used, or capable of being used, as a means of transportation on water, including special-purpose floating structures not primarily designed for or used as a means of transportation on water.

Visitor: anyone coming to the site for short-term action (e.g., inspection, meetings, deliveries, etc.).

Warning Line System (WLS): a barrier erected on a floor, roof, or edge of excavation area to warn workers that they are approaching an unprotected side or edge.

Weathervaning: wind induced rotation of a crane superstructure, when out-of-service, to expose minimal surface area to the wind.

Weighting factor: factor that represents the proportion of the total stochastic (cancer plus genetic) risk resulting from irradiation to tissue to the total risk when the whole body is irradiated uniformly.

Wet-bulb globe temperature (WBGT) index: a measurement of environmental factors that correlate with human deep body temperature and other physiological responses to heat.

Wet location: installations underground or in concrete slabs or masonry in direct contact with the earth and locations subject to saturation with water or other liquids, such as vehicle washing basins, and locations exposed to weather and unprotected.

Whaler: a horizontal structural member; in excavation support systems, whalers are placed parallel to the face of the excavation and bear against uprights or the excavation wall.

Whip Check: A cable-like device used on pressurized hoses that prevents serious injury due to hose or coupling failure and may also minimize damage to equipment, may also be referred to as “safety lashing.

Whipline (runner or auxiliary line): a separate hoist rope system on a crane, usually of a lighter load capacity than the main hoist.

Wild land fire: a planned or an unplanned fire in wild land fuels.

Work positioning system: See “Positioning System”.

Work stand (Portable Work Platform): a portable work stand commonly used by sheetrockers. They are designed to meet ANSI ladder standards rather than scaffold standards.

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